PITCH VARIATION BETWEEN L1 AND L2
A Cross-Cultural/Gender Comparison - Japanese and English

by

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ABSTRACT

Eady (1982) stated that it seems intuitively evident that speakers of different languages utilize a different rate of laryngeal vibration when speaking in their own languages Continuing discussions in the literature often point out that speakers of certain languages generally employ a higher pitch level than speakers of other languages

It has been reported that the pitch levels that Japanese women use, especially when speaking Japanese, are extremely high compared to female native-English speakers (Muta, 1994, Yamazawa & Hollien, 1992, Ohara, 1992) Although these researchers have attempted to explain the pitch differences found between specific language speakers or among specific nationalities, they have not yet clearly explained the reasons why these variations exist It still appears to be an open question for further investigation

In the present study, Japanese and English passages read by bilingual Japanese and Canadian subjects were examined acoustically Both children's stories and news articles were investigated Mean speaking fundamental frequencies (SFF) of

Japanese and Canadian subjects were obtained in both Japanese-speaking and English-speaking conditions. Minimum and maximum F0, pitch range, and reading speed were also investigated.

The aims of this research were to compare

(1) SFF Variation (over time), and

(2) Reading Speed (over time) between languages, and across tasks and sexes.

It was found that generally SFFs of both Japanese and Canadian female subjects were higher when reading the Japanese texts than when reading the English texts. Similarly, most male subjects utilized a higher pitch for reading the Japanese news article than for reading the English news article. However, no significant tendency was found for the male subjects when reading the children's story.

The author suggests that a combination of linguistic and sociolinguistic factors brought about the acoustic variation observed in this research. That is, when reading Japanese, the overall pitch levels utilized by both Japanese males and females rose because of the linguistic nature of Japanese, a pitch accent language, compared with English, an intonation

language However, sociolinguistic factors such as social role or expectation that Japanese men and women hold in their society have a substantial influence on the pitch employed In other words, the extremely high pitch might eventually be utilized by the Japanese women because the sociolinguistic factors overlap with linguistic factors, whereas, the social expectations imposed on the Japanese males, particularly in the work place, cause them to lower their pitch levels to below those expected based on the linguistic structure of Japanese The author further predicts that the present SFF characteristics of Japanese females and males may be changing gradually because the traditional social position of men and women is changing

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Dedication

This thesis is dedicated to my parents, Usayoshi and Hideko Muta, and to my brothers, Nobuyuki and Katsutoshi Muta

Chapter 1 Introduction

1.1 Introduction

It has often been noted that speakers of certain languages generally employ a higher pitch level than speakers of other languages. Cruttenden (1986) commented on the studies of cross-linguistic intonation comparisons (p. 145):

> It is occasionally suggested that some languages use a narrow key[1] (e.g., Danish) or that they use a high register[2] (e.g., many varieties of Chinese) or that variation in key and register according to sex and style is greater in some languages than in others (e.g., it has been suggested that the difference in register between Japanese men and women is greater than it is in English). But most such suggestions are not much more than anecdotal.

There are few acoustic studies that focus on the habitual pitch level a certain language population employs. For instance, Majewski et al. (1972) compared mean Speaking Fundamental Frequency (SFF) between Polish and American university students. The results revealed that the mean SFF

---

[1] The pitch range over whole intonation-groups.

[2] An average overall fundamental frequency ('pitch range' or 'pitch level').

for the Polish students is 8 Hz higher than for the American.

It has been reported that the pitch levels that Japanese women use, especially when speaking Japanese, are extremely high compared to female native-English speakers (Muta, 1994, Yamazawa & Hollien, 1992, Ohara, 1992). Although these researchers have attempted to explain the pitch differences found between specific language speakers or among specific nationalities, they have not yet clearly explained the reasons why these variations exist. It still appears to be an open question for further investigation.

In the present study, Japanese and English passages read by bilingual Japanese and Canadian subjects were examined acoustically. Both children's stories and news articles were investigated. Mean speaking fundamental frequencies (SFF) of Japanese and Canadian subjects were obtained in both Japanese-speaking and English-speaking conditions. Minimum and maximum F0, pitch range, and reading speed were also investigated. The aims of this research were to compare:

(1) SFF Variation (over time), and
(2) Reading Speed (over time) between languages, and across tasks and sexes.

1.2 Vocal Parameters

Pitch (the perceptual correlate of fundamental frequency) seems to be the most commonly referenced vocal parameter in the literature For instance, a recent review of the literature on human vocal emotional state (Murray and Arnott, 1993) found that the pitch contour and its deviation from normal (neutral) speech is the best indicator of the emotional content of an utterance Some researchers have attempted to correlate the speakers' SFFs with their age (Hollien, 1991, Hollien & Shipp, 1972, Hartman & Danhauer, 1979, Hartman, 1979), sex (Maurer et al , 1992, Lass et al , 1980, 1976) and personality (Ray, 1986)

Fundamental frequency refers to the number of complete cycles (opening and closing movements) of vocal cord vibration in a unit of time (per second), and is symbolized as F0 It is measured in Hertz (Hz cycles per second) The range of F0 used in speech is generally classified into three groups of speakers, with men having the lowest average (120 Hz), children the highest (265 Hz) and women an intermediate mean (225 Hz) The total range of F0 used in speech varies from about 60 Hz to about 500 Hz (Fry, 1979, Maurer et al , 1992, Elmlund et al , 1992)

The speaking fundamental frequency (SFF) represents

habitual pitch. It is a vocal characteristic (a single pitch or narrow range of pitches) of an individual or group who use it most of the time.

The mass, length and tension of the vocal folds change continuously so as to produce the variations corresponding to the intonation pattern a speaker wishes to express. The variation in fundamental frequency represents intonation. Both the grammatical intonation patterns and the emotional variations imposed by individual speakers are expressed largely by varying F0 contours.

The spontaneous Speaking (natural everyday speech) Fundamental Frequency (SFF) of an individual represents his or her actual habitual pitch level. Thus, it would be ideal if the spontaneous SFF could be measured efficiently. A review of the literature reveals that the mean F0 is consistently higher for reading than speaking, and that the range for both performances is almost one octave (Hollien & Jackson, 1973, Mysak, 1959, Hanley 1951, Snidecor, 1943). The present experiment, however, was designed to compare fundamental frequencies of reading, not of speaking, among various language groups because of the difficulties of controlling the recording environment.

1.3 Cross-Linguistic SFF Studies in the Past

Several researchers have attempted to measure the pitch levels of different language groups. It seems rather difficult to compare the results found by various researchers since each researcher employs different techniques, parameters, and instruments to measure the SFF. Also the difference of the investigation environment such as recording procedure, sampling materials and subjects (age and the number) could be the important factors affecting the results. The following is an overview of the studies dealing with habitual pitch levels used by various racial/language populations.

Hudson and Holbrook (1981) measured the reading fundamental frequency in 200 young black university students (age 18-29), and compared the results with those of a similar group of white adults (age 17-25) investigated by Fitch and Holbrook (1970). 'The Rainbow Passage' was used as recording material.

	Black	White
Female		
Mean mode (Hz)	193 10	217 00
Mean range limits (Hz)	139 05-266 10	116 00-255 00
Male		
Mean mode (Hz)	110 15	116 65
Mean range limits (Hz)	81 95-158 50	85 00-150 00

It was found that the SFF varies with race black subjects in general have a lower mean modal fundamental vocal frequency and greater mean frequency range than a similar white population

Majewski et al (1972) compared the SFF levels of Polish males and those values of American males (Hollien and Jackson, 1965) which were previously found in similar investigations A Polish translation of 'Apology for Idlers' (by R L Stevenson) was used for a speech sample, and the SFFs of the samples read at a 'normal' speaking intensity level were investigated

	Polish	English
Number	103	157
Age (years)	21 7	20 3
Height (cm)	174 24	177 54
Weight (Kg)	67 40	74 57
SFF (Hz)	137 60	129 30

They hypothesized that the differences in SFF for the Polish and the American subjects would be brought about by their physical size differences rather than by the nationality and/or language differences. All means were compared with SFF by using t-tests (d.f. =101, t[5%]=1.98) and additional tests. However it was found that the SFF does not depend upon the physical size of the subjects. Majewski et al. (1972) concluded that "the reasons for such differences are not clear and the relationship appears to be an open question requiring further investigation" (p. 124).

Krook (1988) investigated the SFF of Swedish subjects in various age groups in order to find the SFF characteristics of Swedish speakers. A Swedish translation of 'The North Wind and the Sun' was used as recording material. The SFF was sampled twice with an average two week interval (I and II).

	Age	N	I	II
Female	20-29	35	195 5	195 9
	30-39	100	194 7	192 2
Male	20-29	7	112 3	114 3
	30-39	20	109 6	105 3

It was found that the SFFs of Swedish speakers were lower (1% lowering of mean SFF for almost all the groups, both female and male) compared with those found in other comparative studies Krook concluded that "it is possible that at higher ages, the number of smokers in our samples was greater and the influence of cultural and linguistic factors on SFF as well could explain such phenomena" (p 88) And further studies of different populations with different cultural and linguistic backgrounds are recommended

A comparison between the fundamental frequency patterns of continuous speech in Mandarin Chinese and American English was carried out by Eady (1982) The subjects were seven English adult male graduate students (age 23-33 years old) at the University of Connecticut, and seven male native speakers of Mandarin Chinese who were from Taiwan, and had lived in America for periods ranging from six months to three

years The English reading passage (containing 400 syllables) was taken from the book 'Intermediate Accounting' by Meigs Mosich et al (1974) The Chinese translation (containing 350 syllables) of the English text was used as the Chinese passage

Speakers	Mean SFF
Mandarin	123 3 Hz
English	106 3 Hz

It was found that speakers of Mandarin Chinese and American English use systematically different patterns of fundamental frequency when reading a text in their native language The F0 patterns of Chinese show a greater amount of dynamic movement than the F0 contours of English Eady (1982) concludes that these differences can be attributed to the influence of linguistic phenomenon such as tone and stress The Chinese speech has a greater number of fluctuations (since all syllables have tone) in the F0 pattern as a function of time and as a function of the number of syllables compared with those of English speech (where fluctuations are found only on those syllables having primary stress)

SFF studies of the Japanese language have also been carried out by a few researchers.

Yamazawa and Hollien (1992) compared the SFF mean levels of Japanese and English passages read by Japanese and Caucasian females. The first paragraph of the 'Rainbow Passage' (Fairbanks, 1960), a semi-scientific text, was used as an English passage, and the 'Donguri to Yamaneko' (by Kenji Miyazawa), a children's story, as the Japanese text.

Language	Japanese			Americans	
	Group A	Group B	Group C	Group D	Group E
N	10	11	11	12	12
Mean Age	22.9	23.9	26.6	23.3	23.6
Japanese	224	224	226	221	
English		218	223	209	195

Group A: Japanese who do not speak English.
Group B: Japanese bilingual speakers who had lived in the U.S. for less than 3 months.
Group C: Japanese who had lived in the U.S. for more than 2 years and demonstrated an average-to-good fluency in English.
Group D: Americans who knew Japanese.
Group E: Americans who spoke only English.

It was found that the Japanese females utilized higher SFF than did the Americans for all speaking conditions, and the differences were statistically significant. Yamazawa and Hollien concluded that "while there may be a racial component contributing to this difference, it probably results primarily from differences between the two languages" (p. 139).

Ohara (1992) examined overall pitch range (low and high) used by six male (age: 21-31) and six female (age: 22-29) Japanese native speakers when reading English and Japanese sentences. Ten independent sentences taken from 'A Course in Phonetics' (Ladefoged, 1982) were used as the English material, and their Japanese translation as the Japanese material.

		English		Japanese	
		Highest	Lowest	Highest	Lowest
Age	N				
Female					
22-29	6	251.67	175.67	280.67	181.00
		[Range: 76.00]		[Range: 99.67]	
Male					
21-31	6	150.33	106.50	150.83	104.33
		[Range: 43.83]		[Range: 46.50]	

Ohara hypothesized that native Japanese speakers change their pitch level when speaking Japanese and when speaking English. More specifically, Japanese females tend to use higher pitch when speaking Japanese than when speaking English. She found that (1) Japanese female speakers raised pitch when speaking in Japanese relative to when speaking in English, but male speakers did not show any significant pitch shift between the two languages, and (2) the pitch range is much greater when speaking in Japanese than when speaking in English. Ohara also had an impression that Japanese males use lower pitch when speaking in Japanese, but the results failed to confirm this. She argues that Japanese females raise their pitch in order to show femininity when speaking in Japanese, but not when speaking in English since they are free from those expectations in this case. Ohara further explained that "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" (p 475).

Loveday (1981) investigated the pitch range employed by

Japanese and English speakers when expressing politeness in speech. Subjects were three Japanese males (age 36-44), two Japanese females (age 28-29), three English males (age 24-46) and two English females (age 23-25). The participants were asked to read a certain role of conversational dialogues written in English and in Japanese (translation) as naturally as possible. Then, Loveday measured the pitch level of the beginning and end parts of three politeness formulae in the dialogue 'Oh hello' (*aa konnichi wa*), 'bye' (*sayonara*), and 'thank you' (*arigato gozaimasu*). It was hypothesized that "Japanese expectations of sexual and social role are much more rigid than those prescribed by English norms" (p. 85). It was found that the Japanese females used an extremely high pitch in speaking Japanese politeness formulae, but the Japanese males did not. The pitch levels of the English females and males, however, are less differentiated. Thus, he concludes that "high pitch level is employed for distinctly different sociosemiotic function in the two language communities: in Japanese a high pitch level serves to express a stereotypically female role while in British English high pitch level is a means of expressing politeness adopted by both sexes" (p. 86).

Muta (1994) investigated SFFs of Japanese and Canadian

subjects in both Japanese-speaking and English-speaking conditions. Twelve subjects, three Canadian females (age 19-20), three Canadian males (age 20-29), three Japanese females (age 26-28) and three Japanese males (age 24-32) were recorded using reading material identical to Yamazawa and Hollien to allow for comparison. The Japanese speech material was taken from 'Donguri to Yamaneko', the English sample was the first paragraph of the 'Rainbow Passage'. The results of mean SFFs for each language were:

	English	Japanese
Canadian Female		
SFF (Hz)	235.39	229.78
Japanese Female		
SFF (Hz)	222.09	228.72
Canadian Male		
SFF (Hz)	119.66	117.44
Japanese Male		
SFF (Hz)	142.96	140.88

Although the Japanese and Canadian females exhibited results similar to those reported by Yamazawa and Hollien (1992), it was found that the male groups showed the opposite trend. That is, both Japanese and Canadian males used a higher F0 when they read the English passage than when they read the Japanese passage. Muta argued that the males'

results could not be explained solely by the language-dependent explanation suggested by Yamazawa and Hollien's (1992) study of female speakers. Muta's (1994) cross-gender examination provides a strong indication that male speakers, in fact, show completely different, and opposite, results from the female speakers. Some possible major contributors to the pitch difference between L1 and L2 were suggested. However, the answer seems to be still an open question.

1.4. Summary

The Japanese Speaking Fundamental Frequency studies conducted in the past have generally found that the pitch levels employed by Japanese women are extremely high compared to female native-English speakers, especially when speaking Japanese. Each researcher has suggested differing reasons why these pitch variations exist. However, these researchers were not able to extract the same results from the males' data. Thus, their explanations of the pitch differences was not fully satisfactory.

In this thesis, it is argued that Japanese pitch formation is made up of a combination of (1) linguistic and (2) sociolinguistic factors.

First, when speaking Japanese, the overall pitch levels used by both Japanese males and females rise. These pitch shifts are brought about by the linguistic or prosodic differences between Japanese and English languages. Japanese is a pitch accent language, whereas English is an intonation language. The tonal characteristics of Japanese create a shift in pitch level which is higher than that of English.

Second, sociolinguistic and psycholinguistic factors also have an effect on the pitch level which Japanese speakers use. That is, pitch variations are created by the unique social standing of males and females in Japanese society. This is associated with the prosodic aspect of politeness. When speaking Japanese, Japanese women use high pitch because they have to express politeness more frequently than Japanese men, whereas Japanese men generally lower their pitch level in order to show masculinity which has been traditionally and stereotypically required of them.

Interaction between linguistic and sociolinguistic factors results in the extremely high pitch of Japanese women when speaking in Japanese. Conversely, Japanese men's pitch level is not distinguishable because the opposing of the two factors neutralizes the influence of each other.

Chapter 2 Experiment

2.1 Procedure

Recordings were all carried out in the sound-treated recording room at the Phonetics Laboratory of the Department of Linguistics of the University of Victoria.

All speech samples were recorded on Digital Audio Tape (Sony DT120) using a Digital Audio Tape Deck (Sony DTC-750). A condenser microphone (AKG C1000S) was used for capturing the speech samples. The distance from the microphone was approximately 20 cm for each recording.

Prior to recording, subjects were requested to complete a questionnaire (Appendix E) dealing with participants' personal information such as weight and height, dialect, and duration of L2 study. The results of the questionnaire were correlated with the measured acoustic values.

The time of day when the recording is done is sometimes discussed since physiological change, especially laryngeal, would bring about SFF differences during a day and over time. Cooper and Yanagihara (1971) discovered that based pitch level does not stay stable throughout the day but varies according to the time. It either continually rises or falls

throughout the day (a pitch rise at noon followed by a lowering of pitch in the late afternoon). Conversely, Nittrouer et al. (1990) report that the measures of laryngeal activity are not affected by the time of day (early morning and late afternoon). In this study all recordings were conducted in the afternoon to avoid any possible time-difference influence.

The participants were asked to read their second language passage, and then to read their first language passage. The reading procedure for the recordings was:

(1) Read the second language children's story silently in order to make sure there are no unknown words in the texts, to gain an understanding of the meaning, and to minimize nervousness. Then the speaker reads it aloud once to enable the experimenter to check recording levels.

(2) Read the same passage five times immediately after completing (1).

(3) Read the L2 news article using the same procedure as (1) and (2).

(4) To read the children's story and the news article in the participant's first language following the same procedure as (1) and (2).

(5) The same procedure (1-4) was carried out three times each approximately one week apart. The passages were given to the subjects for reading practice at home.

The subjects were requested to read children's stories (Japanese and English) as if they were reading to children, and news articles (Japanese and English) as a newscaster.

2.2 Subjects

There were twelve participants in this study: three Japanese males (JM), three Japanese females (JF), three Canadian males (EM), and three Canadian females (EF). All were university students at University of Victoria. The participants had a good command of the foreign language. Canadian participants were enrolled in the Department of Pacific and Asian Studies majoring in Japanese as a foreign language, and had experience living in Japan for over a year.

Although the participants are from various regions of Japan or of Canada, the Japanese subjects all speak the Tokyo dialect of Japanese (so-called standard Japanese), and the Canadian subjects speak Canadian English. No subject reported any kind of illness affecting the throat at the time of recording, or any hearing difficulty.

The ages of English and Japanese male participants ranged from 20 to 40 years old, and those of female participants from 22 to 29 years old, with their mean age of 25.8 years old. Table 1.1 and 1.2 summarize the participants' personal information resulting from the questionnaire administered during the experiment. It is well documented that the acoustic changes which accompany the growth of the vocal tract and the aging process tend to occur at different rates (Orlikoff, 1980). All subjects in this experiment had already acquired the adult voice (especially, male participants had all experienced pubescent voice changes), and gained adult-level speech motor control which is usually achieved around 12 years of age (Kent, 1976). Thus, all participants are assumed to be representative of each language population.

2.3 Speech Samples (Tasks)

All materials used in this experiment were syntactically well balanced. The passages are quite similar to those used in comparable investigations such as the first paragraph of Fairbanks' 'Rainbow Passage,' or 'The North Wind and the Sun' (translation in the target language) (e.g., Yamazawa & Hollien, 1992; Krook, 1988).

2.3.1. Children's story (Japanese & English)

The reading sample was chosen from the first introductory paragraphs of Japanese and English children's stories. None of the materials included any portion of direct speech. The Japanese speech material is taken from a Japanese folk story 'HANASAKAJISAN' (Appendix C). This passage consists of five sentences - nine breath/intonation groups (Japanese Children's story: JC1-9). The English sample is drawn from 'Goldilocks and The Three Bears'. This material is made up of three sentences - nine breath groups (English Children's story: EC1-9).

As is typical of Japanese sentences, the Japanese passage contains three character sets, namely, Katakana,

Hiragana, and Kanji (Chinese characters). The former two character sets (kana characters) are phonetic-based scripts and the latter is a logographic-based script. Kana characters are given on top of the Kanji characters to help speakers smoothly and uniformly select the appropriate reading.

All participants were familiar with their L1 passage, however they were not familiar with that of their target languages.

2.3.2. News Article (Japanese & English)

The Japanese television news article directly transcribed from the Japanese public broadcasting service (NHK: Nippon Hoosoo Kyookai) was used for the recording. This passage consists of two long sentences - seven breath groups (Japanese News article: JN1-7). Like the Japanese children's story, the article is transcribed using three mixed character sets. Again, Hiragana (reading aids) is written on top of each Kanji character. The English T.V. news material is taken from the Canadian Broadcasting Corporation (CBC) in the same manner. This sample consists of four sentences - seven breath groups (English News

article EN1-7)

NHK Japanese has been widely recognized as standard spoken Japanese (1977, NHK), and CBC English as standard spoken Canadian English (McGovern, 1989)

The meanings of any words and idiomatic expression that subjects were not familiar with was explained before recording. Both English and Japanese (original and English translation) children's stories and news stories are included in the Appendices C and D. The lines drawn under and above the Japanese characters indicate which mora of the words is pronounced in a low pitch or a high pitch (Appendix C).

2.4 Analysis

After transferring the speech samples recorded on Digital Audio Tape (DAT) to the computer (Northgate 486 computer), the digitized speech data were analyzed using the Computerized Speech Lab © (CSL) speech analysis software[1]. CSL is a computer program designed to analyze the complex speech waveform data and help researchers to obtain acoustic

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[1] CSL was developed by Speech Technology Research, Ltd., and is available as the CSL 4300 laboratory research system from Kay Elemetrics Corporation, Pine Brook, New Jersey.

information such as pitch contour, energy distribution, formants, and power spectrogram.

Altogether 528 reading passages (12 people, four different passages, and three recording sessions) were recorded on DAT tape. One hundred ninety-two passages (1536 sentences) out of the whole collection were actually analyzed by the CSL program. The analyzed passages were *1a*: the first sample in the first recording, *1b*: the last sample in the first recording, *2*: the last sample in the second recording, and *3*: the last sample in the third recording.

An average SFF, which is considered appropriate for measuring habitual pitch (Coleman and Markham, 1991), was obtained from the divided sentences. Furthermore, minimum and maximum F0, pitch range, standard deviation of SFF, and reading speed were measured.

Actual measurement of fundamental frequency was carried out in the following order: firstly, the IMPLS command of the CSL program was executed in order to compute the pitch separation of voicing impulses in the source speech waveform data, and to place marks at the locations that separate the voicing impulses. Then, the PITCH command extracted the fundamental frequency values by computing the inverse of the time between each impulse mark and plotting the resulting values as a pitch contour on the computer screen. Appendix F

shows an example of the computer screen

All speech data were sampled at a sampling rate of 20,000 Hz. Impulse analysis range and pitch analysis range were both set from 50 Hz to 450 Hz for female, and from 50 Hz to 250 Hz for male. The pitch frame length was 25 msec.

The mean F0 and the standard deviation (SD) of each sentence were calculated as follows:

$$\text{Mean F0 (Hz)} = \frac{\sum x}{N}$$

$$\text{SD (Hz)} = \sqrt{\frac{\sum x^2 - \overline{x^2}}{N}}$$

Where

X F0 of each frame

N Number of the frames within the source waveform

Finally, t-tests were carried out for the results obtained by each subject group in various reading conditions.

2.5 Results

A summary of the individual mean SFF and standard deviation is provided in Appendix B. All charts (Appendix A)

with figures have been created by the calculation of the individual data. A t-test was carried out to assess the significance of difference in F0 values between languages and tasks. The mapping of four recordings (over time, *1a*, *1b*, *2* and *3*) reveals that the pitch levels that each subject utilizes change over time. The average of three recordings (*1b*, *2* and *3*) was used for the various comparisons of the results. The first recording, *1a*, was excluded from the mean calculation because the subject's performance at this stage was not assumed to be stable enough to be able to represent his or her habitual pitch. Krook (1988) discusses subjects' performance instability in her test-retest reliability study of SFF.

> At the second examination they could be expected to be more relaxed and emotionally stable. So, we infer that a degree of tension was expressed by somewhat raised speaking fundamental frequency in the first examination (p. 87).

The abbreviations used in the charts are:

F0: Fundamental frequency

EC: English Children's story. EN: English News article

JC: Japanese Children's story. JN: Japanese News article

EF: English Female (EF1-3: English Female subject 1-3)

EM: English Male (EM1-3: English Male subject 1-3)

JF Japanese Female (JF1-3 Japanese Female subject 1-3)

JM Japanese Male (JM1-3 Japanese Male subject 1-3)

1a The first sample in the first recording

1b The last sample in the first recording

2 The last sample in the second recording

3 The last sample in the third recording

t t-value

t[5%] Critical value of t in a 5% level for the df

df difference

Max df Maximum difference

Max-Mean-Min Maximum, Mean and Minimum value

SD Standard Deviation

Range Pitch range (=Max - MIN)

SP DUR SPeech DURation

2.5.1 Mean Speaking Fundamental Frequency (Chart 1.1 ~ 1.10)

On the whole, SFFs of English females are higher than those of Japanese females (Chart 1.1). Similarly SFFs of English males are higher than those of Japanese males (Chart 1.2).

The relationship between the male subjects and the four

different tasks was statistically significant (t=5.31, df=3, t[5%]=3.182), although no significant relation was found for female subjects (t=2.63, df=3, t[5%]=3.182).

Four females out of six used a higher pitch when reading the Japanese children's story than when reading the English story (Chart 1.3). The results for the Japanese females are almost statistically significant (t=4.17, df=2, t[5%]=4.303).

All female subjects except for EF2 employed a higher pitch for reading the Japanese news article than for reading the English article (Chart 1.4).

No significant tendency was found for the male subjects when reading the children's story (Chart 1.5). However, when reading the news article, all male subjects except for JM2 used higher pitch for the Japanese text reading than for the English article reading (Chart 1.6).

No general relationship was found between the English children's story and news story readings among female subjects (Chart 1.7). The English females tended to raise their pitch higher when reading the news story than when reading the children's story (Chart 1.8). In contrast, the Japanese females tended to use a higher pitch for the Japanese children's story than for the Japanese news story (Chart 1.8). This is also statistically significant (t=7.38, df=2, t[5%]=4.303).

In both English and Japanese, the male subjects tend to raise their pitch higher when reading the news article than when reading the children's story (Chart 1 9 and Chart 1 10)

2.5.2 Mean Speaking Fundamental Frequency over time (Chart 2.1 ~ 2.12)

The mean SFFs of all subjects over the four recordings are plotted individually All female subjects (Chart 2 1 - 2 6) except EF1 consistently spoke one language higher than the other across the four recordings EF2 used a higher pitch level when reading the English materials than when reading Japanese texts, whereas EF3 and all Japanese females used a higher pitch level when reading Japanese than when reading English

Although the English males (Chart 2 7 - 2 9) did not show clear Japanese and English distinction over time, the Japanese males (Chart 2 10 - 2 12) consistently spoke either Japanese higher than English (JM1 and JM3) or English higher than Japanese (JM2)

The maximum differences over the four recordings range between 4 73 Hz and 29 21 Hz among the females, and between 1 08 Hz and 15 08 Hz for the male subjects The females tend

to change their pitch level to a greater extent than do the males in every recording.

2.5.3 F0 Minimum-Mean-Maximum (Chart 3.1 ~ 3.2)

EFs had higher Min values (Average: 166.76 Hz) than JFs' Min (Average: 137.23 Hz) in all reading conditions (Chart 3.1). The statistical relation between the female subjects and the values of Min-Mean-Max were significant (t=4.91, df=2, t[5%]=3.182).

EMs used higher Min (Average: 88.57 Hz) and Max (Average: 159.36 Hz) values than JMs' Min (Average: 80.22 Hz) and Max (149.05 Hz) in all reading conditions (Chart 3.2). This is statistically significant (t=4.10, df=2, t[5%]=3.182).

2.5.4 F0 Range (Chart 4.1 ~ 4.4)

All female subjects except for EF2 used a wider SFF range when reading Japanese texts (Children's story: 213.93 Hz, News article: 188.79 Hz) than when reading English texts (Children's story: 187.48 Hz, News article: 147.05 Hz) in each task. However, the relationship is not statistically

significant (t=1.39, df=3, t[5%]=3.182). Both EFs and JFs used a narrower SFF range for the news article than for the children's story (Chart 4.1 and 4.3).

Both EMs and JMs used a wider tessitura, or "key" (Cruttenden, 1986, p.54), when reading the Japanese texts than when reading the English texts. Statistical significance was found between the male subjects and each task (t=4.81, df=3, t[5%]=3.182). Most of the time, EMs had a wider range than JMs in all reading conditions (Chart 4.2 and 4.4).

2.5.5 F0 Range over time (Chart 5.1 ~ 5.12)

The pitch range which the male subjects (3.67 - 23.45 Hz) used over four recordings are less divergent than those (13.43 Hz - 59.57) of female speakers (Chart 5.1 - 5.12).

2.5.6 Speech Duration (Chart 6.1 ~ 6.4)

All subjects except for JF2 required more time reading their L2 texts than L1 texts (Chart 6.3 and 6.4). EFs and EMs used considerably more time for reading the L2 texts when compared with the Japanese counterparts. Statistical

significance was found between all subjects on the children's story (t=3 25, df=11, t[5%]=2 201), and on the news story (t=5 86, df=11, t[5%]=2 201).

The results of comparing each group's mean (EF, JF, EM and JM) on the children's story (Chart 6 1 and 6 2) did not show any statistically significant relation (t=1 76, df=3, t[5%]=3 182). However, it was found that the group means on the news article were significant (t=3 24, df=3, t[5%]=3 182).

2.5.7 Speech Duration over time (Chart 7.1 ~ 7.12)

The chart in which the reading time of each task was represented over time reveals that both Japanese and Canadian subject groups consistently spent almost the same amount of time for reading their L1 texts, but not for reading their L2 texts. Although the reading time of the L1 texts did not change much over time, reading time of L2 texts was shortened over time.

Maximum difference among English females
L1 0 34s - 1 17s L2 2 77s - 13 61s
Maximum difference among Japanese females
L1 1 08s - 3 15s L2 1 04s - 3 94s

Maximum difference among English males
L1 0.16s - 2.43s L2 3.98s - 21.98s
Maximum difference among Japanese males
L1 1.04s - 3.82s L2 1.73s - 3.72s

The maximum time differences over four recordings did not change greatly between L1 and L2 among the Japanese subjects, but the differences were significant for the English subjects.

2.5.8 Mean Speaking Fundamental Frequency and Physical Size (Table 1.1 ~ 1.2)

The mean SFFs of each subject group were correlated with their physical sizes (Table 1.1). The females' SFFs and their weights, and the males' SFFs and their height showed a significant relationship. In Table 1.2, the shaded numbers indicate relationships which are not significant (df=5, t[5%]=2.571, df=2, t[5%]=4.303).

Chapter 3 Speaking Fundamental Frequency Variation

3.1 Cross-Cultural/Language Pitch Variation

The measure of the habitual range of pitches used by a speaker is referred to as his/her speaking fundamental frequency (SFF). These SFF variations are often connected with racial factors (Hudson & Holbrook, 1981), anatomical factors (Majewski, et al., 1972), linguistic factors (Krook, 1988, Eady 1982, Yamazawa & Hollien, 1992), or cultural factors (Krook, 1988, Ohara 1992, Loveday, 1981). These factors can be considered as major contributors to the pitch difference between L1 and L2.

3.1.1 Type of Languages

According to Cruttenden (1986), in the use of pitch, languages are divided into three types (p. 14).

(1) Intonation languages
All European languages and some intonation languages like Norwegian, Swedish, and Punjabi which make some limited use of tone

(2) Tone languages (a majority of the world's languages)
Languages like Chinese, Vietnamese, and Thai which use tone almost exclusively for lexical purpose
(3) Pitch accent languages
Languages like Japanese which have one immovable high-pitched accent for each accented word

Yamazawa and Hollien (1992) reported that Japanese females exhibited higher SFFs than did American females for all English and Japanese speaking conditions, and both Japanese and American females used higher pitch when reading in Japanese than when reading in English. Yamazawa and Hollien suggested that the differences in level result primarily from differences in the structure of the two languages. That is, the tonal characteristics of Japanese create a shift in SFF level relative to that of English.

In addition to female subjects, Muta (1994) investigated the SFFs of male subjects since the author had the impression that Japanese males use a higher pitch level when speaking English than when speaking Japanese. Although the Japanese and Canadian females exhibited the same result as that reported by Yamazawa and Hollien (1992), it was found that the male groups showed the opposite trend. That is, both Japanese and Canadian males used a higher SFF when reading the English passage than when reading the Japanese passage. Therefore, alternative or additional explanations will be required in order to explain the results. The males' results

cannot be explained solely by the language-dependent explanation suggested by Yamazawa and Hollien.

The present study revealed that, contrary to the findings of Yamazawa and Hollien (1992), the Japanese female speakers did not exhibit higher SFFs than did Canadian females for most speaking conditions (Chart 1.1). That is, Canadian females exhibited higher SFFs than Japanese females for most reading conditions. However, individual female data indicates that most of the time higher SFFs were used for reading Japanese texts than for reading English texts. These female results would be further evidence which is able to support Yamazawa and Hollien's findings for female speakers and a language specific SFF explanation. However, the male results cannot be satisfactorily explained by language type differences. Although the male results for reading the news article (Chart 1.6) coincide with female results of Yamazawa and Hollien, when reading the children's story, the males did not show any significant tendency (Chart 1.5). The female data in the present study can support the idea that language genres can create SFF differences. However, whether the male data supports it or not is still not clear.

3.1.2 Physical size

SFF variation can be partly explained by anatomical size. It may be expected that anatomical conditions such as the geometry of the vocal tract (particularly its length), shape and mobility of the articulatory organs and of the larynx delimit certain ranges for average F0, formant bandwidths, aperiodic spectral components and other parameters (Laver and Trudgill, 1979, Laver, 1980).

Several researchers assume that there is a close correlation between some general anatomical characteristics and characteristics of the vocal apparatus.

> A tall, well-built man will tend to have a long vocal tract and large vocal folds. His voice quality will reflect the length of his vocal tract by having correspondingly low ranges of format frequencies, and his voice dynamic features will indicate the dimensions and mass of his vocal folds by a correspondingly low range of fundamental frequency. (Laver and Trudgill, 1979, p. 9)

Lass et al. (1976, 1980) have claimed that listeners are able to identify correctly the heights and weights of speakers when presented with only their voices.

Contrary to the claims of Laver and Trudgill, and Lass et al., Kunzel (1989) and Dommelen (1992) found no

significant correlation between acoustic and physical parameters. Average F0 of a subject shows no relationship with either his/her height or weight. Wheat and Hudson (1988) also reported no significant relationships between the physical variables of speaker height and weight, and of mean or range F0 measures for Black male and female 5-year-old children.

Interestingly, Tsuge et al. (1987) found a positive relationship between female speakers' height, weight and vowel pitch frequency, but found no significant relationship between male speakers' height, weight and pitch frequency.

It is reported that some acoustic characteristics vary with race. Except for the F0 of infants, Blacks tend to exhibit lower SFF than do Whites of comparable age (Wheat & Hudson, 1988; Hudson & Holbrook, 1981, 1982). The researchers suggest that certain race-specific physical characteristics cause the F0 difference. They cite two sources for evidence (p 723):

> Boshoff's (1945) measurement of the larynges of black and of white cadavers indicated that those of the Black cadavers were larger than those of the white ones.
>
> Krogman noted (1972, pp 55-70) that African infants weighed more and grew more quickly than White infants during the first nine months of life, that Black children exhibited a more rapid skeletal growth than White children during the first 3 years of life, and that African and Black American children appear to develop longer arms, legs and feet.

Wheat and Hudson (1988) suggest that with an increase in the skeletal structure of the body, there is a corresponding increase in the cartilaginous framework of the larynx. Thus this may characterize the pitch level of certain racial groups.

Table 1.1 shows the participants' age, height, weight, and Table 1.2 describes the t-values for mean SFFs of each reading situation. A statistically significant relationship was found between the female's SFFs and weight. The males' SFFs and height showed a significant relationship. These results partially support those reported by Tsuge et al. (1981). It can be concluded that the SFF variations may be partly due to individual physical size differences. However, more subjects should be investigated in order to confirm this result.

3.1.3 Socio- and Psycholinguistic Attributes

Ohara (1992), Muta (1994), and Yamazawa and Hollien (1992) all found that Japanese female subjects used higher pitch when speaking Japanese compared with the pitch used when speaking English. Ohara attempts to explain the pitch

difference by a sociological comparison of the two cultures. That is, she argues that people modify their pitch for the purpose of giving a particular image or conforming to stereotyped expectations prescribed by their society. Shibamoto (1985) states in her book

> Suprasegmental phenomena associated with female speech are high pitch, a greater range of pitch relative to male speech (Mashimo, 1969), and more extensive use of contrastive pitch-stress patterns (Chikamatsu 1979, Mashimo, 1969) (p. 55).

The SFF variation might be linked to the prosodic aspect of politeness, and this fact eventually relates to the social standing of men and women in a society. Japanese has a broad range of politeness forms, primarily marked by changes in the use of the verbal (and verb auxiliary) morphology. This selection process is based on factors such as age, degree of familiarity or intimacy, social status (social standing), social relation, and gender (Mizutani, 1987). It is acknowledged that the Japanese language has a far more complex politeness system than English (Hill et al., 1986). Japanese women use polite forms more frequently than Japanese men (Shibatani, 1990).

Certain prosodic/phonological characteristics are sometimes correlated with the speaker-addressee's social relationship and various emotional expressions in speech.

Brown and Levinson (1987) quote several acoustic studies on politeness in their book

> "When speaking to a good friend, a child, or anyone with whom share a certain amount of solidarity, Basques will palatalize several consonants which are not otherwise palatalized" (Corum, 1975, ibid 96) There seems to be a similar palatalization rule in Japanese which applies in almost identical intimate contexts only (Sansom 1928 305, O'Neill 1966 134) Tzeltal-speakers[1] use creaky voice to express commiseration and complaint, and to invite commiseration, and use sustained falsetto as a politeness honorific feature In Tamil[2], low-caste (Harijan) speakers addressing high-cast powerful persons, in the rural area studied, use a customary thin high-pitched voice with a trailing-off of speech volume at the end of utterances (pp 267-268)

Correlating prosodic/phonological features with social contexts, Brown and Levinson (1987) further suggest that creaky voice, having as a natural source low speech energy, can implicate calmness and assurance and hence comfort and commiseration On the other hand, high pitch has natural associations with the voice quality of children for an adult then to use such a feature to another adult may implicate self-humbling and thus deference Similarly, Ohara (1983, 1984) proposed an innate "frequency code" whereby high-frequency vocalizations suggest smallness, and hence a

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1 A language of the Mayan family without written tradition
2 A Dravidian language of Madras state in southern India and of northern and eastern Ceylon

submissive attitude, and lower frequency vocalizations suggest greater size, and hence a more dominant attitude. In other words, high F0 signifies smallness, a non-threatening attitude, being desirous of the goodwill of the receiver, whereas low F0 conveys largeness, threat, self-confidence and self-sufficiency. According to these acoustic studies, including perceptional ones, we may conclude that a high F0 seems to be used for expressing politeness in various languages in general.

Loveday (1981) reports that Japanese speakers use higher pitch than English speakers when expressing politeness in each language. These higher F0 levels of Japanese speakers would have become habitual pitch for them. Thus, Japanese women especially tend to use a higher pitch level when reading Japanese than when reading English.

The polite nature and femininity of Japanese women's speech is linked to social powerlessness and inferiority (Loveday, 1986). Ohara (1992) argued that "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" (p. 474). That is, in Japanese society, the gender role distinction is much sharper than in Western societies.

Traditionally, Japanese females in Japanese society have to behave more *onnarashiku* 'womanly' than their Western counterparts. Smith (1992) points out that one aspect of femininity training is modesty in speech, extending further into requirements for reticence, softness of voice, a polite or Japanese feminine style of speech and covering the mouth when talking or laughing. Japanese expectations of sexual and social role are much more rigid than Western expectations (Loveday, 1981).

Unlike females, the Japanese males did not show significant pitch change across the two languages (Ohara, 1992, Muta, 1994). Ohara suggests two reasons (p. 475):

> (1) high pitch is stigmatized for male speakers
> (2) 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.

One possible answer is that the Japanese males tend to employ a lower pitch level in order to express their social standing in Japanese society. In Japanese society, it is often observed that females and males tactically modify their pitch level according to the addressee's age, social status, degee of familiarity and gender. Loveday (1986) states that "I have observed -- but this requires empirical

substantiation -- how males in service situations, e g , shopkeepers and hotel staff and in other contexts in which males assume a conventionally inferior status, adopt a high pitch level" (P 95)

3.1.4 Language proficiencies

Although this study attempted to correlate SFF difference and target language proficiency level (Table 2), a significant relationship could not be found This is mainly because the language proficiency might not coincide with the duration of the subject's L2 study and of living in the country where his or her target language is spoken

There might be a possibility such that a Japanese native speaker carries over their L1 accent pattern when they read the English sentences, and an English native speaker cannot exercise correct Japanese accent patterns when reading the Japanese texts

The language-dependent explanation is one of the possible explanations of the SFF difference, but other factors which have been described above must be considered to explain the present results more fully

3.2 Reading style difference

The speech samples analyzed in this study were all reading materials, not naturally spoken materials. The reading style might be slightly different across different languages and sexes. In addition, the secondary elements such as age, reading instruction in each country, reading experience, and image difference for the reading in the target language could bring about SFF variation for each language/gender group in each reading condition.

The first task was to read the children's story as if they were reading to children. It is well supported that raised pitch is very likely to be a universal (cross-language) characteristic of caretakers (Shute & Wheldall, 1989, Grieser & Kuhl, 1988, Masataka, 1992, Fernald et al., 1989). This characteristic would be reflected in the reading of children's stories. In this study, all subjects raised the pitch level when reading the children's stories.

Cross-language comparisons of the prosodic features of parental (caretaker's) speech also reveal interesting facts. Fernald et al. (1989) compared the prosodic characteristics in mothers' and fathers' speech to infants (aged about 10-14 months) in French, Italian, German, Japanese, British

English, and American English It was found that mothers, but not fathers, used a wider F0-range The same results were also found in this study In both the children's story (Chart 4 1) and the news article (Chart 4 2), the female informants used a wider F0-range than the male subjects Fernald et al also reported that American English parents used the most extreme intonational exaggeration, and Japanese mothers used a somewhat narrower pitch range than French mothers when addressing their child They argue that these differences may well be language-specific rather than culture-specific

The present study found that Japanese females used a wider F0 range than the Canadian females when reading the children's story, especially in Japanese (Chart 4 1) This result can be explained by the difference in language In Japanese, whether a word is accented or unaccented, and the accent position within the word (initial, medial, or final) play a significant role in distinguishing the meaning of the words and differentiating dialects The Japanese subjects, mainly women, might have used a much wider pitch range in order to express the pitch characteristics to children

In a similar study, Grieser and Kuhl (1988) report that Mandarin mothers increase the overall pitch and expand the range of each individual tone This eventually would

preserve the linguistic distinctiveness of tone in maternal speech to infants. Parental speech to infants or children may well over-exemplify the prosodic characteristics in his or her language.

The second task was to read the news articles like a newscaster. It is quite natural to think that all subjects have, more or less, adopted the reading characteristics of a newscaster. Any newscasters on radio and T.V. read news stories following a style guide which is prepared by each broadcasting company. The guide commonly includes the desired qualities of voice, reading pace, emphasis and reader's personality which are considered to be appropriate as a news-reader. A comprehensive examination of CBC radio news-reading style over time was carried out by McGovern (1989). He found that "newsreaders tend to adopt settings that approximate a perceived authoritative phonetic model" (p. 19). Laver and Trudgill (1979, p. 28) describe this "authoritative sound" at the phonetic level: a given speaker might have a long vocal tract, and speaks with a prestige accent. Thus, lowering the pitch level might be the main contributor to creating the authoritative sound during the newsreading.

Esling and Wong (1983, p. 92) state that lowered larynx voice (along with a low pitch range) often characterizes

newsreaders and other public speakers throughout North America. McGovern (1989) also states that "modal voice and creaky voice are the phonatory types one expects to hear on a newscast (p. 22). This low pitch range has been observed as a characteristic feature in the voices of public speakers throughout North America "where the degree of prestige can be assumed to be high" (Esling & Wong, 1983, p. 92).

These other studies concur with the characteristics demonstrated by the participants in this study. That is, the mean pitch levels used for the news story reading were lower than those used for the children's story reading (Chart 1.1 and 1.2). The Japanese subjects especially utilized a distinctively reduced pitch for reading the news article.

Regarding pitch range, most of the subjects used a wider pitch range when reading the children's story than when reading the news article in English. When reading texts in Japanese, the females tend to use wider F0 range for the children's story, but males did not show any particluar tendency.

3.3 Reading Speed

3.3.1 Reading Speed Variation

The Japanese passage was given to the subjects in Japanese characters, not in Roman alphabetic equivalent of Japanese. The different subject groups (cultures and sexes) might have used different mental processing systems had Roman orthography been used.

Over the past two decades, cognitive psychologists and neuropsychologists have been researching the cognitive processing or visual information processing of various orthographies (e.g., Robeck, & Wallace, 1990, Tzeng, 1983, Henderson, 1982, Hung & Tzeng, 1981, Sasanuma, 1980). They have found that pictographic and syllable-based characters seem to be processed in different hemispheres of the brain.

Most Japanese texts are written in a mixture of five different scripts: Kanji (Chinese characters), Hiragana, Katakana, Roman alphabet, and pictographs. The Kanji and pictographs are logographic-based scripts, and the rest are phonetic-based scripts. Furthermore, Kanji belongs to a phonologically deep orthography because of its complex letter-to-sound correspondence, whereas Hiragana and Katakana belong to a phonologically shallow orthography because of their simplicity of letter-to-sound correspondences.

Japanese is classified as an agglutinative language, and highly marked for cases. Typologically, it is an SOV language.

Nomura's survey (1980) of the weekly Japanese journals reveals that they consist of 29.9% Kanji, 50.1% Hiragana, 9.6% Katakana, 0.4% alphabet, 0.8% pictographs (including Arabic numerals), and 9.2% miscellaneous symbols such as parentheses, dots, hyphens, etc.

Some researchers have found evidence that reading Kanji and Kana engage different processing mechanisms. Sasanuma (1975) and Yamadori (1975, 1980) reported that, in Japanese aphasics, the abilities to use logographic-based Kanji and phonetic-based Kana are selectively impaired. Similarly, with non-impaired people, it was found that a right visual-field (left hemisphere) advantage is usually found for the recognition of Kana, whereas a left visual-field (right hemisphere) advantage is usually found for the recognition of Kanji (Hatta, 1985, 1977, 1978, Sasanuma et al., 1977, and Tzeng et al., 1979). Chen and Juola (1982) found that the formats of coding memory representations are different between logographic Chinese and alphabetic English.

Katz and Feldman (1983) investigated the differences in processing strategies within two alphabetic systems: English (complex and deep spelling-speech correspondence) and Serbo-

Croatian in Yugoslavia (simple and shallow spelling-speech correspondence). They found a strong influence of the internal lexicon on both recognition and pronunciation in English, but not in Serbo-Croatian.

Biederman and Tsao (1979) reported the finding that orthographic variations have important effects on bilingual processing.

In this investigation, it was found that the reading speed of all subjects was slower in their second language than in their first language, especially when English speakers read the Japanese texts. Similar results were also reported by Favreau and Segalowitz (1982). They found that a majority of their bilingual subjects read significantly more slowly in their second language when compared with their first language.

There is much evidence that many bilinguals read more slowly in their second language than in their first language. Segalowitz (1986) reviews the common explanations for this:

(1) The reader lacks some of the basic linguistic knowledge necessary for skilled reading (Favreau & Segalowitz, 1983, Favreau, Komoda, & Segalowitz, 1980),
(2) The reader may not have a full and accurate command of the vocabulary and syntax of the language, the stylistic conventions of paragraph structure, or the cultural assumptions underlying the text (Alderson & Urquhart, 1984).

Some researchers also argue that such slowed L2 reading is partly due to a reduced sensitivity to orthographic, syntactic, and semantic redundancies of the language (Favreau et al , 1980, Hatch, Polin, & Part, 1974) Oller and Tullius (1973) associated the slower L2-reading with differences in the fixation time of eye movements

Thus, it is safe to conclude that the reading strategies for differing orthographies, in this case, Japanese and English, might have had a substantial influence on the reading speed

3.3.2 Reading Speed over time

Practice readings over time may reduce the reading time Since the same texts were used for each repeated sampling in this experiment, it is quite plausible to expect some improvement in reading

Every skilled performance includes some components that can be characterized as automatic (Shiffrin, Dumais, & Schneider, 1981) as well as controlled (Segalowitz, 1991) An "automatic process" means that a person requires little or no attentional effort and takes relatively little time and

minimal effort to perform the task. On the other hand, a "controlled process" needs a fair amount of attentional effort to complete the task. Thus, for fluent bilinguals the reading is likely to be fairly automatic in the L2. However, those who are not fluent in the L2 have fewer automatic cognitive processes and require more controlled cognitive processes. Thus, controlled processes are presumed to contribute significantly to the slowing of performance (Ackerman, 1987). Practice reduces or eliminates the controlled processes' influence and speeds up and stabilizes performance (Segalowitz & Segalowitz, 1993).

Consistent practice in any task dealing with information (not only just simple repetition) has been pointed out to be a major factor in the development of good skills, because such repeated practice leads to automatization (Schneider & Fisk, 1982, Shiffrin & Schneider, 1977).

In this experiment, the reading speed of the L1 did not change much over time, however, the speed of the L2 reading was generally reduced with every recording. This finding can be explained by the ratio of "automatic" and "controlled" which the individual speaker established for reading the L2 texts. That is, when reading the texts in their mother tongue, almost no reading time change was observed since the automatization of reading has been established. However,

when reading their second language texts, the reading time was gradually shortened since the subjects' unestablished reading skill may have improved over time In other words, the "controlled" factor was reduced, and the "automatic" one was increased with every reading

Chapter 4 Conclusion

This study investigated the speaking fundamental frequency (SFF) variations among twelve bilingual Japanese and Canadian speakers. Two reading tasks, namely children's stories and news articles, were assigned to all female and male informants. The sampled data were acoustically analyzed, statistically compared, and possible explanations as to the SFF variations were suggested.

Chapter 1 contained a brief account of vocal parameters and the review of past cross-language SFF studies. The details of this experiment included procedure, informants' information, speech samples, method of analysis, and the results. The SFF variations found in this experiment were examined and the possible triggers of those variations were discussed. Finally, reading speed differences among the speakers were discussed.

When speaking Japanese, the overall pitch levels utilized by both Japanese males and females rose because of the linguistic nature of Japanese, a pitch accent language, compared with English, an intonation language. However, sociolinguistic factors such as social role or expectation in Japanese society have a substantial influence on the pitch

employed That is, the extremely high pitch might eventually be utilized by the Japanese women because sociolinguistic factors overlap with linguistic factors, whereas, the social expectations imposed on the Japanese males, particularly in the work place, cause them to lower their pitch levels to below those expected in Japanese

The advancement of females into jobs which have been traditionally dominated by males may affect pitch That is, female workers may change their voice cues in order to gain the same paralinguistic effects male workers have Now, in Japan, we can see a dramatic change in the work place and in society in general for women In the near future some change in the paralinguistic component of Japanese women may be observable There is also a possibility that men's pitch will rise since the traditional social position of men is changing Nowadays, Japanese males are not necessarily required to show the masculinity which has been traditionally required of them

In Japanese, as well as in other languages, a change in the use of pitch throughout time has been observed In 1965, Austin commented

> Low pitch has lately became fashionable for women, but fifty years ago all "ladies" spoke with a high pitch In Germany today the approved paralanguage for upper class males is high pitch nasality In Japan, there are marked linguistic differences between male and

> female speech Male speech is loud and low, in Samurai movies almost a bark, female speech is soft and high, almost a squeak (pp 37-38)

It seems that the pitch levels females utilize in some languages, including Japanese, are generally lowering Japanese males' speech no longer sounds as loud or as low as that of the actors in the Samurai movies

The author believes that this research will shed light on the fundamental reasons why the Japanese and Canadian subjects used different pitch levels in each reading condition Hopefully, the framework utilized in this research will help other researchers to investigate SFF variation in other languages as well

In order to obtain more salient relations between acoustic information and other factors such as linguistic and anatomical information, the following should be considered in future research

(1) More subjects should be analyzed

(2) The present results should be compared with those of other populations which belong to linguistically differing groups or which have unique social backgrounds

(3) Subjects should be picked from different

occupational groupings

(4) Various age groups should be examined since the education system in different generations might reflect pitch use

(5) Since the subjects in the present study had all been exposed to the target-language environment, they might be influenced by the L2 and/or social surroundings Thus, subjects who have less influence from other cultures should be examined

(6) Subjects from various regions in Japan in which different accent patterns are utilized should be compared, especially with the people who speak in a flat accent pattern (no accent within the word) such as speakers in Sendai and Kumamoto Thus it could be clarified to what degree the typical Japanese pitch accent characteristics shift the actual acoustic pitch level Perhaps the male pitch would be further lowered, and the female pitch would be lower than speakers who have accented dialects because the only variable would be sociolinguistic

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Appendix A

Mean SFF (Female) 68
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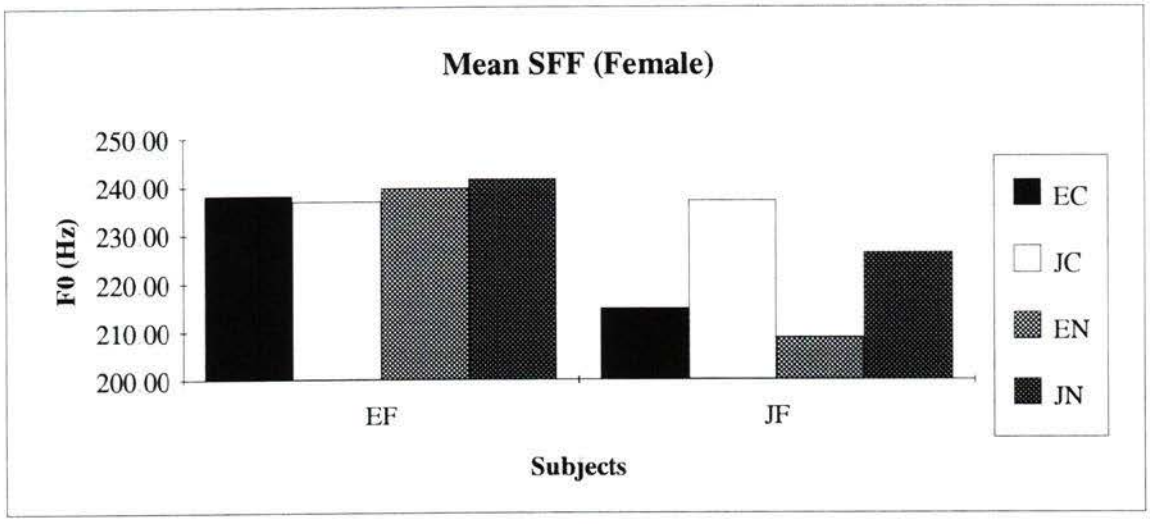
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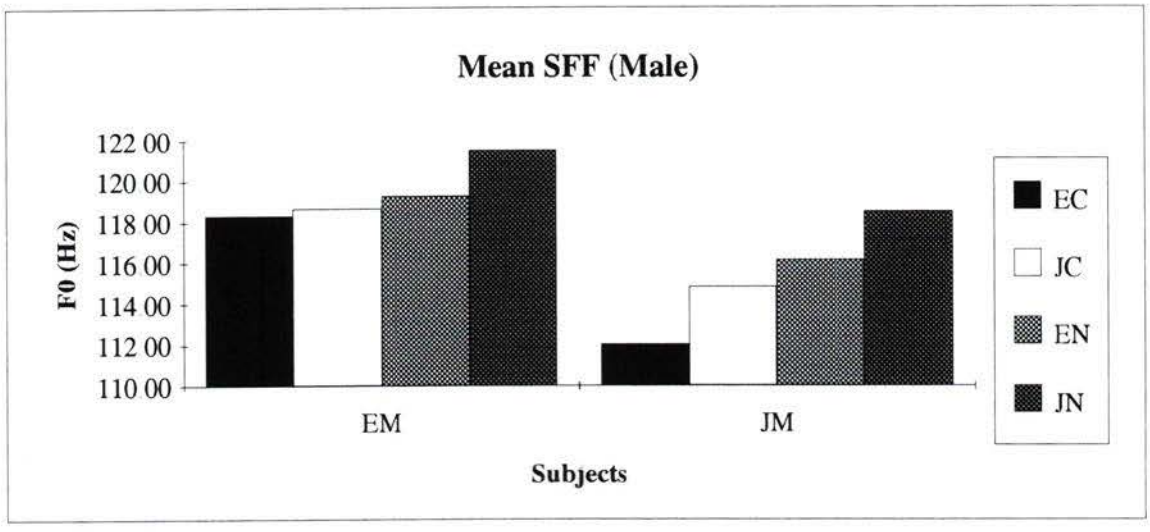
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	EF	JF
EC	238 12	214 78
JC	236 92	236 96
EN	239 71	208 84
JN	241 56	226 24

t=2 63 (df=3, t[5%]=3 182)

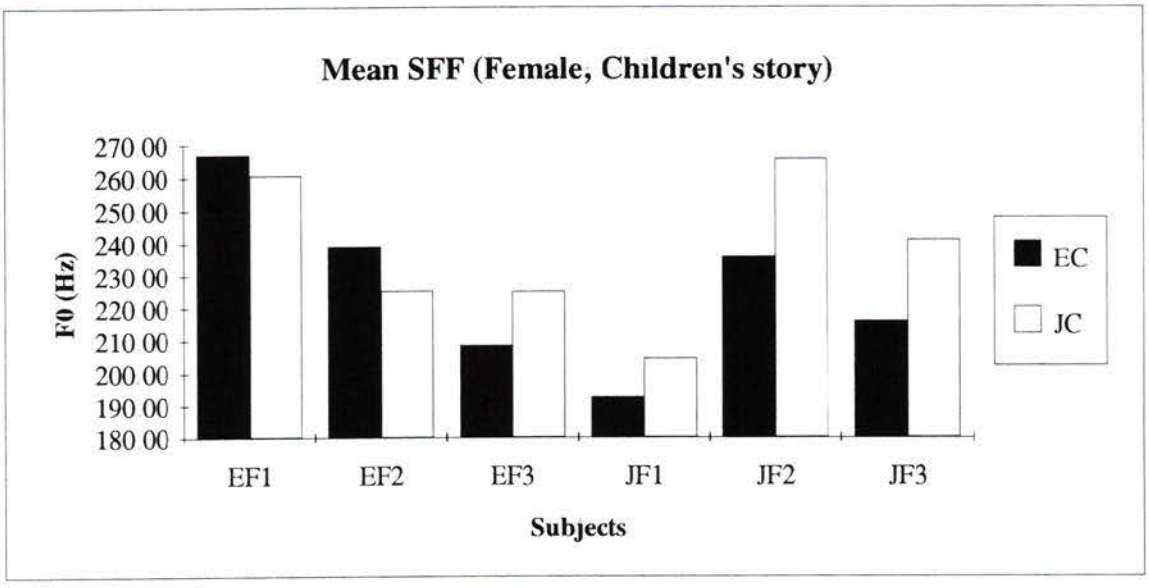
Chart 1 1



	EM	JM
EC	118 30	112 01
JC	118 65	114 85
EN	119 27	116 13
JN	121 50	118 50

t=5 31 (df=3, t[5%]=3 182)

Chart 1 2



Female (Children's story)

	EC	JC
EF1	266 84	260 71
EF2	239 04	225 19
EF3	208 47	224 86
JF1	192 56	204 46
JF2	235 84	265 55
JF3	215 93	240 88

t=1 49 (df=5, t[5%]=2 571)

Chart 1 3

EF (Children's story)

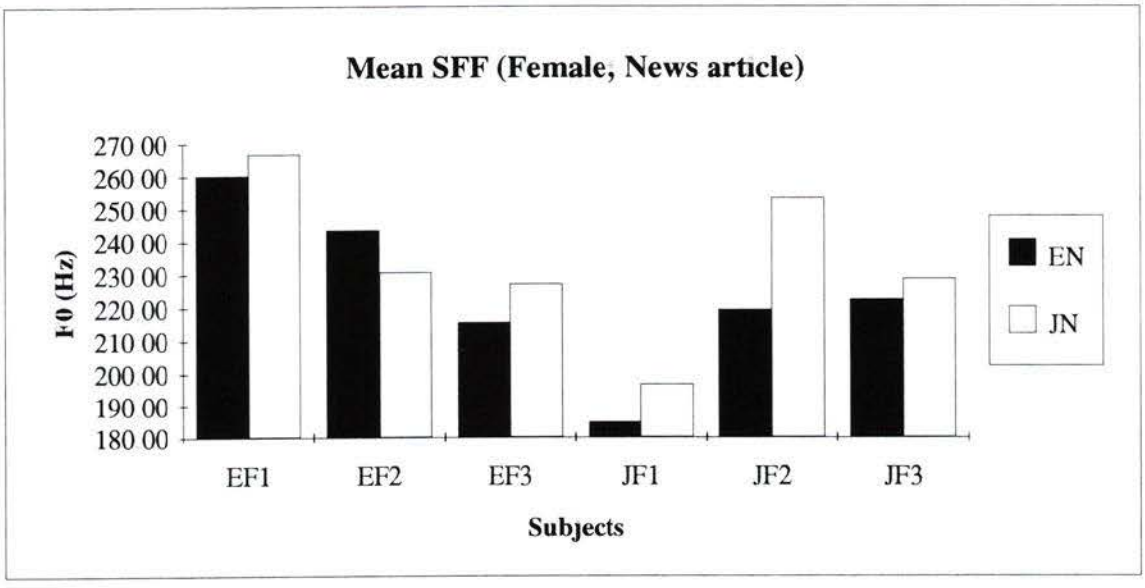
	EC	JC
EF1	266 84	260 71
EF2	239 04	225 19
EF3	208 47	224 86

t=0 13 (df=2, t[5%]=4 303)

JF (Children's story)

	EC	JC
JF1	192 56	204 46
JF2	235 84	265 55
JF3	215 93	240 88

t=4 17 (df=2, t[5%]=4 303)



Female (News article)

	EN	JN
EF1	260 22	266 76
EF2	243 51	230 75
EF3	215 41	227 18
JF1	184 74	196 64
JF2	219 33	253 29
JF3	222 46	228 79

t=1 57 (df=5, t[5%]=2 571)

Chart 1 4

EF (News article)

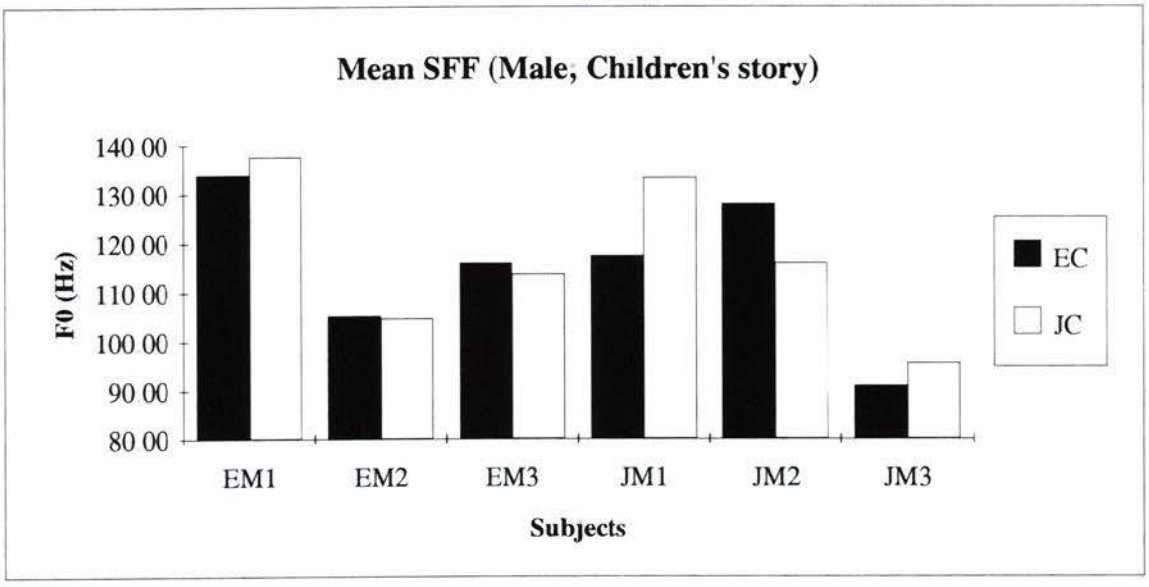
	EN	JN
EF1	260 22	266 76
EF2	243 51	230 75
EF3	215 41	227 18

t=0 25 (df=2, t[5%]=4 303)

JF (News article)

	EN	JN
JF1	184 74	196 64
JF2	219 33	253 29
JF3	222 46	228 79

t=2 06 (df=2, t[5%]=4 303)



Male (Children's story)

	EC	JC
EM1	133 87	137 63
EM2	105 22	104 66
EM3	115 82	113 65
JM1	117 31	133 19
JM2	127 88	115 82
JM3	90 85	95 54

t=0 42 (df=5, t[5%]=2 571)

Chart 1 5

EM (Children's story)

	EC	JC
EM1	133 87	137 63
EM2	105 22	104 66
EM3	115 82	113 65

t=0 19 (df=2, t[5%]=4 303)

JM (Children's story)

	EC	JC
JM1	117 31	133 19
JM2	127 88	115 82
JM3	90 85	95 54

t=0 35 (df=2, t[5%]=4 303)

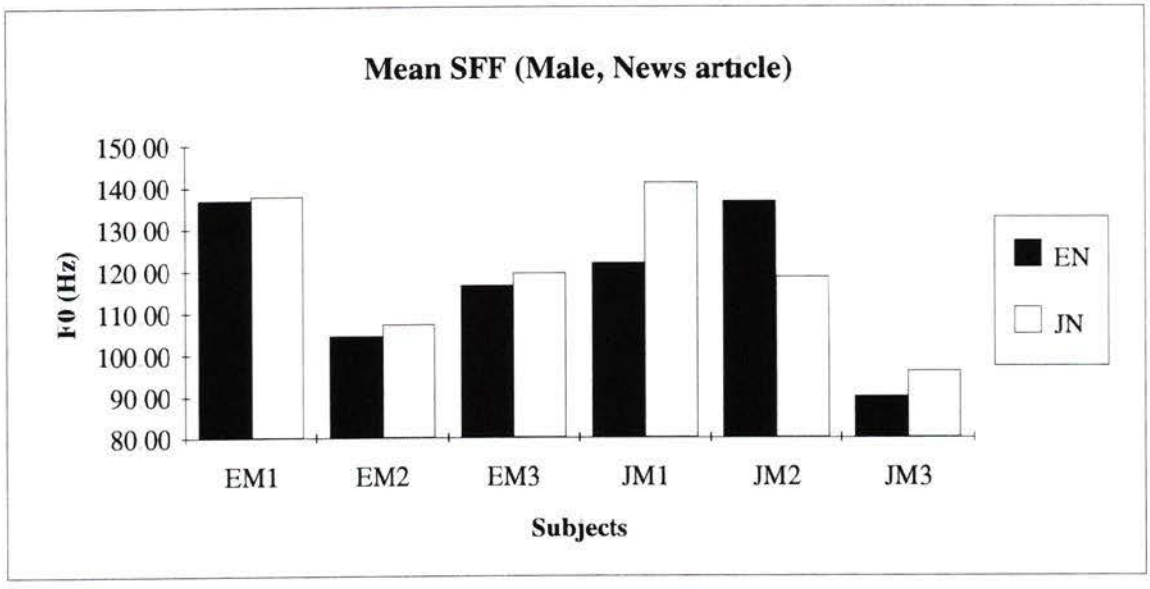


Chart 1 6

Male (News article)

	EN	JN
EM1	136 81	137 87
EM2	104 52	107 25
EM3	116 49	119 39
JM1	121 80	141 01
JM2	136 64	118 41
JM3	89 94	96 07

t=0 47 (df=5, t[5%]=2 571)

EM (News article)

	EN	JN
EM1	136 81	137 87
EM2	104 52	107 25
EM3	116 49	119 39

t=3 80 (df=2, t[5%]=4 303)

JM (News article)

	EN	JN
JM1	121 80	141 01
JM2	136 64	118 41
JM3	89 94	96 07

t=0 22 (df=2, t[5%]=4 303)

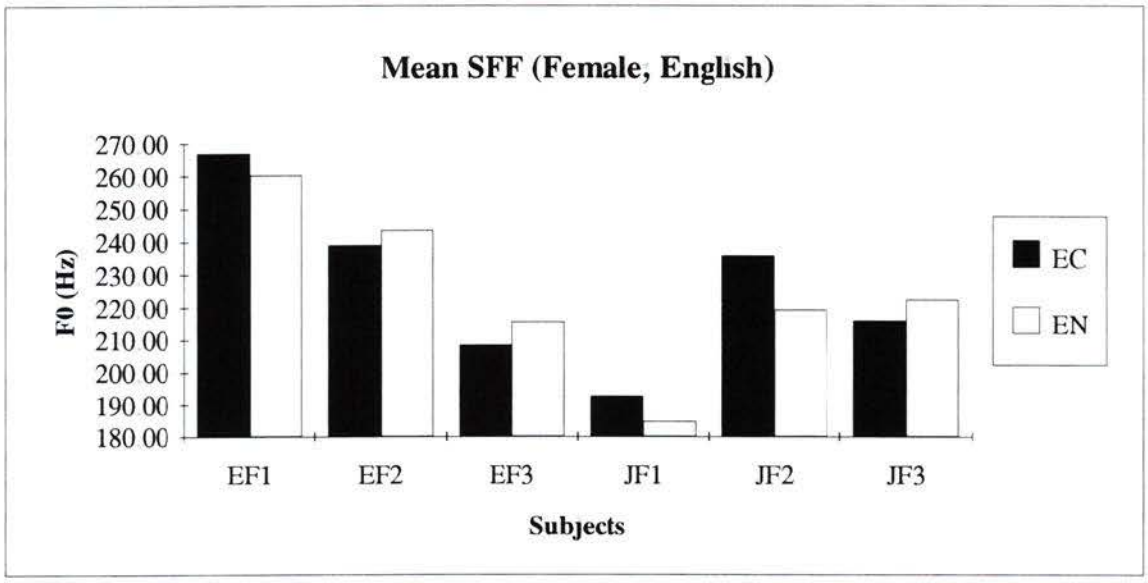


Chart 1 7

Female (English)

	EC	EN
EF1	266 84	260 22
EF2	239 04	243 51
EF3	208 47	215 41
JF1	192 56	184 74
JF2	235 84	219 33
JF3	215 93	222 46

t=0 55 (df=5, t[5%]=2 571)

EF (English)

	EC	EN
EF1	266 84	260 22
EF2	239 04	243 51
EF3	208 47	215 41

t=0 38 (df=2, t[5%]=4 303)

JF (English)

	EC	EN
JF1	192 56	184 74
JF2	235 84	219 33
JF3	215 93	222 46

t=0 88 (df=2, t[5%]=4 303)

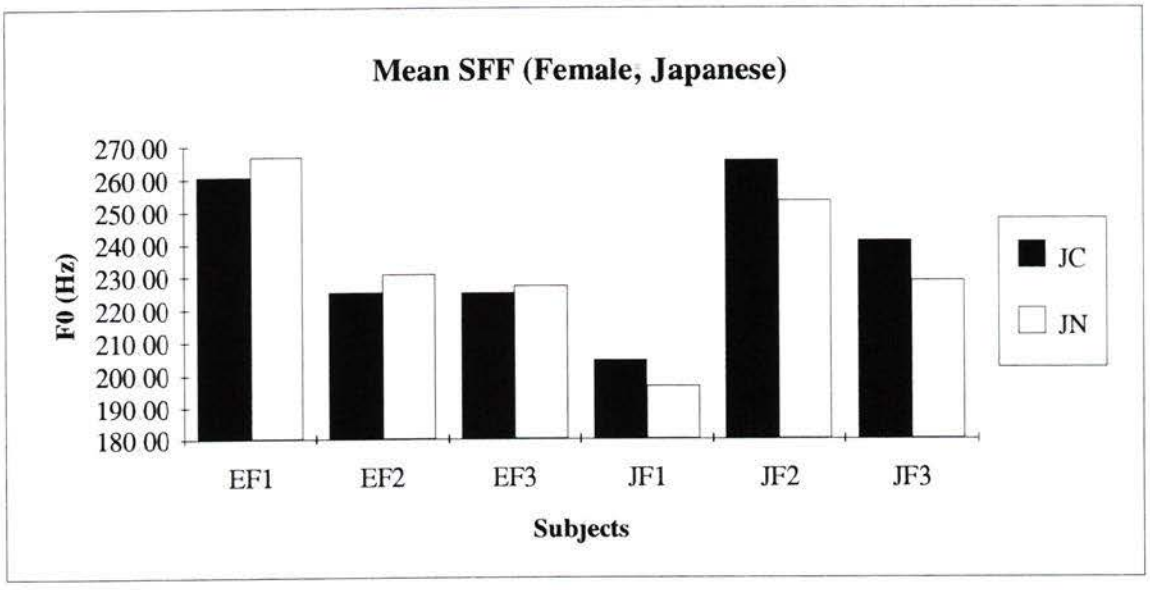


Chart 1 8

Female (Japanese)

	JC	JN
EF1	260 71	266 76
EF2	225 19	230 75
EF3	224 86	227 18
JF1	204 46	196 64
JF2	265 55	253 29
JF3	240 88	228 79

t=0 86 (df=5, t[5%]=2 571)

EF (Japanese)

	JC	JN
EF1	260 71	266 76
EF2	225 19	230 75
EF3	224 86	227 18

t=3 97 (df=2, t[5%]=4 303)

JF (Japanese)

	JC	JN
JF1	204 46	196 64
JF2	265 55	253 29
JF3	240 88	228 79

t=7 38 (df=2, t[5%]=4 303)

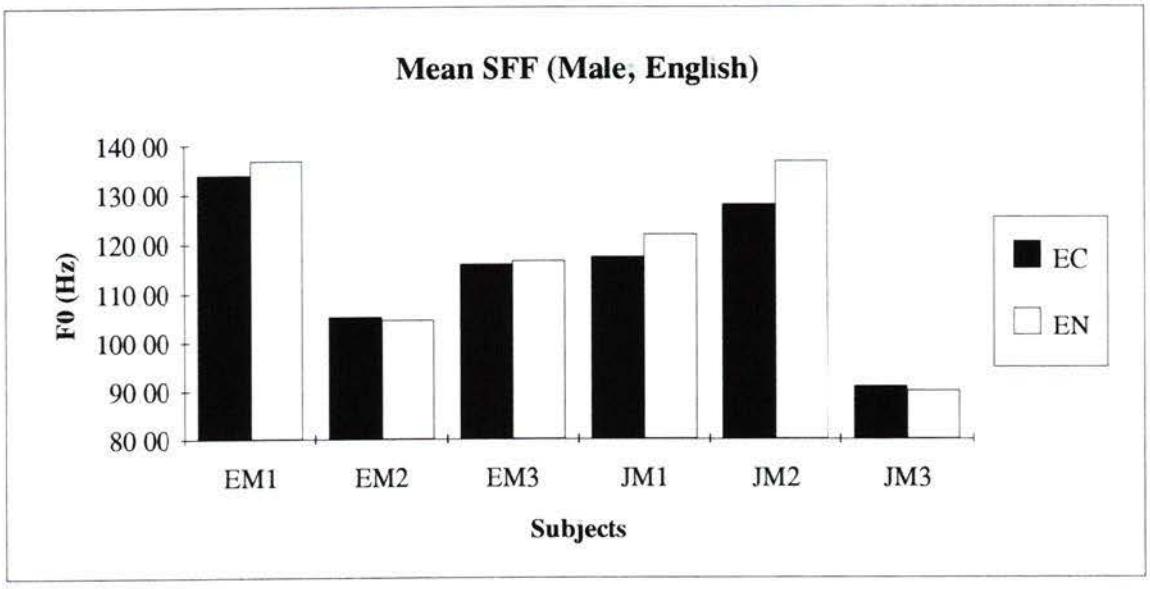


Chart 1 9

Male (English)

	EC	EN
EM1	133 87	136 81
EM2	105 22	104 52
EM3	115 82	116 49
JM1	117 31	121 80
JM2	127 88	136 64
JM3	90 85	89 94

t=1 68 (df=5, t[5%]=2 571)

EM (English)

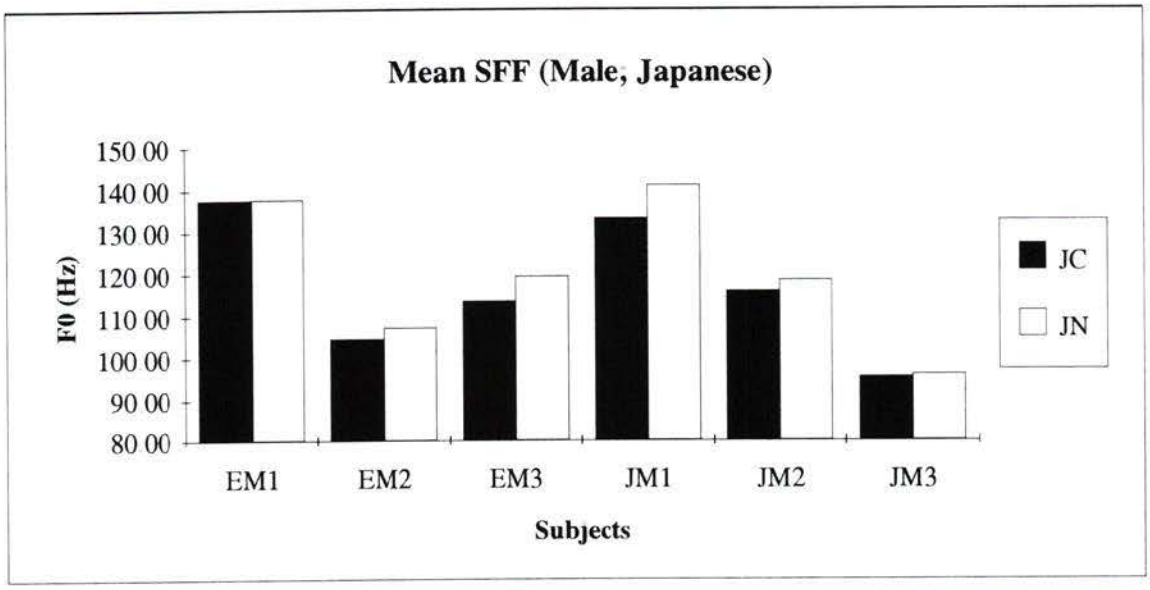
	EC	EN
EM1	133 87	136 81
EM2	105 22	104 52
EM3	115 82	116 49

t=0 91 (df=2, t[5%]=4 303)

JM (English)

	EC	EN
JM1	117 31	121 80
JM2	127 88	136 64
JM3	90 85	89 94

t=1 47 (df=2, t[5%]=4 303)



Male (Japanese)

	JC	JN
EM1	137 63	137 87
EM2	104 66	107 25
EM3	113 65	119 39
JM1	133 19	141 01
JM2	115 82	118 41
JM3	95 54	96 07

t=2 67 (df=5, t[5%]=2 571)

Chart 1 10

EM (Japanese)

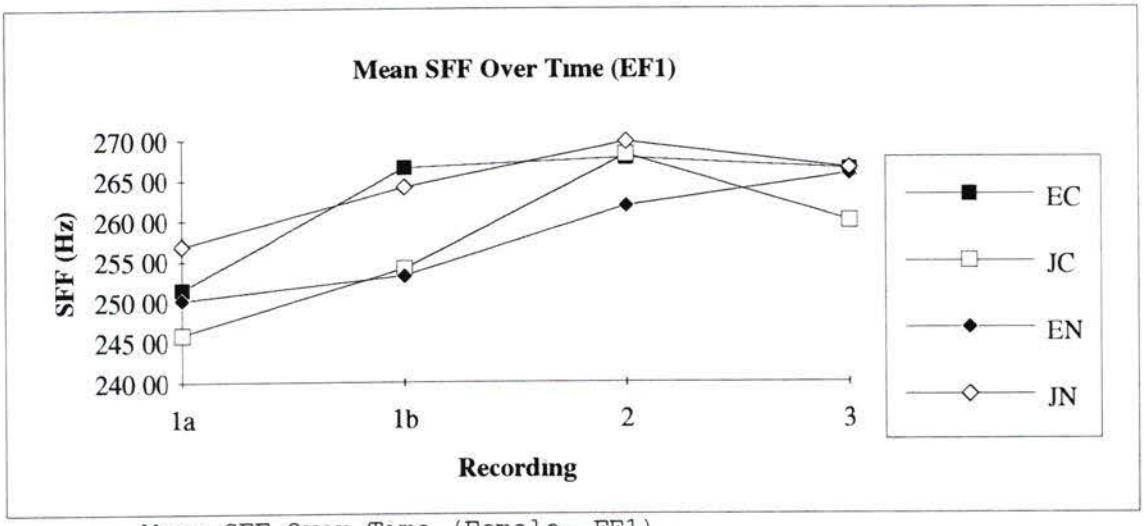
	JC	JN
EM1	137 63	137 87
EM2	104 66	107 25
EM3	113 65	119 39

t=1 79 (df=2, t[5%]=4 303)

JM (Japanese)

	JC	JN
JM1	133 19	141 01
JM2	115 82	118 41
JM3	95 54	96 07

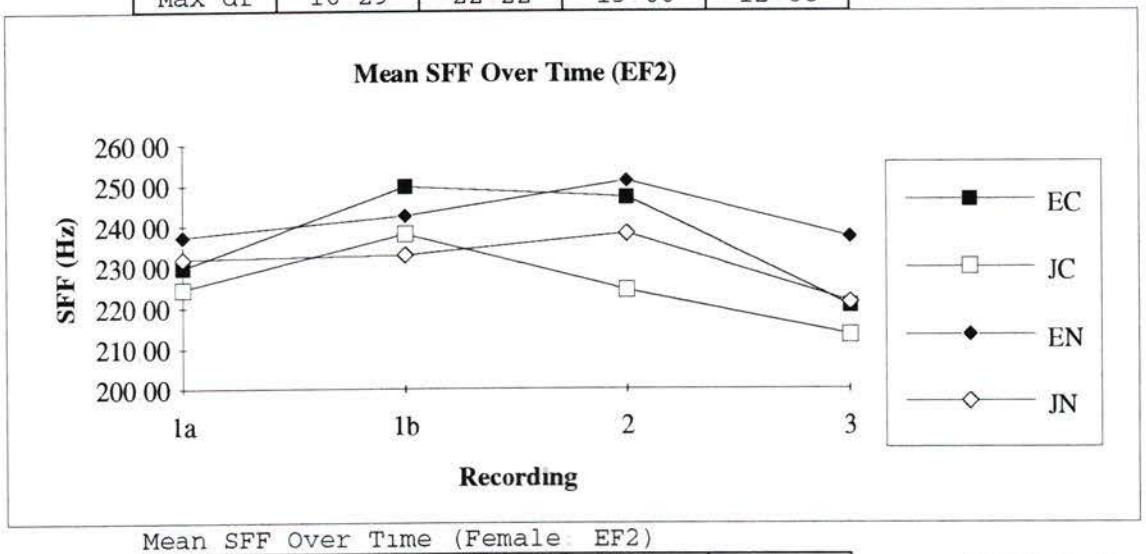
t=1 68 (df=2, t[5%]=4 303)



Mean SFF Over Time (Female EF1)

	EC	JC	EN	JN
1a	251 40	245 91	250 11	256 82
1b	266 52	254 02	253 15	264 13
2	267 69	268 13	261 80	269 70
3	266 31	259 97	265 71	266 45
Average	262 98	257 01	257 69	264 28
Max df	16 29	22 22	15 60	12 88

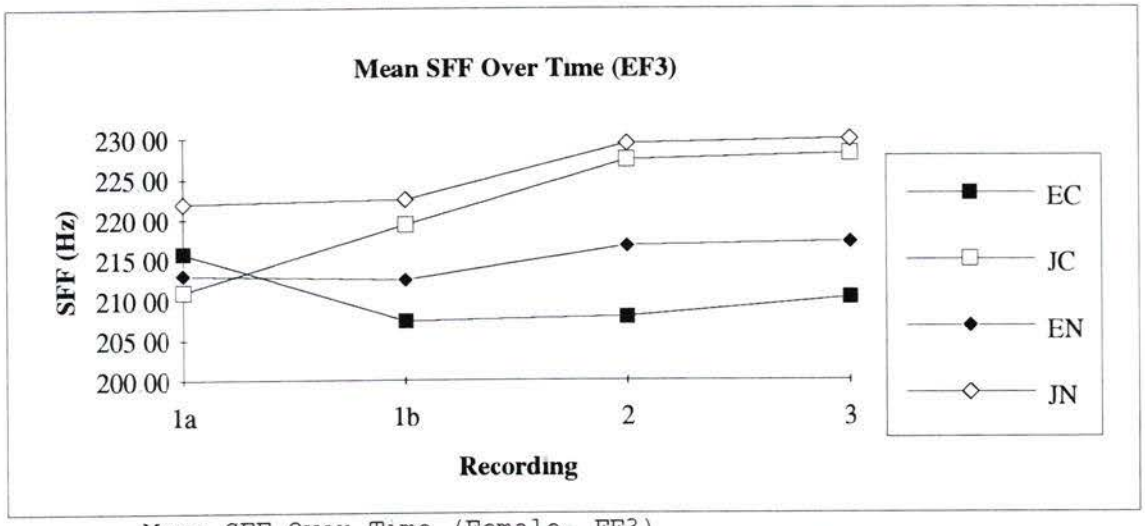
Chart 2 1



Mean SFF Over Time (Female EF2)

	EC	JC	EN	JN
1a	229 73	224 46	237 34	231 93
1b	249 62	237 99	242 39	232 90
2	247 08	224 19	251 05	238 06
3	220 41	213 39	237 10	221 29
Average	236 71	225 01	241 97	231 05
Max df	29 21	24 60	13 95	16 77

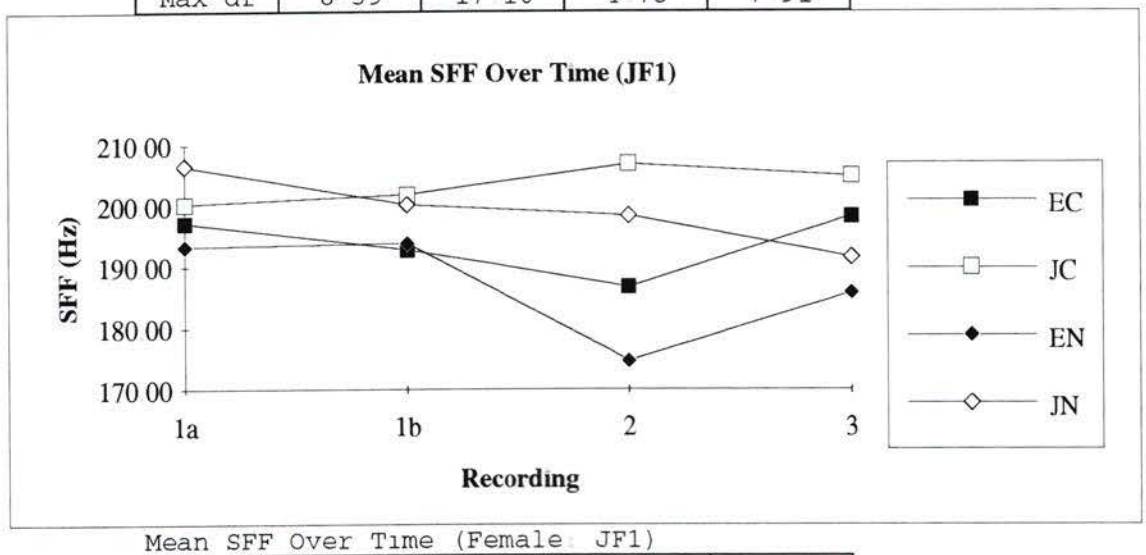
Chart 2 2



Mean SFF Over Time (Female EF3)

	EC	JC	EN	JN
1a	215 72	210 89	213 01	221 90
1b	207 33	219 31	212 41	222 44
2	207 87	227 28	216 68	229 29
3	210 20	227 99	217 14	229 81
Average	210 28	221 37	214 81	225 86
Max df	8 39	17 10	4 73	7 91

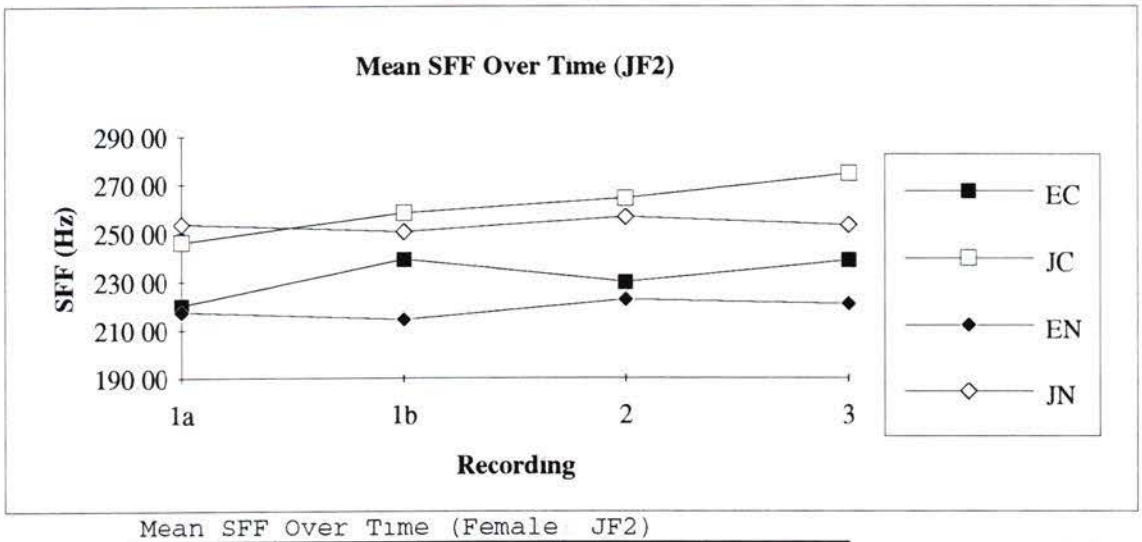
Chart 2 3



Mean SFF Over Time (Female JF1)

	EC	JC	EN	JN
1a	197 09	200 20	193 27	206 51
1b	192 79	201 77	193 83	200 12
2	186 69	206 76	174 67	198 29
3	198 21	204 84	185 71	191 50
Average	193 70	203 39	186 87	199 11
Max df	11 52	6 56	19 16	15 01

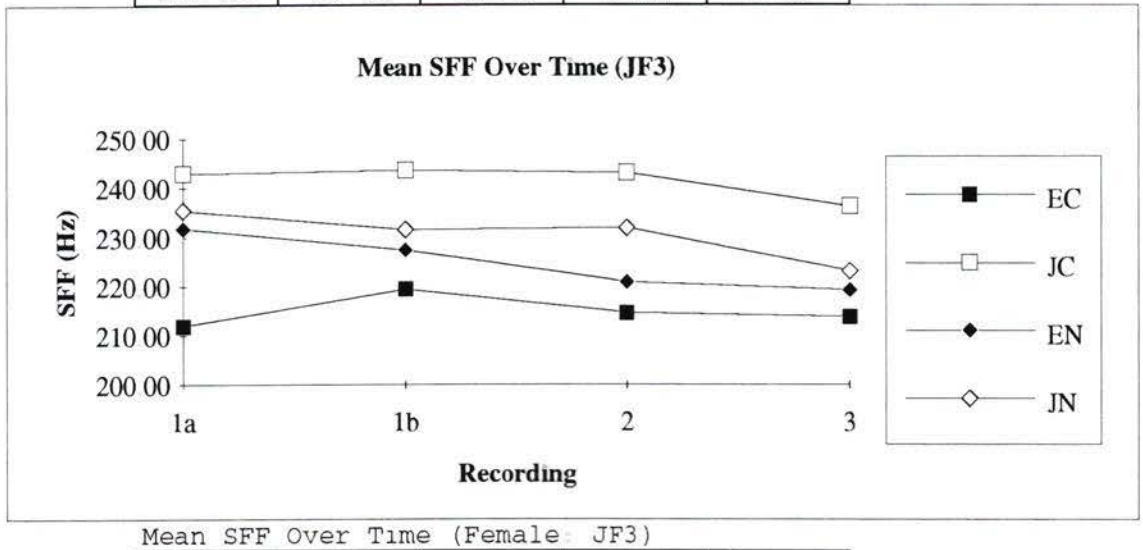
Chart 2 4



Mean SFF Over Time (Female JF2)

	EC	JC	EN	JN
1a	220 12	246 20	217 62	253 45
1b	239 17	258 19	214 40	250 43
2	229 80	264 17	222 70	256 51
3	238 55	274 30	220 90	252 92
Average	231 91	260 72	218 91	253 33
Max df	19 05	28 10	8 30	6 08

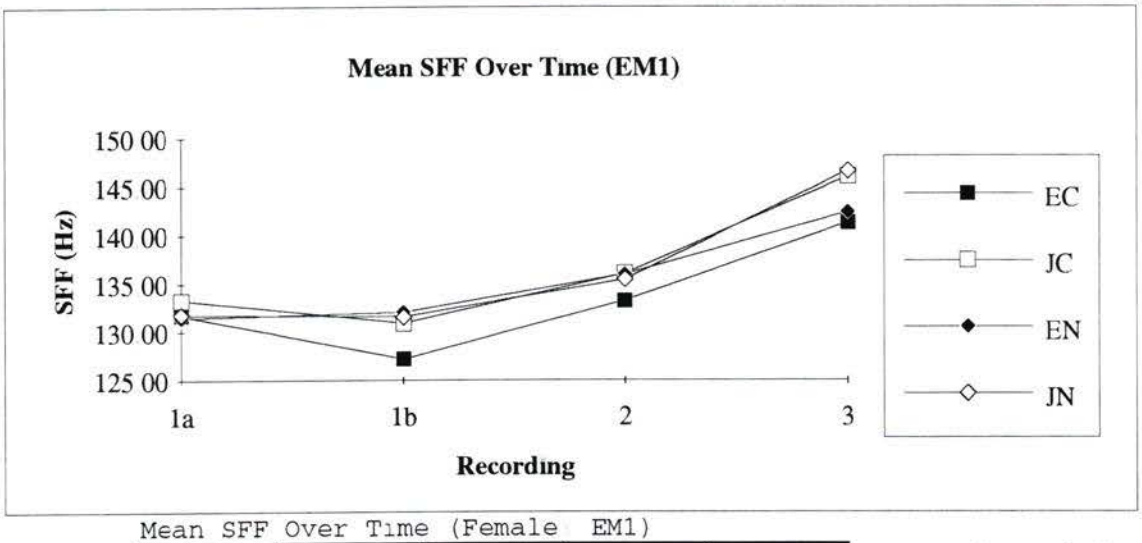
Chart 2 5



Mean SFF Over Time (Female JF3)

	EC	JC	EN	JN
1a	211 97	242 87	231 76	235 36
1b	219 42	243 54	227 34	231 44
2	214 53	242 91	220 86	231 87
3	213 83	236 18	219 18	223 05
Average	214 94	241 38	224 79	230 43
Max df	7 45	7 36	12 58	12 31

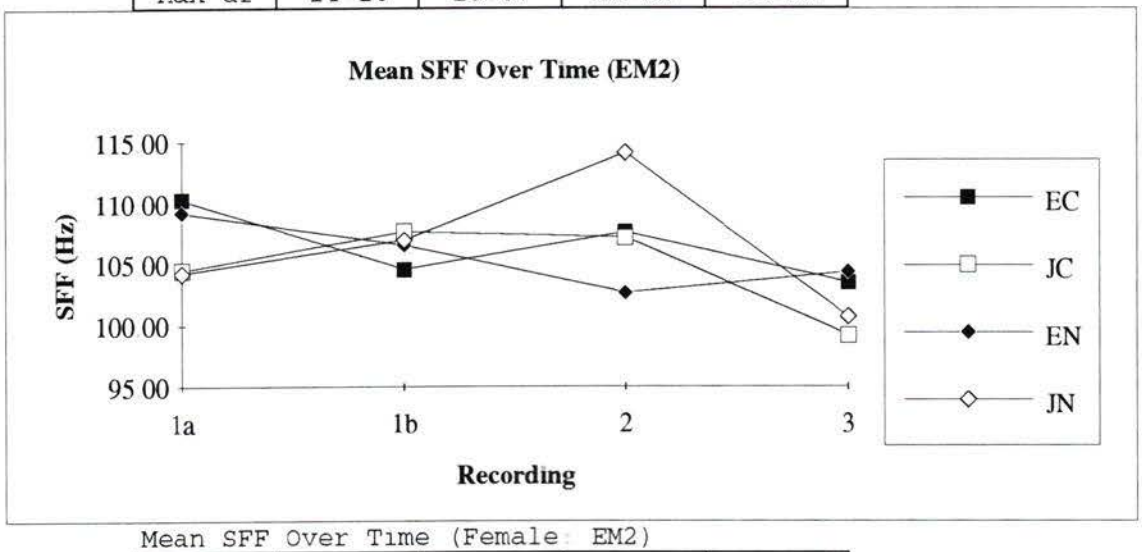
Chart 2 6



Mean SFF Over Time (Female EM1)

	EC	JC	EN	JN
1a	131 67	133 27	131 46	131 75
1b	127 16	130 91	132 15	131 54
2	133 19	135 99	135 94	135 44
3	141 26	145 98	142 34	146 62
Average	133 32	136 54	135 47	136 34
Max df	14 10	15 07	10 88	15 08

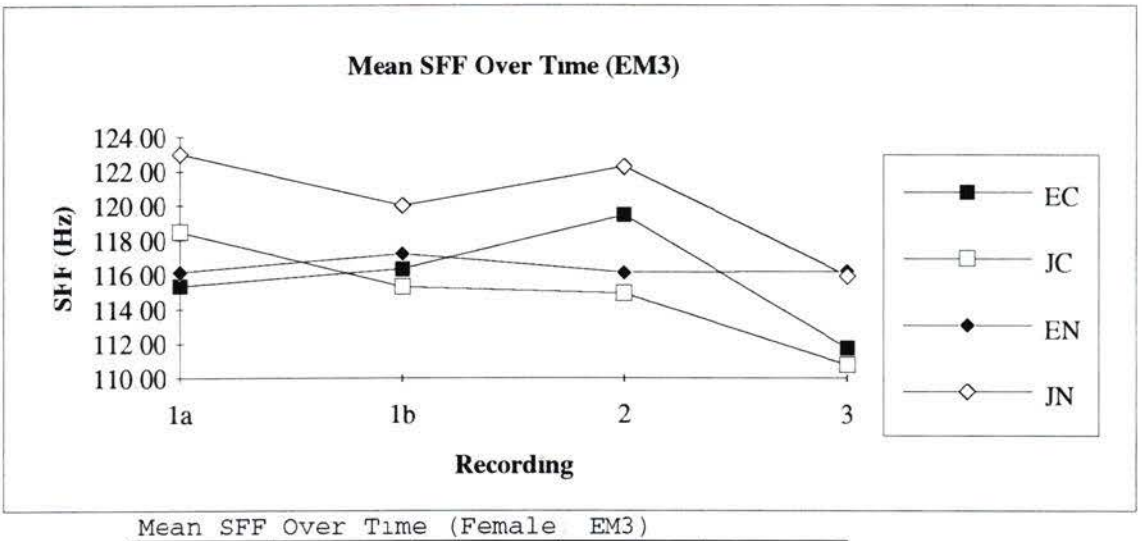
Chart 2 7



Mean SFF Over Time (Female EM2)

	EC	JC	EN	JN
1a	110 29	104 46	109 19	104 25
1b	104 57	107 64	106 56	106 96
2	107 59	107 19	102 64	114 12
3	103 50	99 16	104 36	100 68
Average	106 49	104 61	105 69	106 50
Max df	6 79	8 48	6 55	13 44

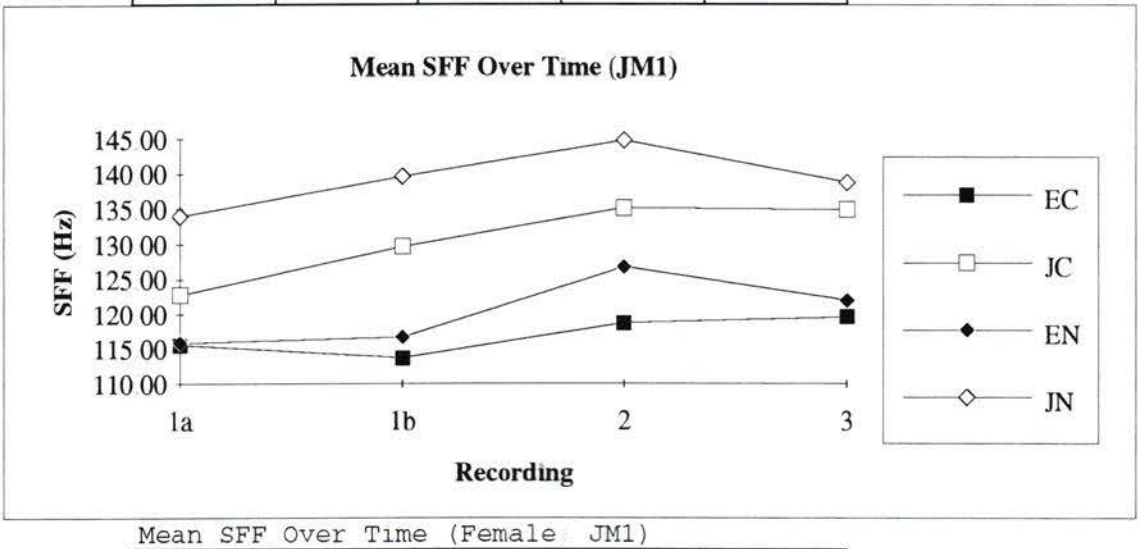
Chart 2 8



Mean SFF Over Time (Female EM3)

	EC	JC	EN	JN
1a	115 31	118 44	116 13	122 99
1b	116 31	115 26	117 19	119 98
2	119 41	114 90	116 11	122 26
3	111 73	110 78	116 17	115 92
Average	115 69	114 85	116 40	120 29
Max df	7 68	7 66	1 08	7 07

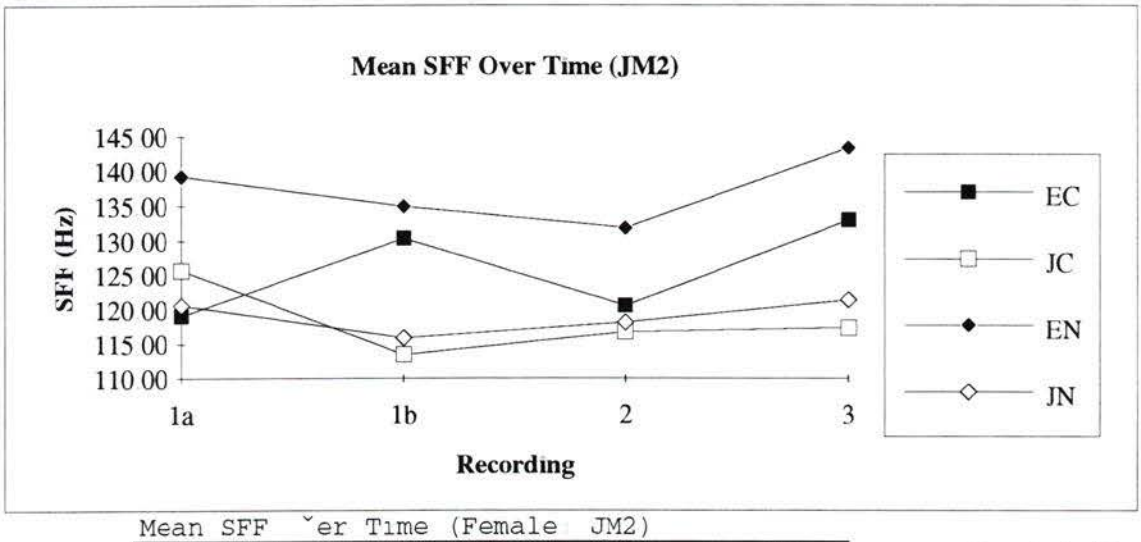
Chart 2 9



Mean SFF Over Time (Female JM1)

	EC	JC	EN	JN
1a	115 52	122 72	115 81	133 94
1b	113 67	129 64	116 71	139 59
2	118 70	135 12	126 71	144 70
3	119 57	134 81	121 99	138 73
Average	116 87	130 57	120 31	139 24
Max df	5 90	12 40	10 90	10 76

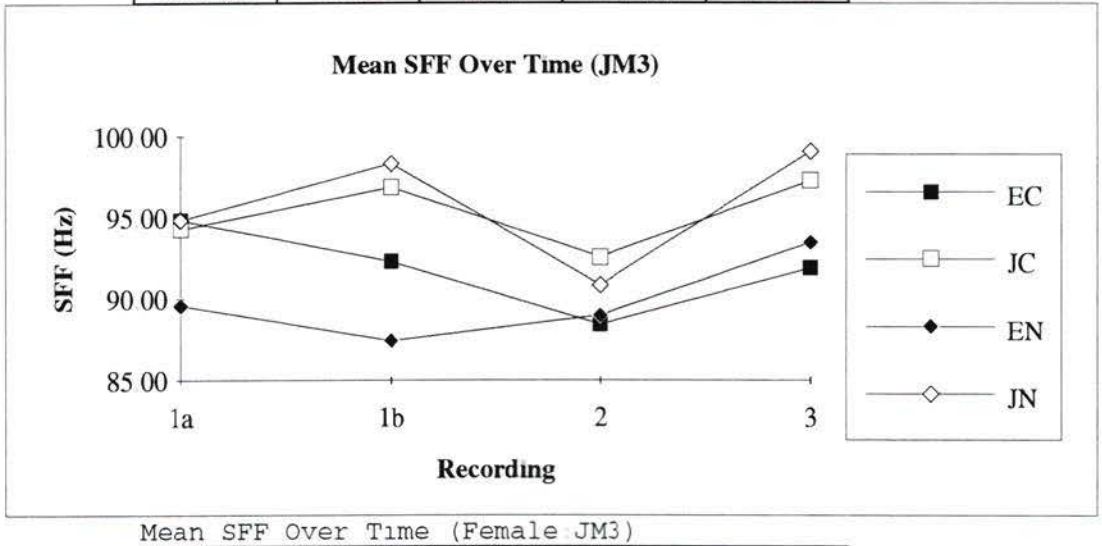
Chart 2 10



Mean SFF ˇer Tıme (Female JM2)

	EC	JC	EN	JN
1a	119 03	125 73	139 20	120 57
1b	130 25	113 44	134 87	115 83
2	120 48	116 71	131 81	118 04
3	132 92	117 32	143 23	121 36
Average	125 67	118 30	137 28	118 95
Max df	13 89	12 29	11 42	5 53

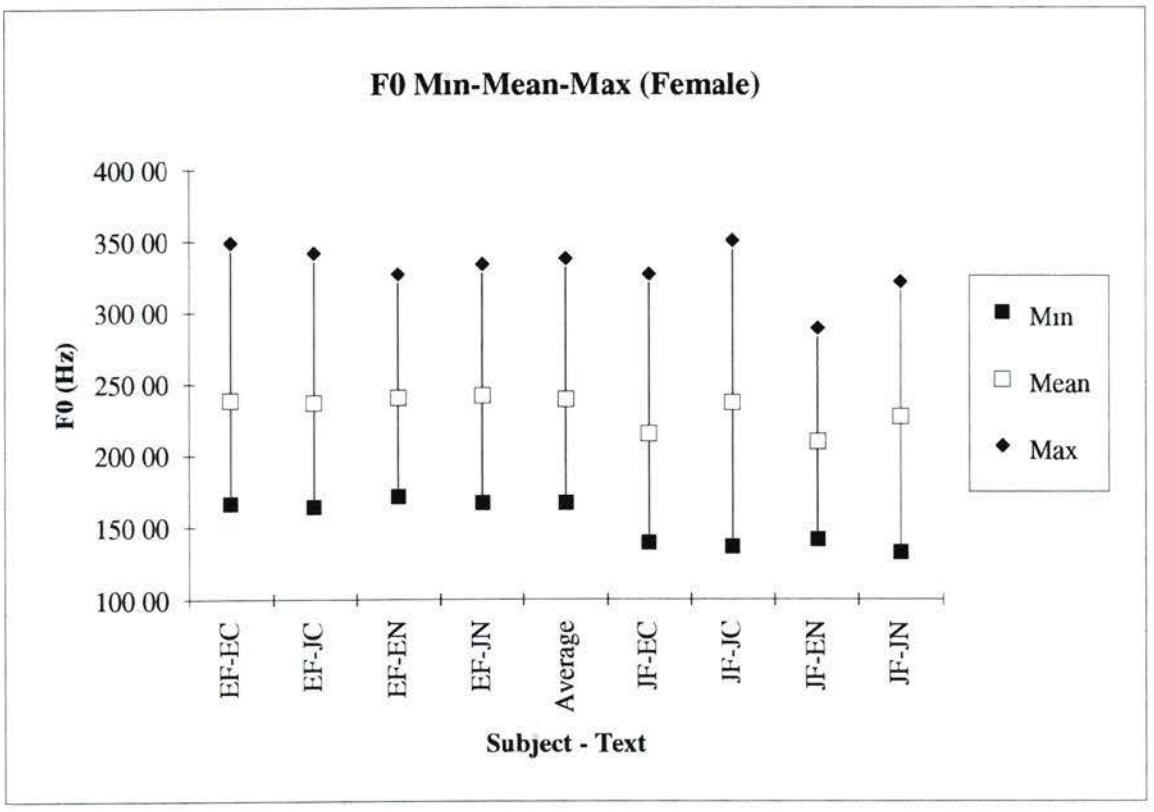
Chart 2 11



Mean SFF Over Time (Female JM3)

	EC	JC	EN	JN
1a	94 81	94 26	89 57	94 79
1b	92 27	96 84	87 43	98 32
2	88 41	92 51	88 97	90 83
3	91 86	97 26	93 43	99 05
Average	91 84	95 22	89 85	95 75
Max df	6 40	4 75	6 00	8 22

Chart 2 12



Average Mın-Mean-Max (Female)

	Mın	Mean	Max
EF-EC	165 81	238 12	348 53
EF-JC	163 59	236 93	341 63
EF-EN	171 06	239 71	326 52
EF-JN	166 57	241 56	333 98
Average	166 76	239 08	337 67
JF-EC	139 06	214 78	326 54
JF-JC	136 25	236 96	350 17
JF-EN	141 36	208 85	288 41
JF-JN	132 24	226 24	321 03
Average	137 23	221 71	321 54

Chart 3 1

Average Mın-Mean-Max (Female, all tasks)

	EF	JF
Mın	166 76	137 23
Mean	239 08	221 71
Max	337 67	321 54

t=4 91 (df=2, t[5%]=4 303)

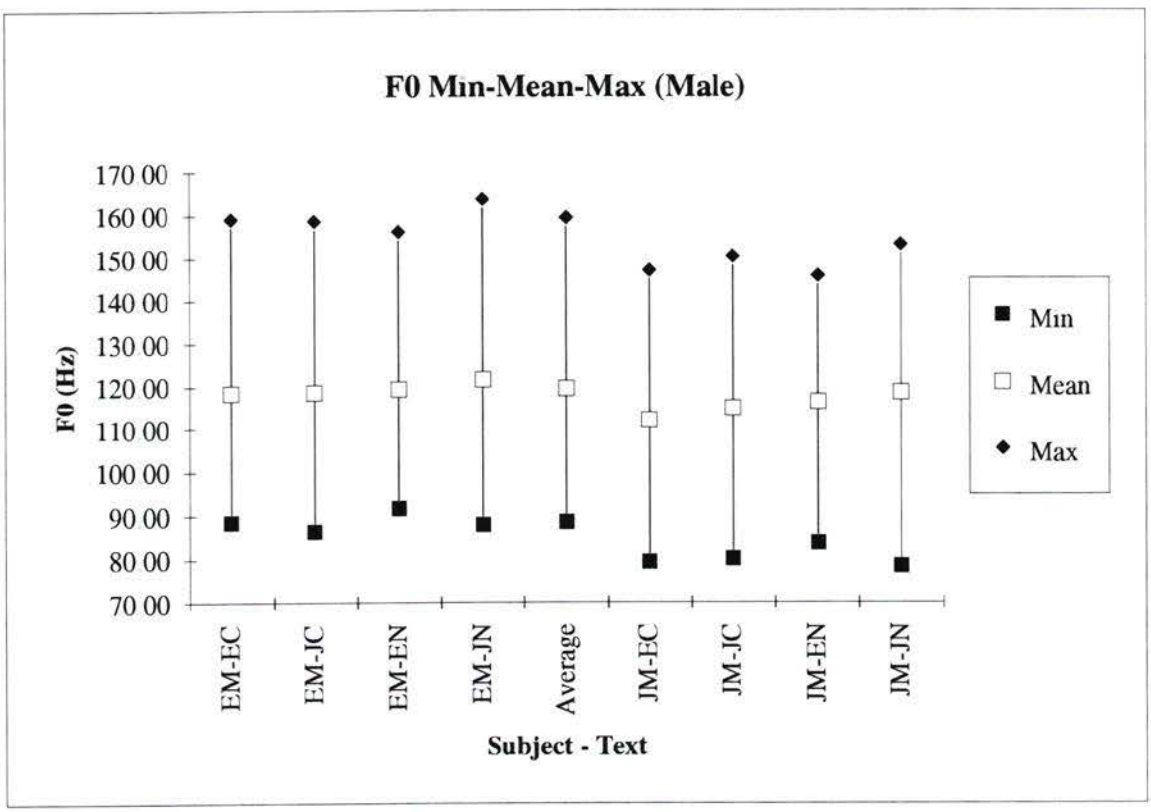


Chart 3 2

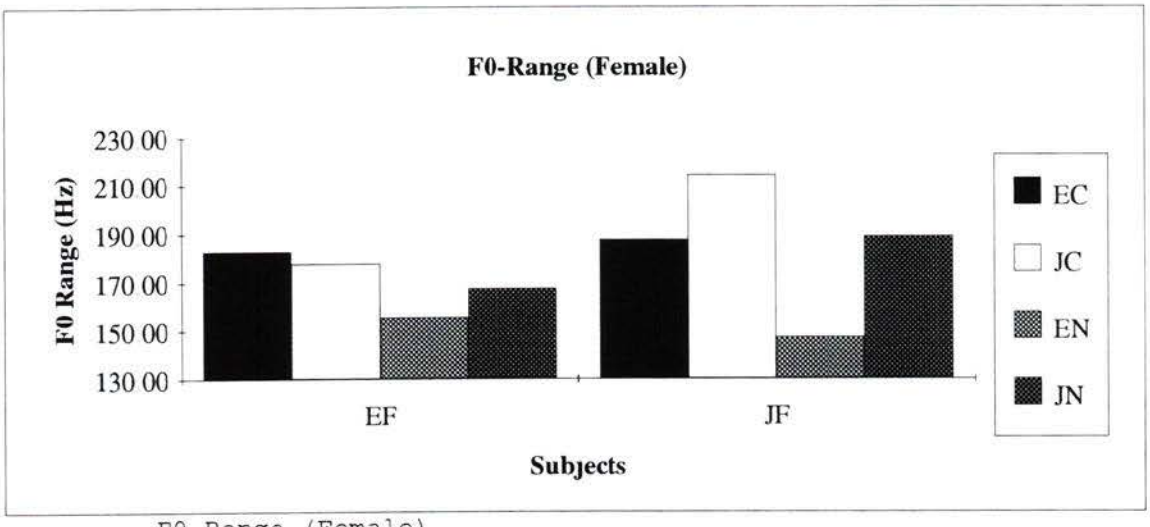
Average Min-Mean-Max (Male)

	Min	Mean	Max
EM-EC	88 32	118 30	159 04
EM-JC	86 38	118 65	158 68
EM-EN	91 62	119 27	156 09
EM-JN	87 95	121 50	163 63
Average	88 57	119 43	159 36
JM-EC	79 13	112 01	147 00
JM-JC	79 89	114 85	150 38
JM-EN	83 57	116 13	145 78
JM-JN	78 27	118 49	153 03
Average	80 22	115 37	149 05

Average Min-Mean-Max (Male, all tasks)

	EM	JM
Min	88 57	80 22
Mean	119 43	115 37
Max	159 36	149 05

t=4 10 (df=2, t[5%]=4 303)

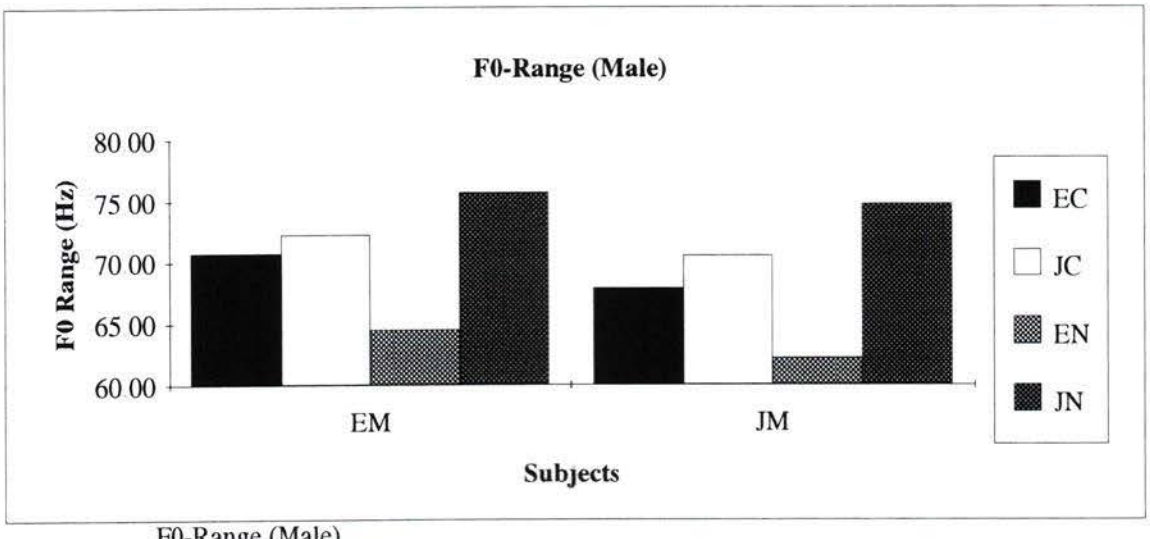


F0-Range (Female)

	EF	JF
EC	182 73	187 48
JC	177 91	213 93
EN	155 46	147 05
JN	167 41	188 79

t=1 39 (df=3, t[5%]=3 182)

Chart 4 1

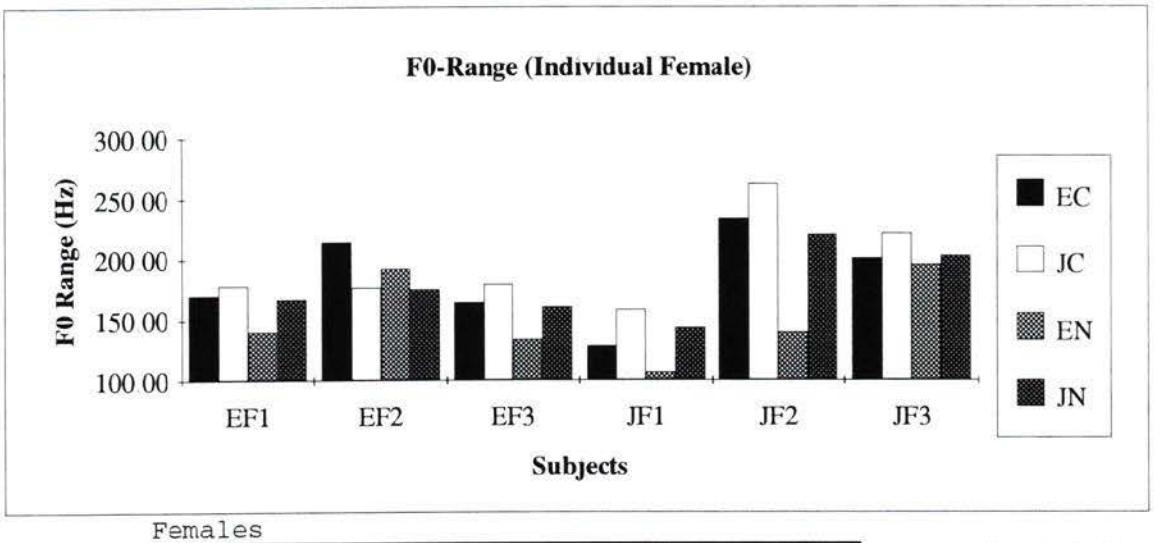


F0-Range (Male)

	EM	JM
EC	70 72	67 87
JC	72 30	70 50
EN	64 48	62 20
JN	75 68	74 76

t=1 39 (df=3, t[5%]=3 182)

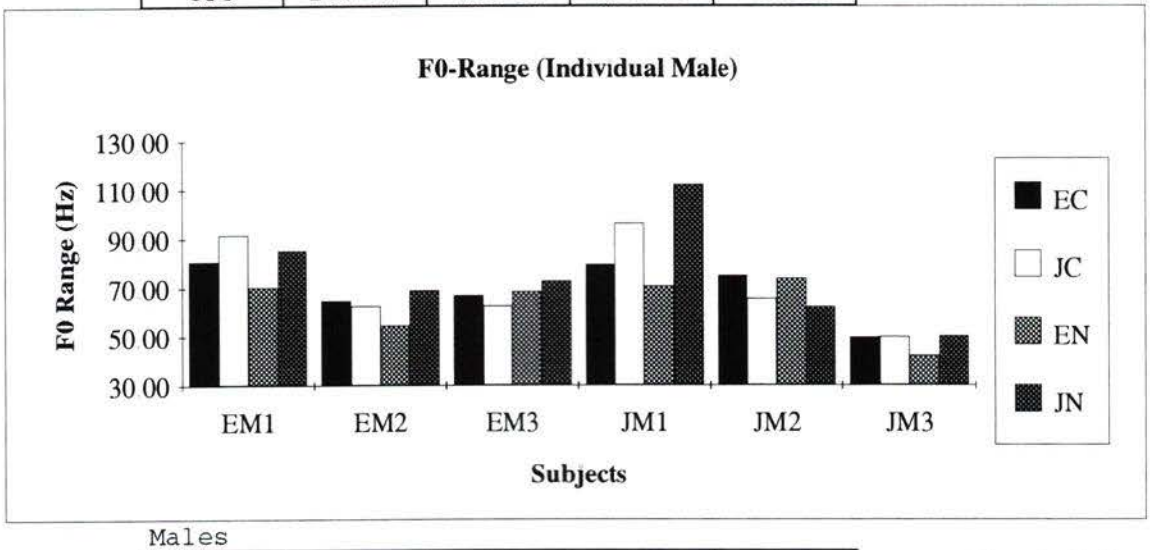
Chart 4 2



Females

	EC	JC	EN	JN
EF1	170 04	178 22	140 33	166 62
EF2	214 19	176 37	192 10	174 95
EF3	163 96	179 15	133 95	160 67
JF1	128 74	158 44	106 76	143 57
JF2	233 33	262 30	139 43	220 33
JF3	200 37	221 04	194 95	202 48

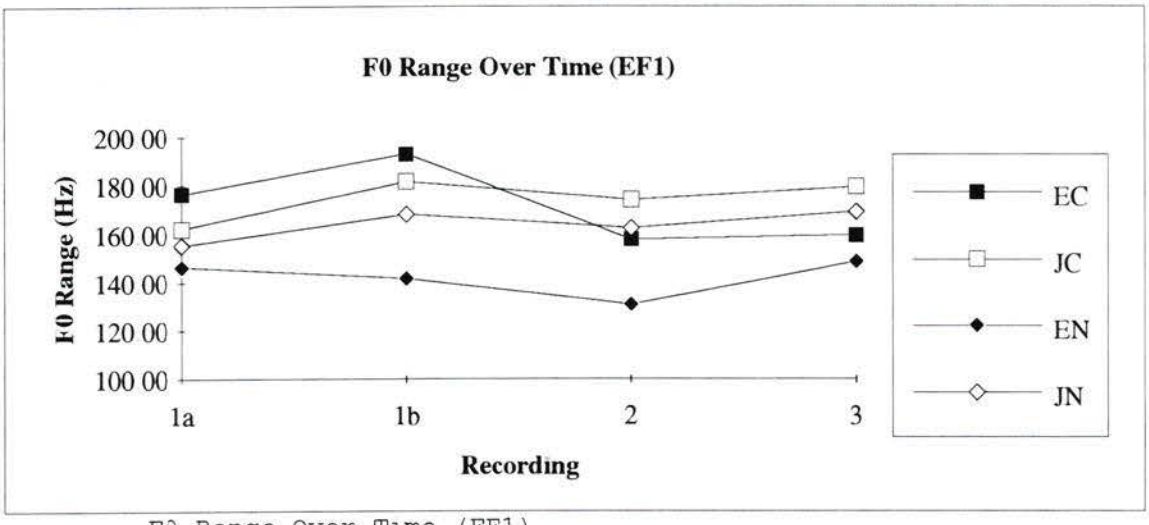
Chart 4 3



Males

	EC	JC	EN	JN
EM1	80 63	91 59	70 24	85 38
EM2	64 78	62 63	54 62	68 95
EM3	66 74	62 67	68 57	72 71
JM1	79 30	96 26	70 71	111 95
JM2	74 74	65 41	73 86	62 24
JM3	49 56	49 82	42 04	50 10

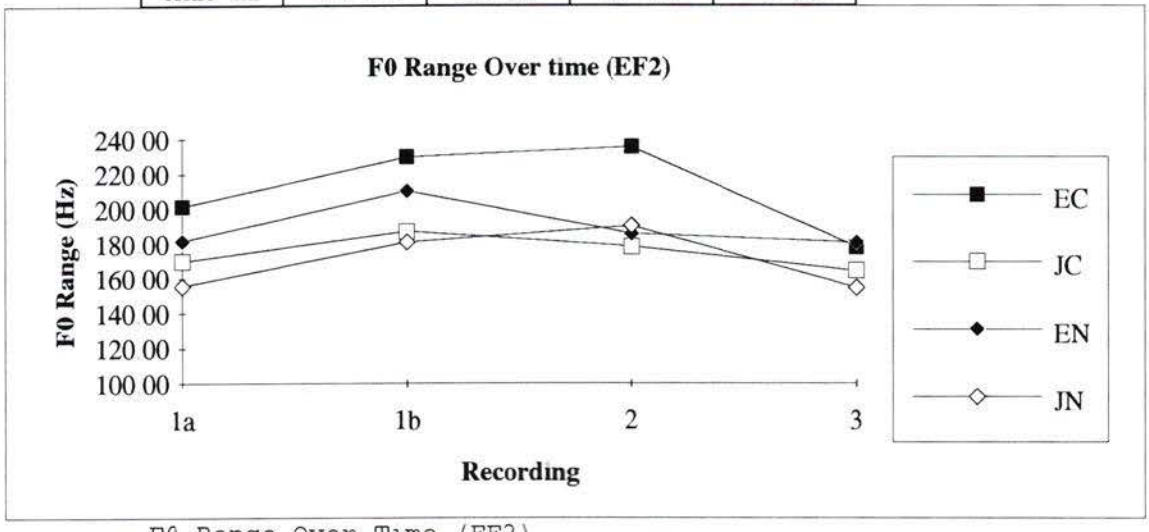
Chart 4 4



F0 Range Over Time (EF1)

	EC	JC	EN	JN
1a	176 33	162 11	146 43	155 29
1b	192 89	181 33	141 71	168 14
2	157 78	174 00	130 71	162 57
3	159 44	179 33	148 57	169 14
Average	171 61	174 19	141 86	163 79
Max df	35 11	19 22	17 86	13 85

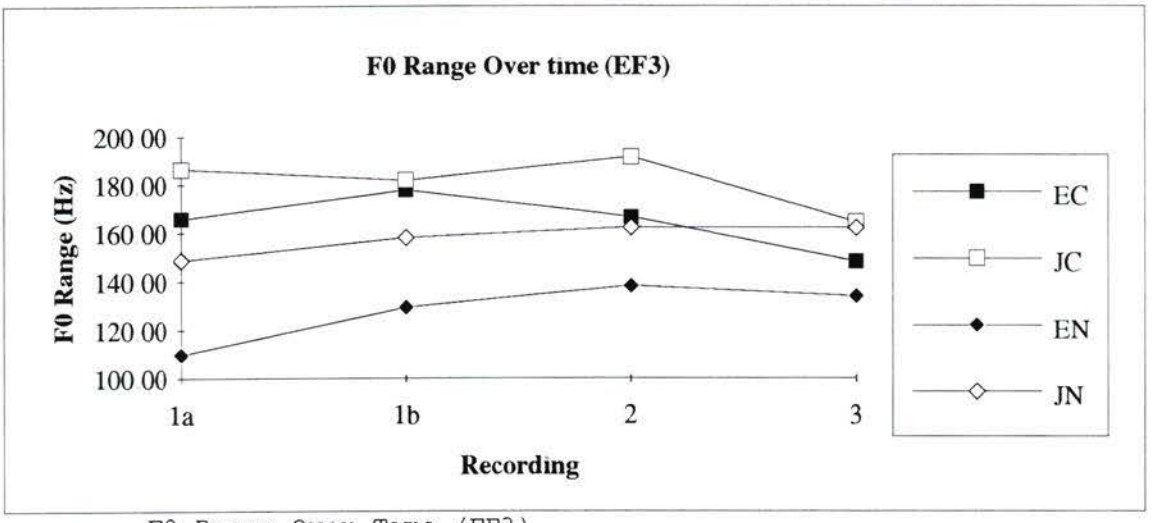
Chart 5 1



F0 Range Over Time (EF2)

	EC	JC	EN	JN
1a	201 33	169 56	181 29	155 29
1b	229 56	187 11	210 29	180 57
2	235 22	178 11	185 71	190 14
3	177 78	163 89	180 29	154 14
Average	210 97	174 67	189 40	170 04
Max df	57 44	23 22	30 00	36 00

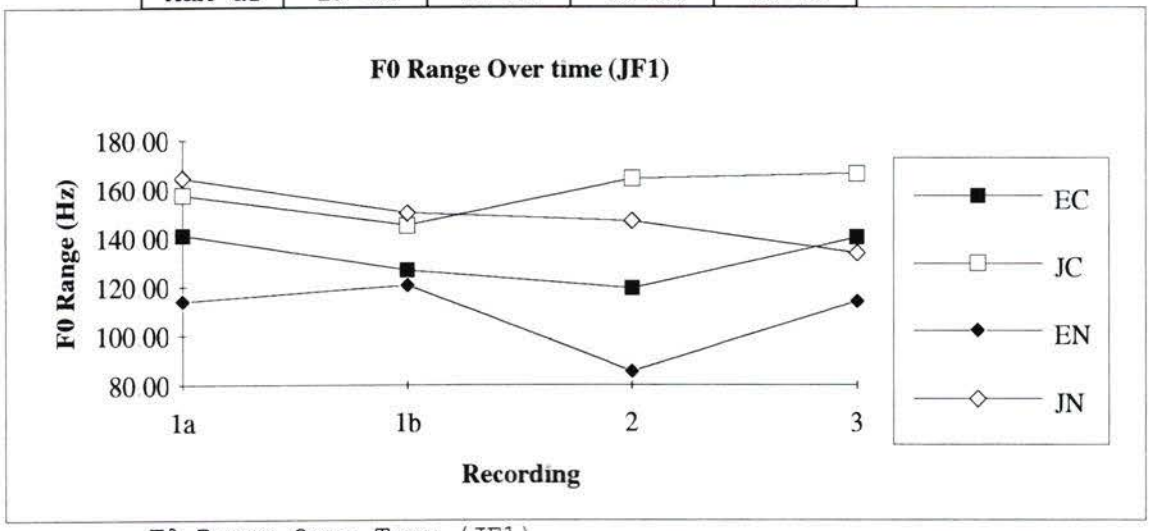
Chart 5 2



F0 Range Over Time (EF3)

	EC	JC	EN	JN
1a	165 56	186 56	109 71	148 71
1b	177 56	181 67	129 57	157 86
2	166 33	191 44	138 29	162 14
3	148 00	164 33	134 00	162 00
Average	164 36	181 00	127 89	157 68
Max df	29 56	27 11	28 58	13 43

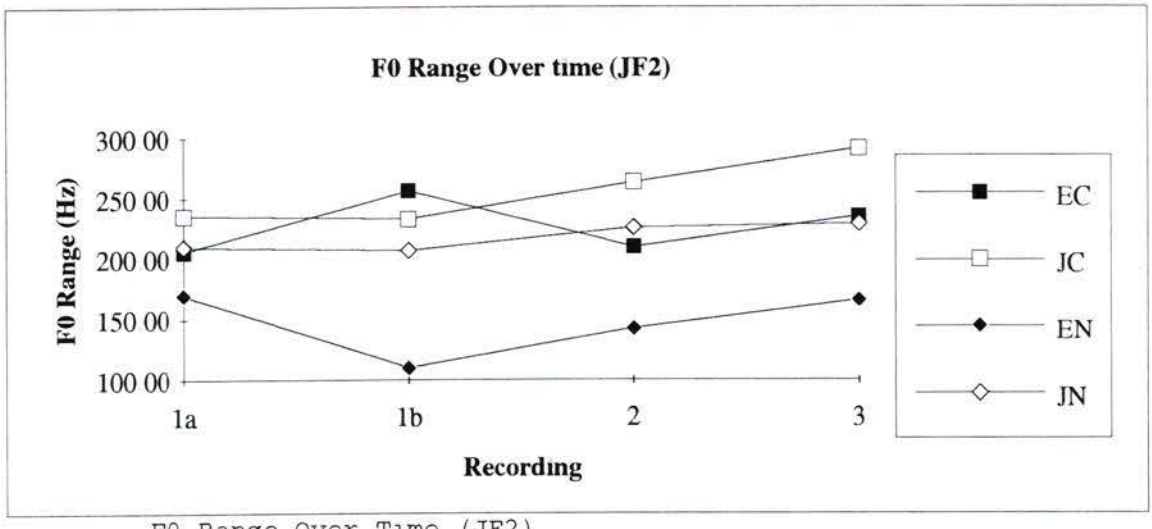
Chart 5 3



F0 Range Over Time (JF1)

	EC	JC	EN	JN
1a	141 11	157 44	113 86	164 43
1b	126 78	145 22	120 71	150 29
2	119 33	164 00	85 57	146 86
3	140 11	166 11	114 00	133 57
Average	131 83	158 19	108 54	148 79
Max df	21 78	20 89	35 14	30 86

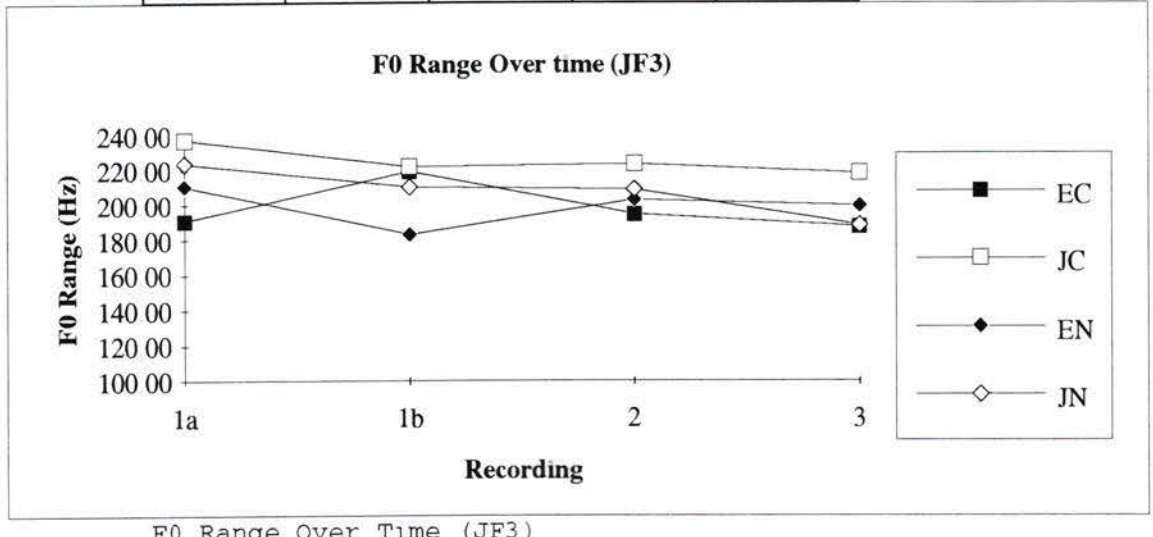
Chart 5 4



F0 Range Over Time (JF2)

	EC	JC	EN	JN
1a	205 56	235 78	169 43	209 57
1b	255 78	232 67	109 86	206 57
2	209 44	263 00	142 43	225 71
3	234 78	291 22	166 00	228 71
Average	226 39	255 67	146 93	217 64
Max df	50 22	58 55	59 57	22 14

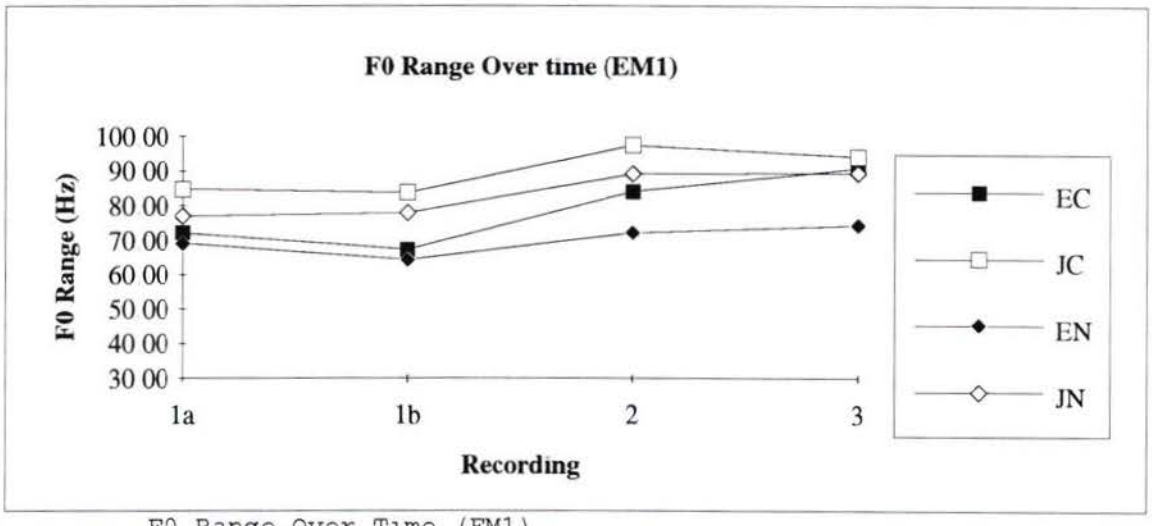
Chart 5 5



F0 Range Over Time (JF3)

	EC	JC	EN	JN
1a	190 89	237 33	210 57	223 57
1b	219 33	221 89	183 00	210 29
2	194 44	223 22	202 57	208 86
3	187 33	218 00	199 29	188 29
Average	198 00	225 11	198 86	207 75
Max df	32 00	19 33	27 57	35 28

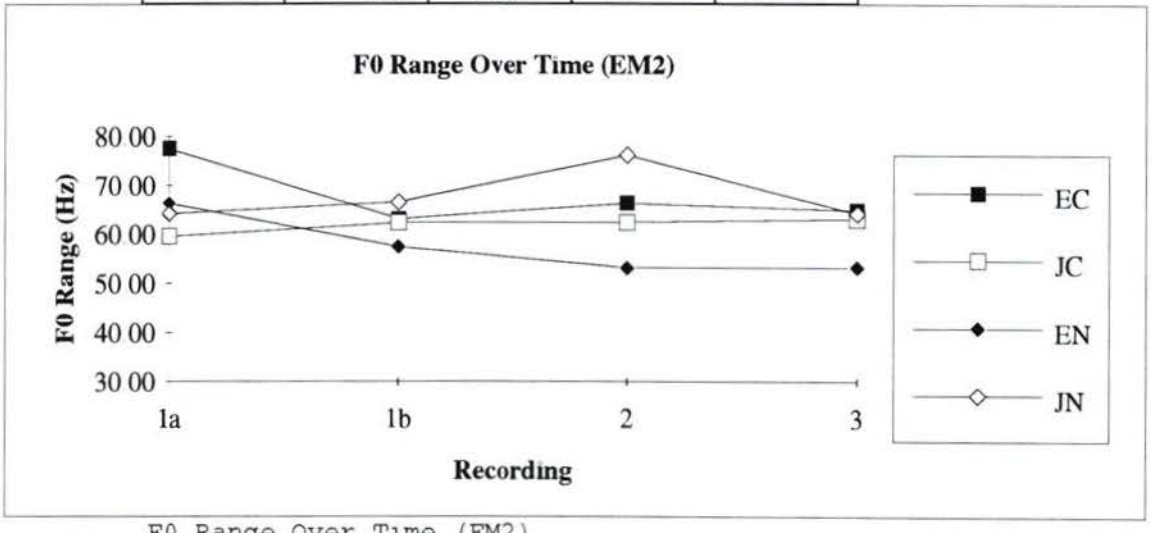
Chart 5 6



F0 Range Over Time (EM1)

	EC	JC	EN	JN
1a	72 11	84 67	69 00	76 86
1b	67 22	83 56	64 29	77 86
2	84 00	97 22	72 14	89 00
3	90 67	94 00	74 29	89 29
Average	78 50	89 86	69 93	83 25
Max df	23 45	13 66	10 00	12 43

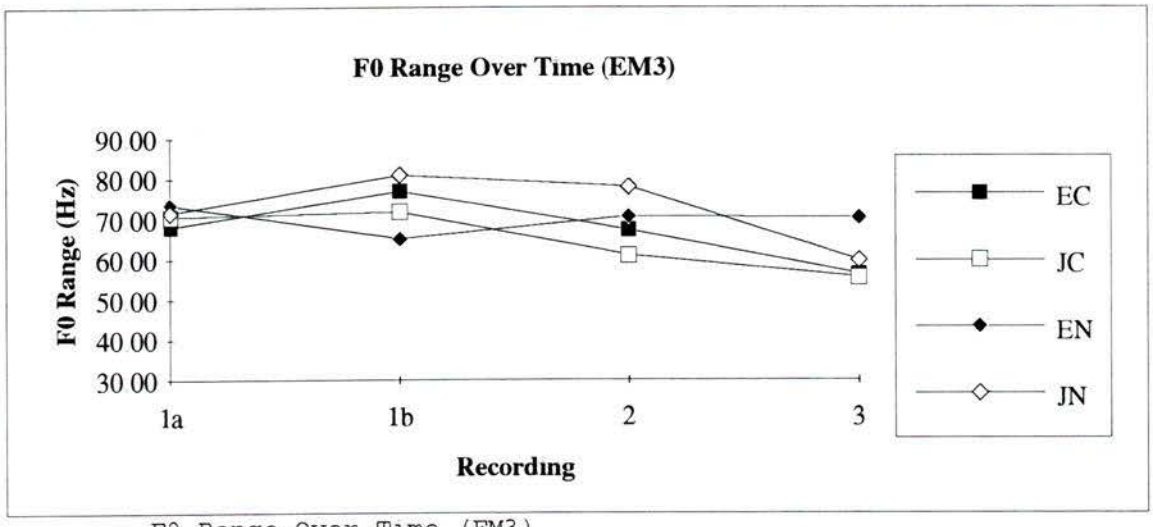
Chart 5 7



F0 Range Over Time (EM2)

	EC	JC	EN	JN
1a	77 44	59 44	66 29	64 14
1b	63 11	62 33	57 43	66 57
2	66 33	62 44	53 14	76 14
3	64 89	63 11	53 29	64 14
Average	67 94	61 83	57 54	67 75
Max df	14 33	3 67	13 15	12 00

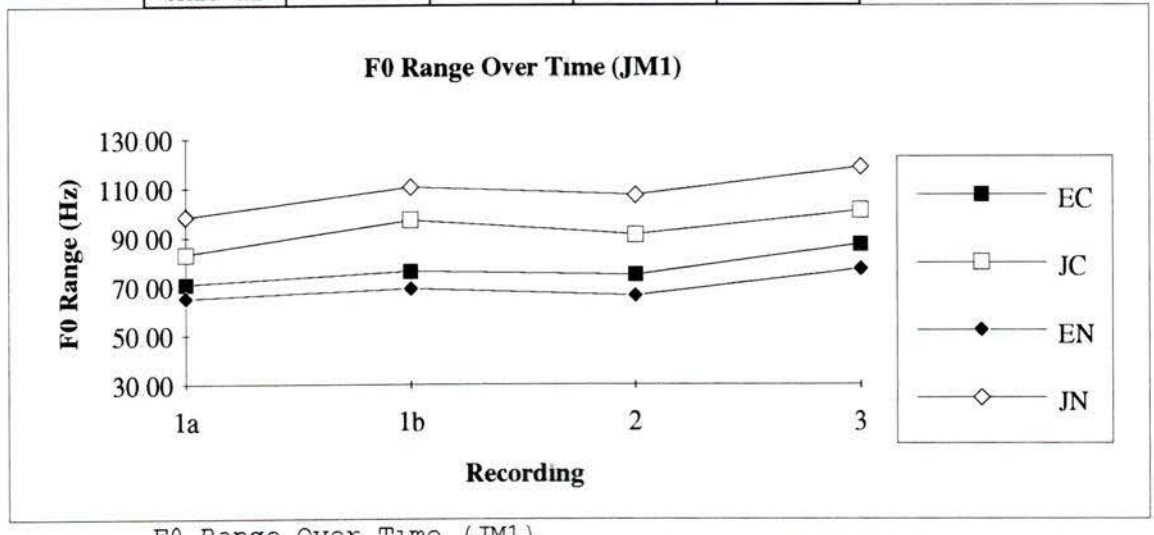
Chart 5 8



F0 Range Over Time (EM3)

	EC	JC	EN	JN
1a	68 00	70 44	73 43	71 43
1b	76 78	71 56	65 00	80 71
2	67 11	60 89	70 57	77 86
3	56 33	55 56	70 14	59 57
Average	67 06	64 61	69 79	72 39
Max df	20 45	16 00	8 43	21 14

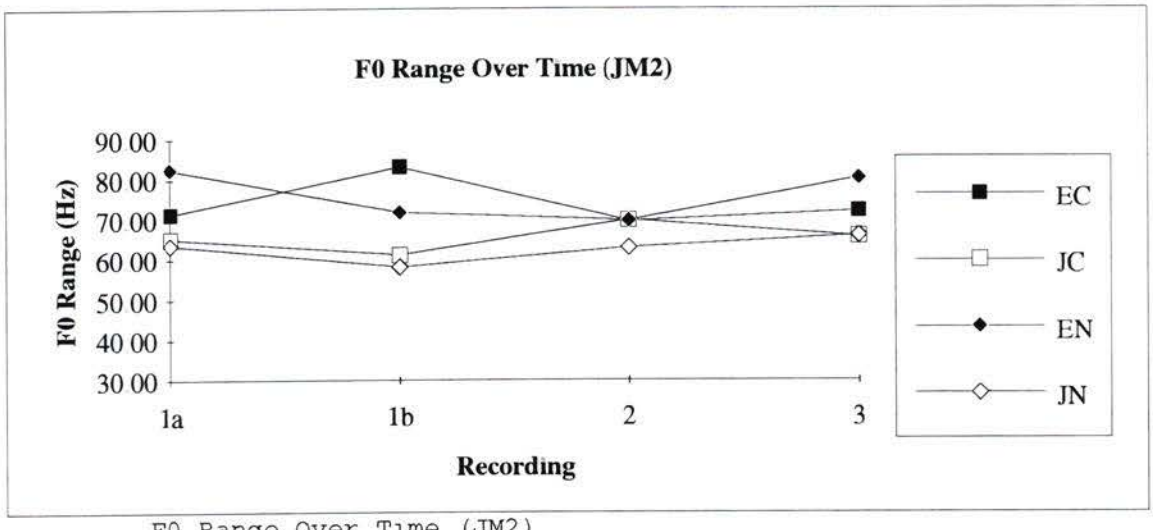
Chart 5 9



F0 Range Over Time (JM1)

	EC	JC	EN	JN
1a	70 78	83 11	65 00	98 29
1b	76 22	96 89	69 14	110 29
2	74 67	91 11	66 00	107 14
3	87 00	100 78	77 00	118 43
Average	77 17	92 97	69 29	108 54
Max df	16 22	17 67	12 00	20 14

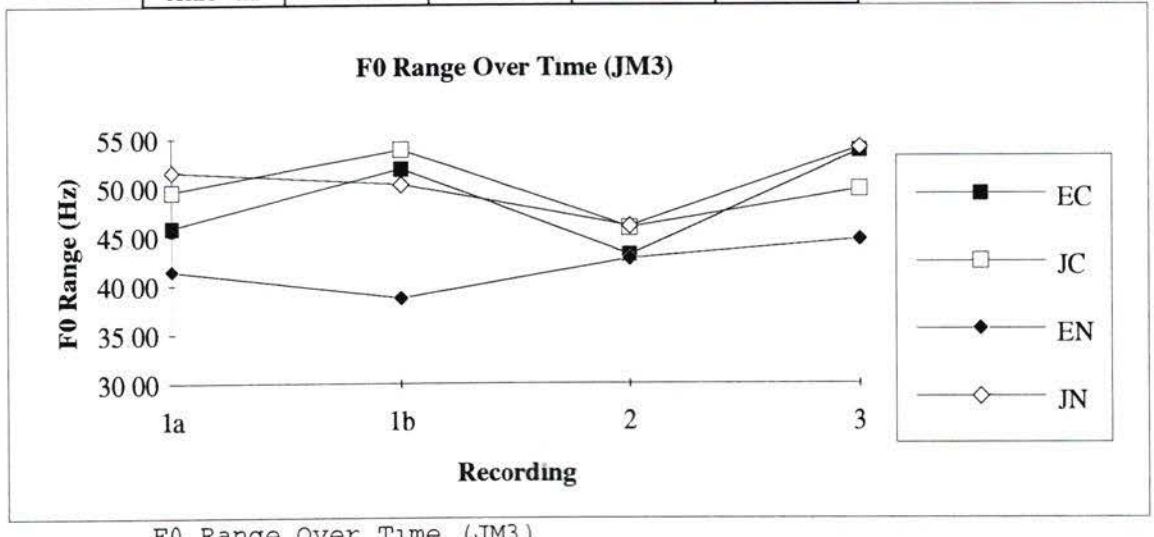
Chart 5 10



F0 Range Over Time (JM2)

	EC	JC	EN	JN
1a	71 11	65 00	82 29	63 43
1b	83 00	61 00	71 71	58 00
2	69 33	69 67	69 57	62 86
3	71 89	65 56	80 29	65 86
Average	73 83	65 31	75 97	62 54
Max df	13 67	8 67	12 72	7 86

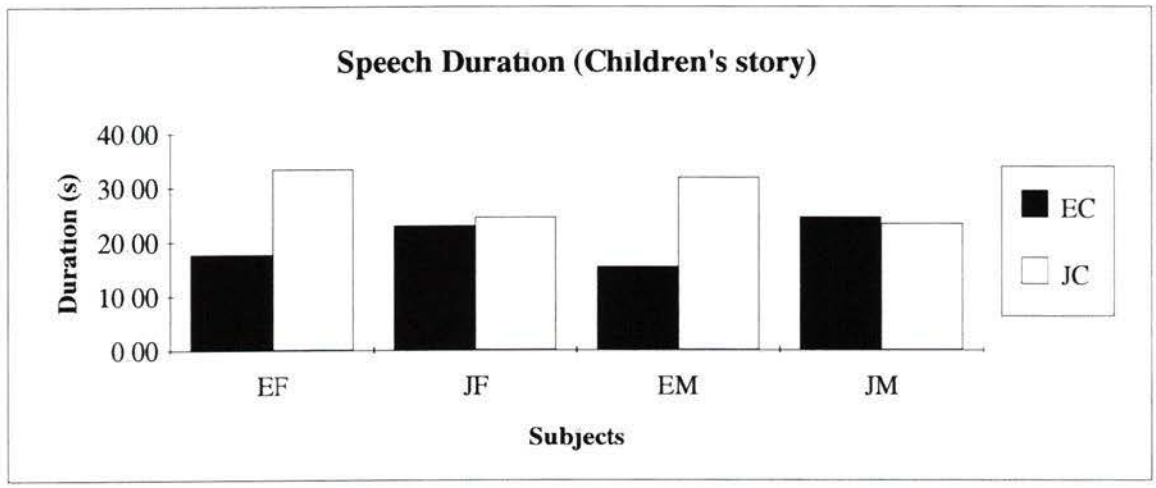
Chart 5 11



F0 Range Over Time (JM3)

	EC	JC	EN	JN
1a	45 89	49 56	41 43	51 57
1b	51 89	53 78	38 71	50 29
2	43 11	45 89	42 71	46 00
3	53 67	49 78	44 71	54 00
Average	48 64	49 75	41 89	50 47
Max df	10 56	7 89	6 00	8 00

Chart 5 12

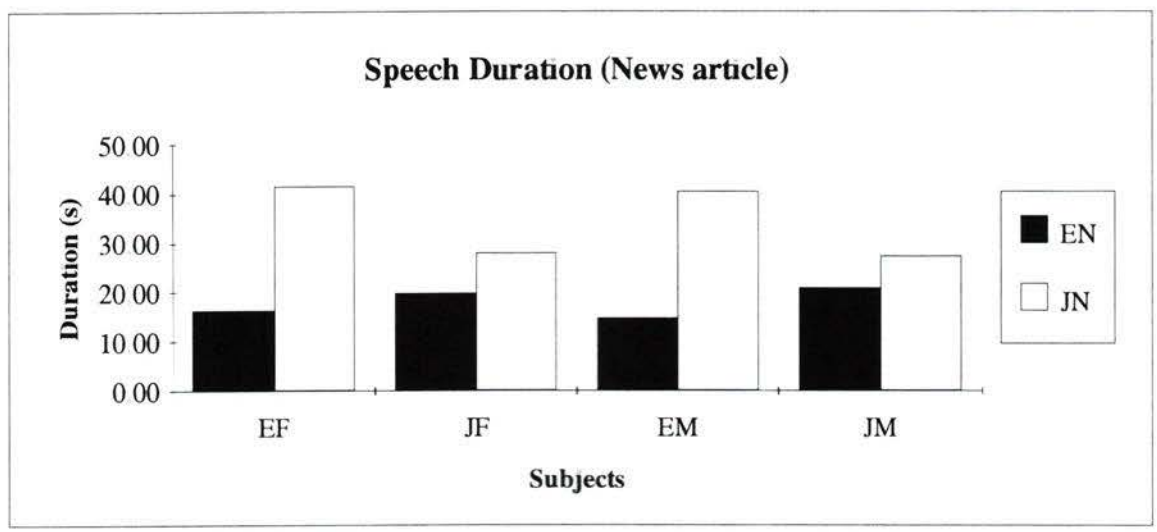


Speech Duration (Children's story)

	EC	JC
EF	17 70	33 29
JF	22 92	24 50
EM	15 39	31 77
JM	24 56	23 37

t=1 76 (df=3, t[5%]=3 182)

Chart 6 1

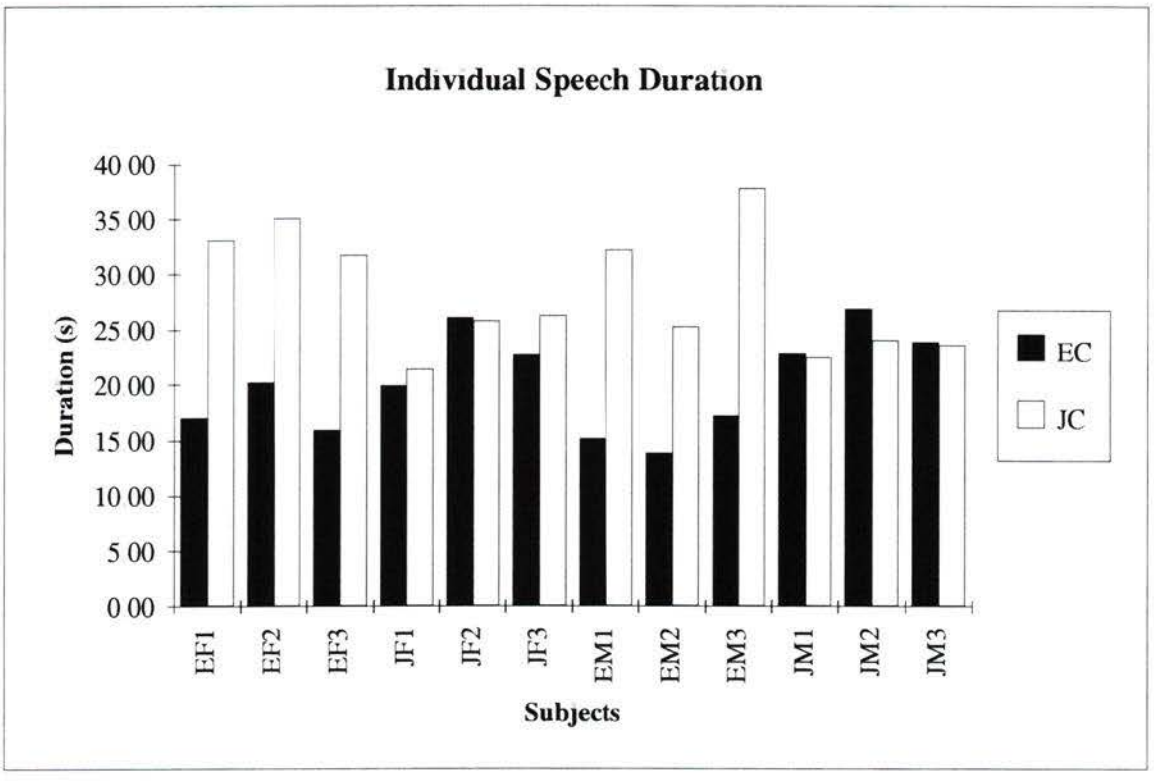


Speech Duration (News article)

	EN	JN
EF	16 32	41 51
JF	19 71	28 03
EM	14 65	40 45
JM	20 82	27 32

t=3 14 (df=3, t[5%]=3 182)

Chart 6 2

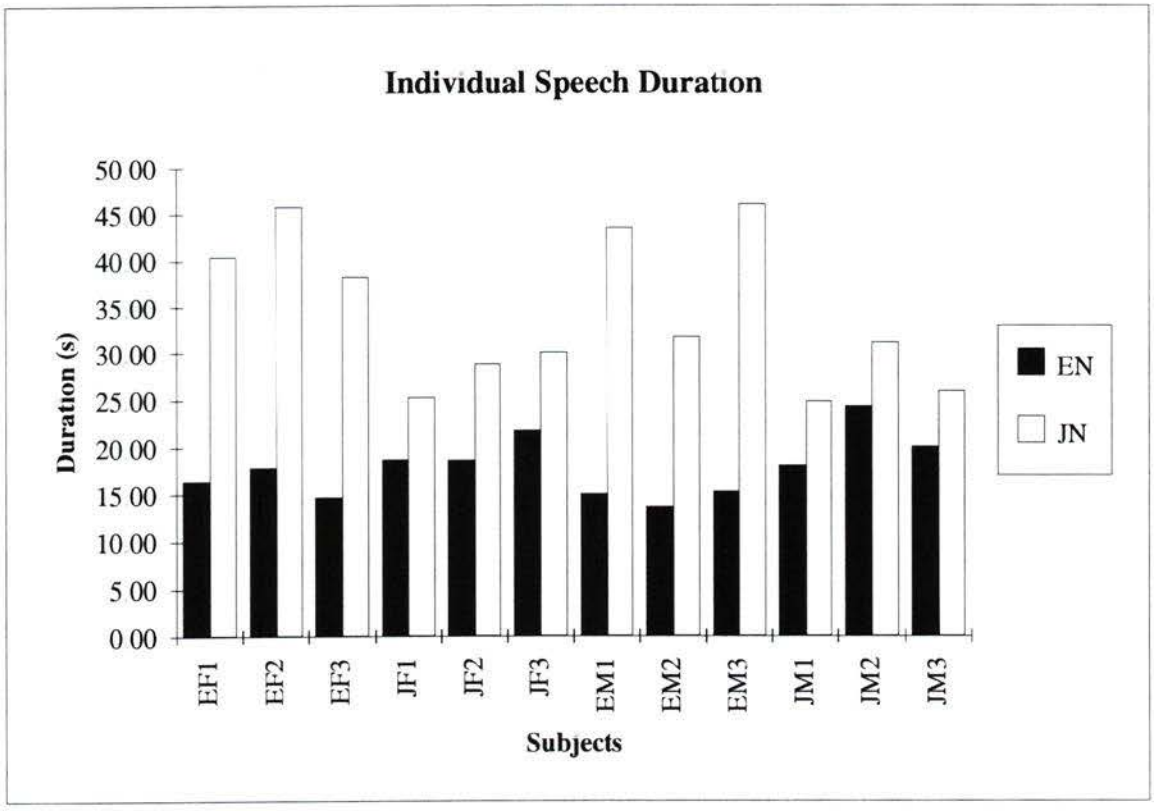


Speech Duration (Children's story)

	EC	JC
EF1	17 02	33 11
EF2	20 19	35 05
EF3	15 89	31 72
JF1	19 92	21 38
JF2	26 11	25 84
JF3	22 73	26 27
EM1	15 13	32 21
EM2	13 86	25 28
EM3	17 18	37 83
JM1	22 84	22 47
JM2	26 94	24 08
JM3	23 90	23 57

t=3 25 (df=11, t[5%]=2 201)

Chart 6 3

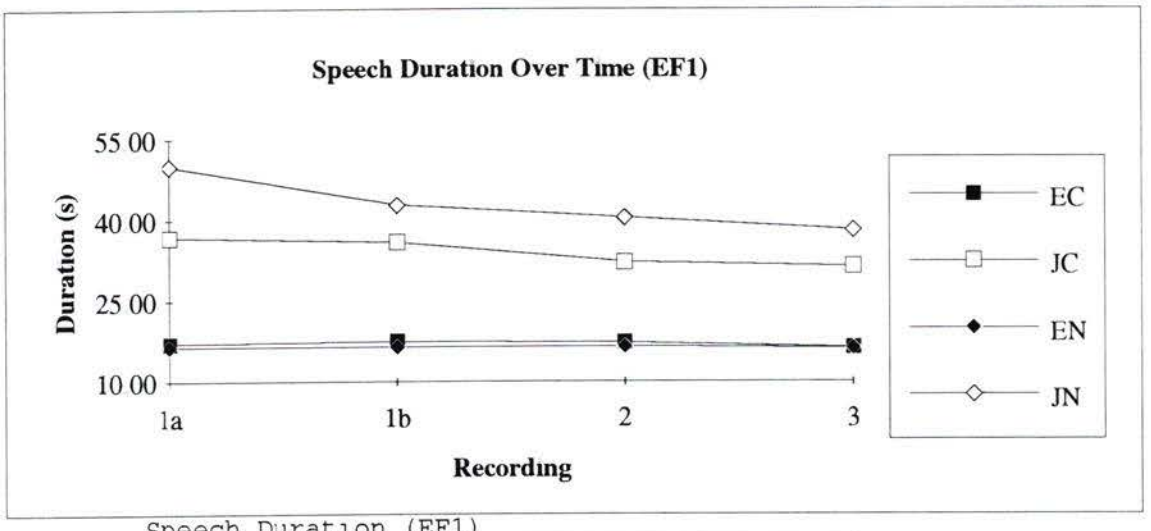


Speech Duration (News article)

	EN	JN
EF1	16 42	40 44
EF2	17 84	45 83
EF3	14 69	38 26
JF1	18 69	25 28
JF2	18 62	28 75
JF3	21 82	30 06
EM1	14 99	43 51
EM2	13 67	31 77
EM3	15 29	46 08
JM1	18 04	24 86
JM2	24 33	31 13
JM3	20 10	25 96

t=5 71 (df=11, t[5%]=2 201)

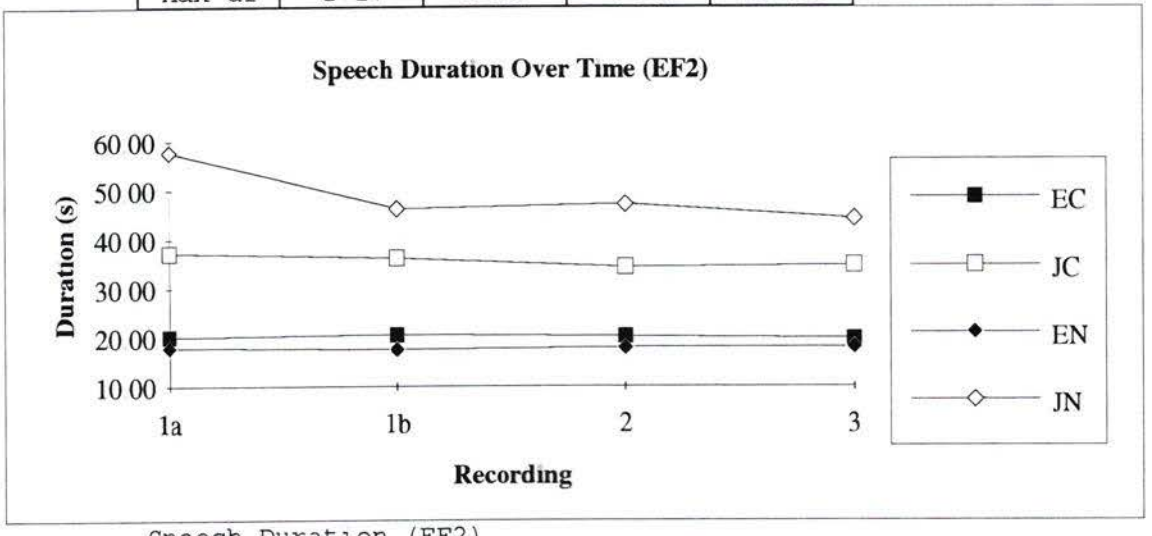
Chart 6 4



Speech Duration (EF1)

	EC	JC	EN	JN
1a	17 08	36 84	16 57	50 01
1b	17 47	35 88	16 52	42 82
2	17 30	32 15	16 51	40 41
3	16 30	31 31	16 23	38 09
Average	17 04	34 05	16 46	42 83
Max df	1 17	5 53	0 34	11 92

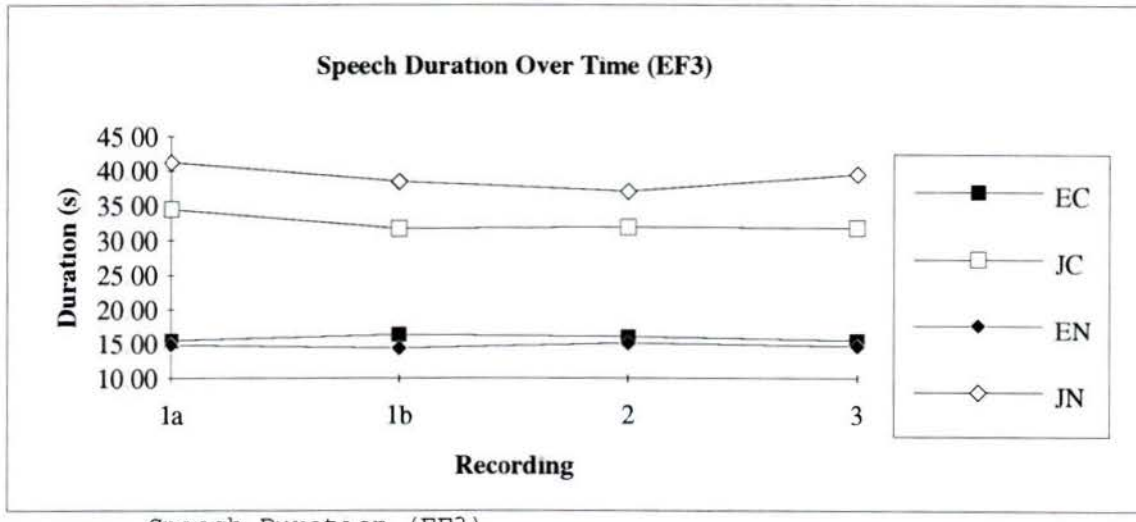
Chart 7 1



Speech Duration (EF2)

	EC	JC	EN	JN
1a	20 05	37 80	17 96	57 77
1b	20 62	36 14	17 59	46 18
2	20 15	34 30	17 87	47 14
3	19 80	34 71	18 05	44 16
Average	20 16	35 74	17 87	48 81
Max df	0 82	3 50	0 46	13 61

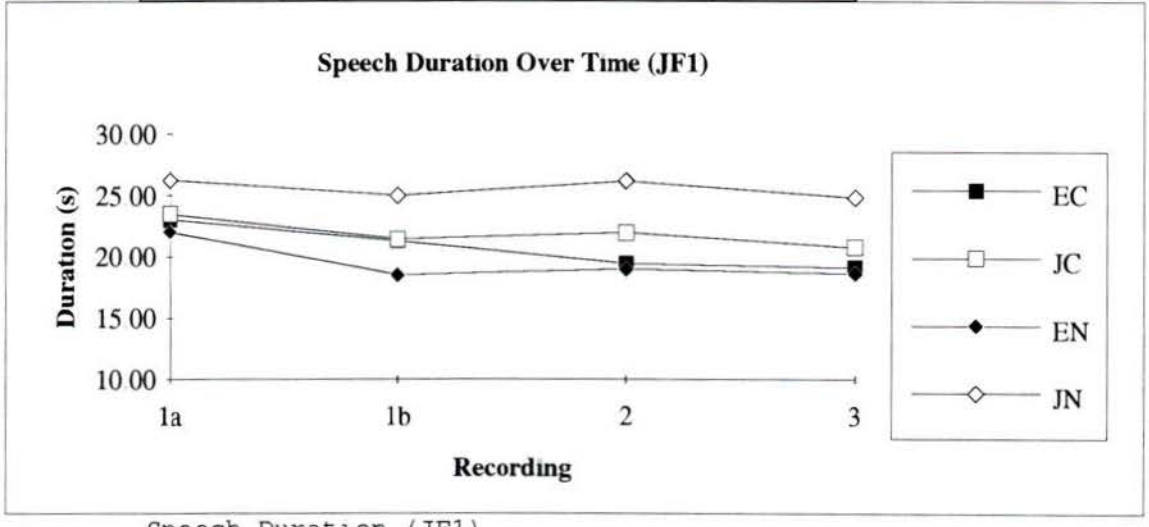
Chart 7 2



Speech Duration (EF3)

	EC	JC	EN	JN
1a	15 48	34 34	14 85	41 23
1b	16 26	31 57	14 37	38 38
2	15 97	31 88	15 08	36 95
3	15 45	31 70	14 62	39 45
Average	15 79	32 37	14 73	39 00
Max df	0 81	2 77	0 71	4 28

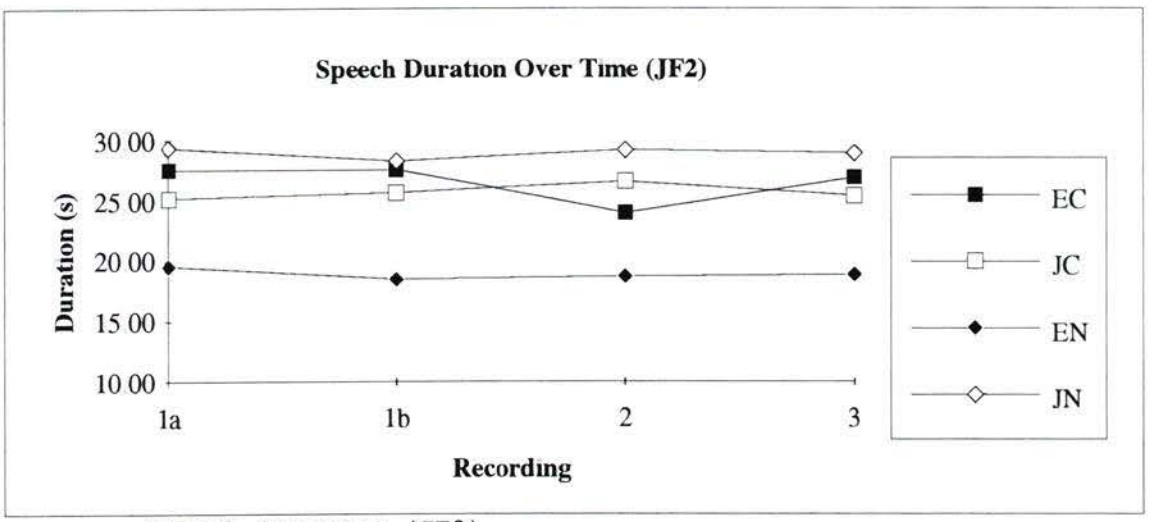
Chart 7 3



Speech Duration (JF1)

	EC	JC	EN	JN
1a	23 02	23 45	22 02	26 23
1b	21 27	21 45	18 51	24 96
2	19 41	21 96	18 97	26 11
3	19 08	20 74	18 59	24 78
Average	20 70	21 90	19 52	25 52
Max df	3 94	2 71	3 51	1 45

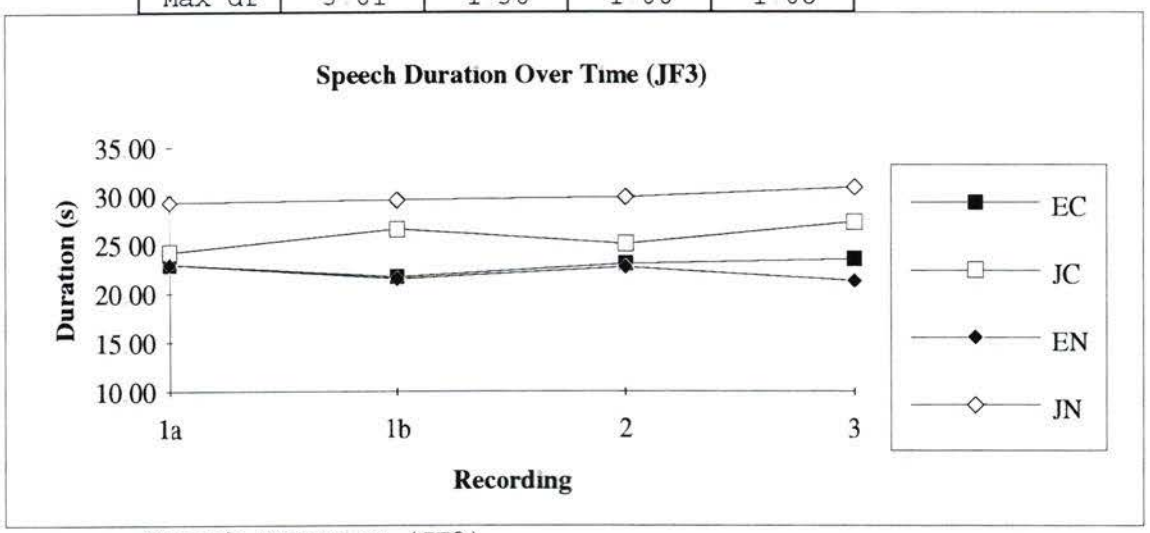
Chart 7 4



Speech Duration (JF2)

	EC	JC	EN	JN
1a	27 56	25 18	19 48	29 32
1b	27 54	25 63	18 42	28 24
2	23 95	26 54	18 65	29 14
3	26 84	25 36	18 80	28 87
Average	26 47	25 68	18 84	28 89
Max df	3 61	1 36	1 06	1 08

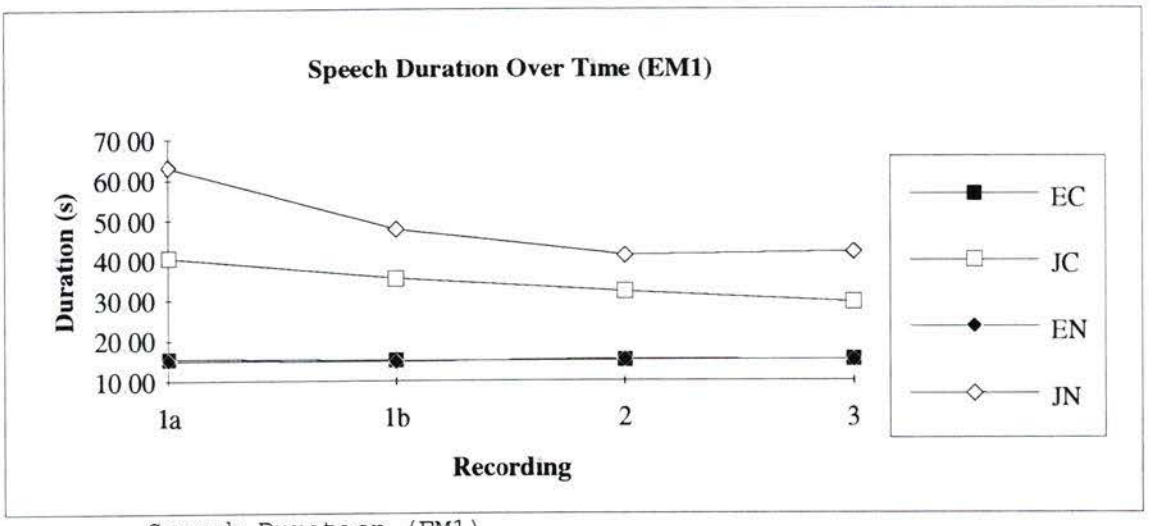
Chart 7 5



Speech Duration (JF3)

	EC	JC	EN	JN
1a	22 96	24 13	22 96	29 30
1b	21 70	26 51	21 46	29 53
2	23 03	25 02	22 72	29 81
3	23 46	27 28	21 29	30 83
Average	22 79	25 74	22 11	29 87
Max df	1 76	3 15	1 67	1 53

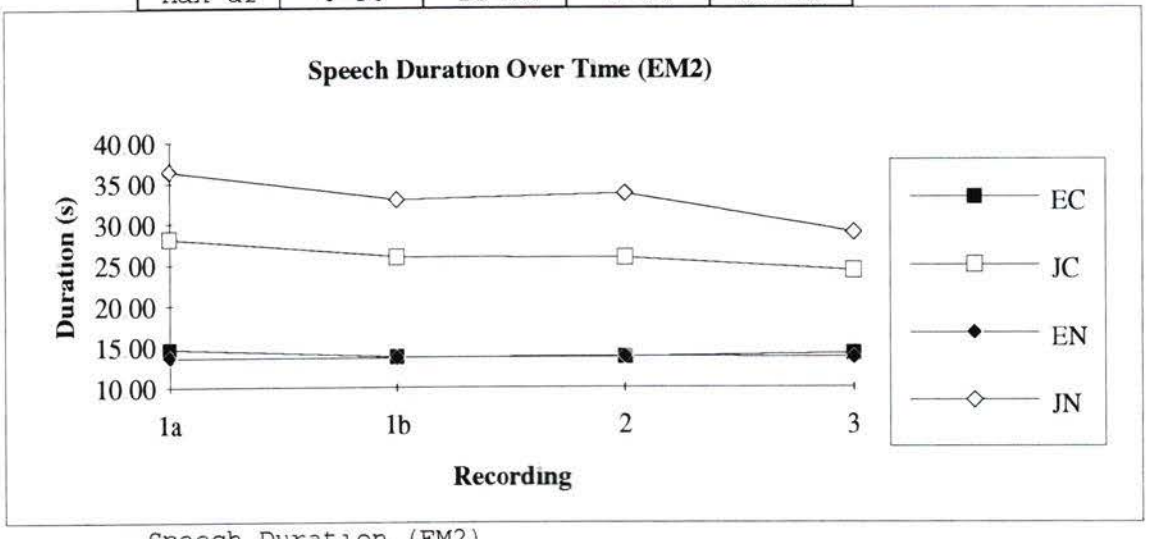
Chart 7 6



Speech Duration (EM1)

	EC	JC	EN	JN
1a	15 58	40 37	15 09	62 99
1b	15 08	35 32	14 63	47 62
2	15 09	31 99	15 32	41 01
3	15 21	29 31	15 02	41 89
Average	15 24	34 25	15 02	48 38
Max df	0 50	11 06	0 69	21 98

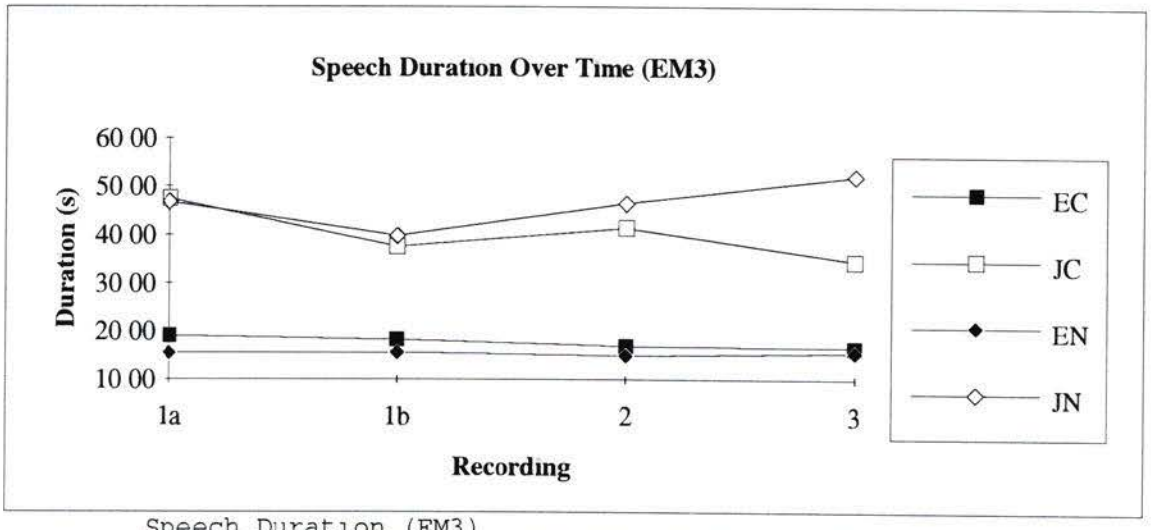
Chart 7 7



Speech Duration (EM2)

	EC	JC	EN	JN
1a	14 63	28 14	13 63	36 44
1b	13 71	25 91	13 62	32 89
2	13 75	25 78	13 77	33 64
3	14 13	24 16	13 61	28 78
Average	14 06	26 00	13 66	32 94
Max df	0 92	3 98	0 16	7 66

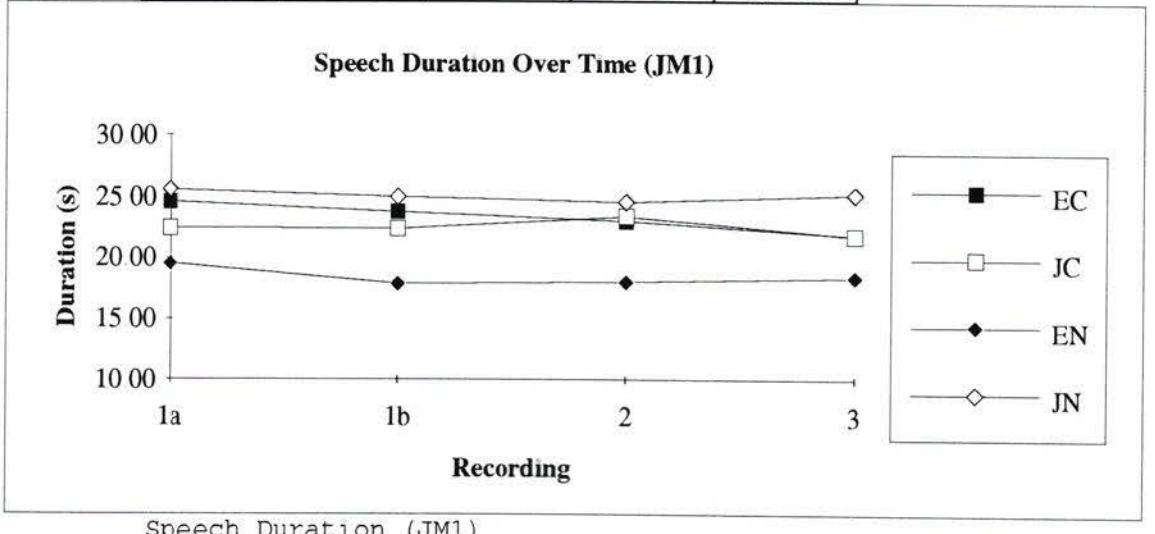
Chart 7 8



Speech Duration (EM3)

	EC	JC	EN	JN
1a	18 96	47 40	15 33	46 65
1b	18 13	37 58	15 51	39 76
2	16 88	41 31	14 88	46 43
3	16 53	34 60	15 49	52 06
Average	17 63	40 22	15 30	46 23
Max df	2 43	12 80	0 63	12 30

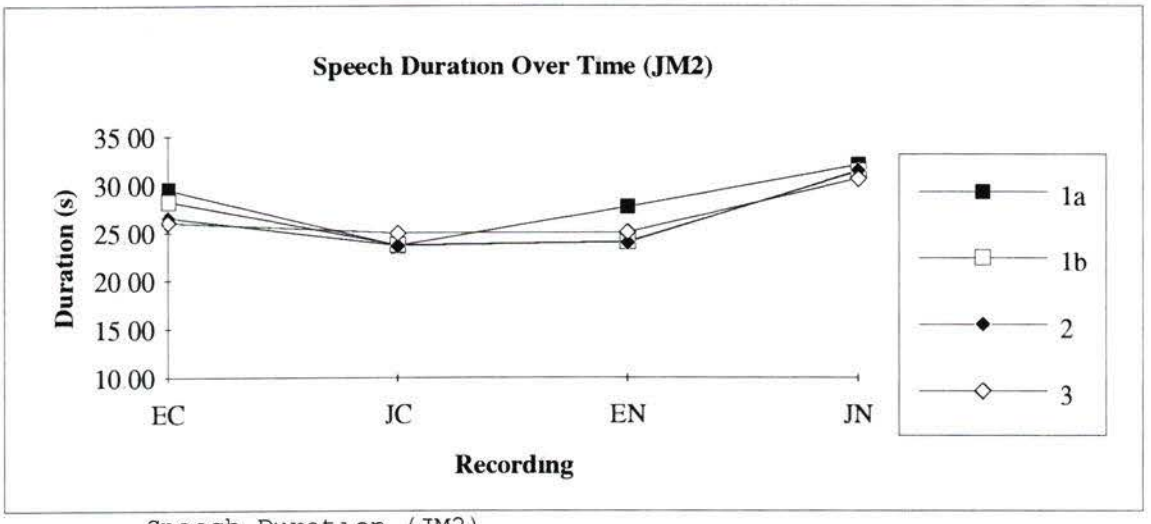
Chart 7 9



Speech Duration (JM1)

	EC	JC	EN	JN
1a	24 57	22 43	19 52	25 54
1b	23 72	22 31	17 79	24 94
2	22 98	23 35	17 97	24 50
3	21 82	21 76	18 36	25 13
Average	23 27	22 46	18 41	25 03
Max df	2 75	1 59	1 73	1 04

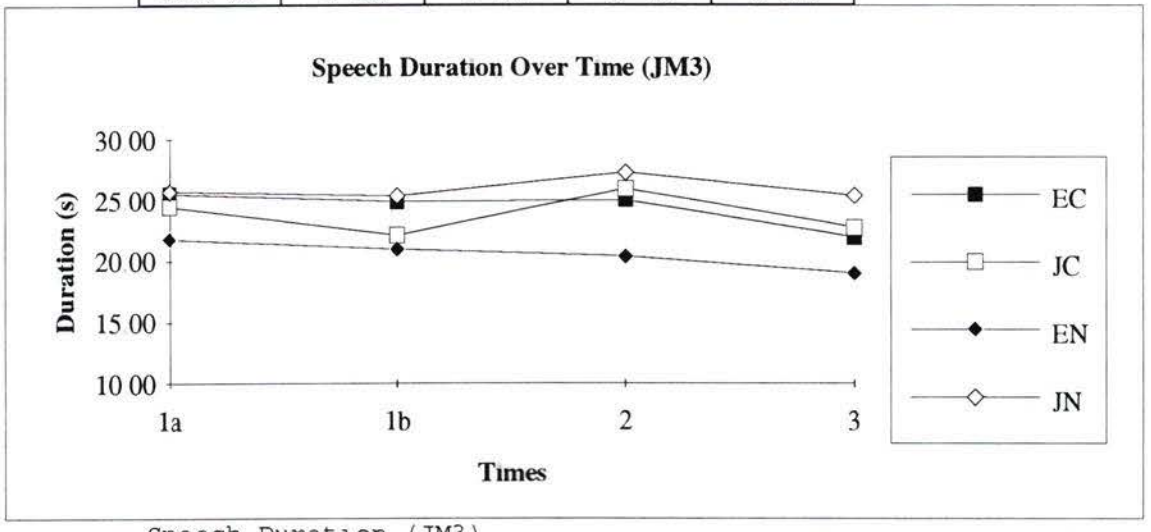
Chart 7 10



Speech Duration (JM2)

	EC	JC	EN	JN
1a	29 49	23 64	27 66	32 03
1b	28 25	23 69	24 00	31 36
2	26 55	23 61	23 94	31 40
3	26 03	24 93	25 05	30 64
Average	27 58	23 97	25 16	31 36
Max df	3 46	1 32	3 72	1 39

Chart 7 11



Speech Duration (JM3)

	EC	JC	EN	JN
1a	25 48	24 43	21 77	25 68
1b	24 84	22 09	20 95	25 32
2	24 94	25 91	20 34	27 22
3	21 93	22 70	19 00	25 33
Average	24 30	23 78	20 52	25 89
Max df	3 55	3 82	2 77	1 90

Chart 7 12

Summary of Personal Information (Physical)

Table 1 1

Subjects	Age	Height (Cm)	Weight (Kg)
EF1	24	160 00	52 20
EF2	23	163 00	63 50
EF3	22	170 00	60 00
Mean	23	164 33	58 57
JF1	23	165 00	68 00
JF2	27	162 00	50 00
JF3	29	165 00	50 00
Mean	26	164 00	56 00
EM1	26	180 00	71 60
EM2	21	190 00	74 80
EM3	30	180 00	83 90
Mean	26	183 33	76 77
JM1	25	177 00	72 00
JM2	40	173 00	63 00
JM3	20	165 00	70 00
Mean	28	171 67	68 33

T-Values for SFFs

The shaded numbers are statistically not significant
(df=5, t[5%]=2 571, df=2, t[5%]=4 303)

English Children's Story

Table 1 2

	EF (3)	JF (3)	EM (3)	JM (3)
Height	5 26		9 81	
	3 73	3 80	5 82	7 12
Weight	13 35		5 79	
	9 35	8 80	4.00	3.43

Japanese Children's Story

	EF (3)	JF (3)	EM (3)	JM (3)
Height	6 96		9 06	
	5 10	3.93	5 20	7 67
Weight	14 42		6 05	
	11 81	7 75	3 47	4 32

English News Article

	EF (3)	JF (3)	EM (3)	JM (3)
Height	5 28		7 82	
	4 70	3.57	5 25	4 97
Weight	13 56		5 19	
	11 92	8 46	3 73	3 08

Japanese News Article

	EF (3)	JF (3)	EM (3)	JM (3)
Height	6 47		8 17	
	5 12	3.61	5 27	5 58
Weight	14 21		6 29	
	11 60	7 75	4.14	3.96

Summary of Personal Information (Social)

Table 2

Subjects	Age	Birth Place	How long studying?	How long staying/ed?
EF1	24	B C	6 years	2 years
EF2	23	B C	4 years	2 years
EF3	22	B C	4 years	1 year
Mean	23		4 7 years	1 7 years
JF1	23	Tokyo	over 10 years	4 years
JF2	27	Nagoya	over 10 years	2 years
JF3	29	Shizuoka	over 10 years	1 year
Mean	26		over 10 years	2 3 years
EM1	26	Alberta	7 years	1 year
EM2	21	B C	3 years	1 year
EM3	30	Nova Scotia	5 years	2 year
Mean	26		5 years	1 3 years
JM1	25	Tokyo	over 10 years	2 years
JM2	40	Nagano	over 10 years	9 years
JM3	20	Nagano	8 years	2 years
Mean	28		9 3 years	4 3 years

Appendix B

SFF Worksheet EF1 (*1a, 1b, 2, & 3*) 105
SFF Worksheet EF2 (*1a, 1b, 2, & 3*) 109
SFF Worksheet EF3 (*1a, 1b, 2, & 3*) 113

SFF Worksheet EM1 (*1a, 1b, 2, & 3*) 117
SFF Worksheet EM2 (*1a, 1b, 2, & 3*) 121
SFF Worksheet EM3 (*1a, 1b, 2, & 3*) 125

SFF Worksheet JF1 (*1a, 1b, 2, & 3*) 129
SFF Worksheet JF2 (*1a, 1b, 2, & 3*) 133
SFF Worksheet JF3 (*1a, 1b, 2, & 3*) 137

SFF Worksheet JM1 (*1a, 1b, 2, & 3*) 141
SFF Worksheet JM2 (*1a, 1b, 2, & 3*) 145
SFF Worksheet JM3 (*1a, 1b, 2, & 3*) 149

SFF WORKSHEET

Subject : EF1, Recording 1a

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	178 00	363 00	252 88	40 14	1 99	185 00
JC2	152 00	307 00	226 02	26 02	3 53	155 00
JC3	165 00	363 00	249 76	36 09	4 66	198 00
JC4	183 00	363 00	253 10	38 16	5 82	180 00
JC5	153 00	303 00	231 03	30 19	3 96	150 00
JC6	165 00	327 00	265 78	37 31	1 01	162 00
JC7	183 00	317 00	243 22	20 81	5 84	134 00
JC8	181 00	322 00	250 70	32 85	5 28	141 00
JC9	173 00	327 00	240 73	32 75	4 76	154 00
MEAN	170 33	332 44	**245 91**	32 70	**36.84**	162 11

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	120 00	350 00	268 58	31 25	6 81	230 00
JN2	176 00	338 00	261 97	30 78	5 35	162 00
JN3	198 00	333 00	252 47	23 12	7 02	135 00
JN4	198 00	317 00	246 68	24 30	10 01	119 00
JN5	198 00	344 00	261 39	31 41	5 93	146 00
JN6	196 00	322 00	251 55	27 94	7 07	126 00
JN7	169 00	338 00	255 07	35 47	7 81	169 00
MEAN	179 29	334 57	**256 82**	29 18	**50 01**	155 29

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	215 00	408 00	288 72	58 44	1 89	193 00
EC2	162 00	307 00	230 87	21 60	2 84	145 00
EC3	172 00	400 00	255 57	50 75	1 63	228 00
EC4	168 00	307 00	248 87	37 79	1 53	139 00
EC5	176 00	289 00	223 22	24 43	1 61	113 00
EC6	188 00	408 00	289 26	54 12	1 81	220 00
EC7	161 00	317 00	231 52	33 12	1 74	156 00
EC8	200 00	363 00	252 26	46 49	1 95	163 00
EC9	162 00	392 00	242 35	56 49	2 08	230 00
MEAN	178 22	354 56	**251.40**	42 58	**17 08**	176 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	194 00	425 00	272 67	53 32	2 90	231 00
EN2	165 00	259 00	213 37	17 31	1 07	94 00
EN3	217 00	377 00	281 46	41 02	1 83	160 00
EN4	147 00	281 00	229 27	23 68	2 19	134 00
EN5	198 00	363 00	276 00	33 49	2 21	165 00
EN6	185 00	277 00	235 27	19 82	2 30	92 00
EN7	173 00	322 00	242 72	32 56	4 09	149 00
MEAN	182 71	329 14	**250.11**	31 60	**16 57**	146 43

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EF1, Recording 1b

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	176 00	370 00	263 68	42 36	2 11	194 00
JC2	168 00	327 00	242 23	41 45	3 61	159 00
JC3	169 00	370 00	251 88	49 09	4 66	201 00
JC4	183 00	384 00	253 66	40 03	5 22	201 00
JC5	150 00	317 00	224 18	34 54	3 75	167 00
JC6	175 00	333 00	263 73	45 00	0 94	158 00
JC7	173 00	350 00	265 29	40 68	5 68	177 00
JC8	169 00	370 00	268 94	48 04	4 81	201 00
JC9	176 00	350 00	252 63	36 43	5 10	174 00
MEAN	171 00	352 33	**254.02**	41 96	**35.88**	181 33

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	180 00	357 00	272 66	38 47	5 79	177 00
JN2	192 00	344 00	261 16	29 12	5 02	152 00
JN3	175 00	344 00	254 70	32 75	6 14	169 00
JN4	151 00	350 00	259 30	30 54	8 29	199 00
JN5	190 00	363 00	273 60	44 39	5 73	173 00
JN6	183 00	327 00	263 64	33 89	5 24	144 00
JN7	194 00	357 00	263 84	41 86	6 62	163 00
MEAN	180 71	348 86	**264 13**	35 86	**42 82**	168 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	224 00	454 00	303 37	65 07	1 92	230 00
EC2	185 00	363 00	238 16	27 47	2 39	178 00
EC3	158 00	400 00	250 95	53 62	1 69	242 00
EC4	163 00	350 00	277 57	49 64	1 71	187 00
EC5	169 00	312 00	238 24	31 29	1 74	143 00
EC6	200 00	454 00	315 20	57 53	1 71	254 00
EC7	192 00	298 00	235 32	27 21	1 74	106 00
EC8	194 00	363 00	268 05	41 66	2 09	169 00
EC9	157 00	384 00	271 78	59 22	2 46	227 00
MEAN	182 44	375 33	**266 52**	45 86	**17.47**	192 89

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	204 00	377 00	270 27	43 40	2 91	173 00
EN2	172 00	285 00	224 63	23 16	1 08	113 00
EN3	202 00	392 00	288 71	45 98	1 92	190 00
EN4	183 00	277 00	225 20	17 93	2 12	94 00
EN5	186 00	363 00	283 40	42 61	2 04	177 00
EN6	183 00	277 00	226 44	17 15	2 19	94 00
EN7	176 00	327 00	253 39	34 07	4 26	151 00
MEAN	186 57	328 29	**253.15**	32 04	**16 52**	141 71

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EF1, Recording 2

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	194 00	363 00	276 72	42 67	2 08	169 00
JC2	176 00	322 00	247 72	34 62	3 46	146 00
JC3	176 00	357 00	260 85	33 99	4 22	181 00
JC4	206 00	377 00	276 05	41 27	4 69	171 00
JC5	176 00	344 00	252 73	38 22	3 90	168 00
JC6	198 00	363 00	277 44	58 94	0 95	165 00
JC7	181 00	370 00	292 61	50 19	4 43	189 00
JC8	186 00	357 00	264 75	42 31	4 08	171 00
JC9	186 00	392 00	264 33	42 87	4 34	206 00
MEAN	186 56	360 56	**268 13**	42 79	**32 15**	174 00

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	202 00	384 00	280 10	35 99	5 54	182 00
JN2	206 00	350 00	268 12	31 44	5 48	144 00
JN3	208 00	370 00	264 31	31 09	5 78	162 00
JN4	204 00	370 00	265 72	33 03	7 58	166 00
JN5	198 00	377 00	283 90	42 35	4 89	179 00
JN6	194 00	344 00	259 78	34 87	4 89	150 00
JN7	202 00	357 00	265 96	41 37	6 26	155 00
MEAN	202 00	364 57	**269 70**	35 73	**40 41**	162 57

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	232 00	454 00	305 15	54 84	1 90	222 00
EC2	200 00	307 00	244 41	19 14	2 33	107 00
EC3	183 00	350 00	272 71	40 06	1 57	167 00
EC4	185 00	363 00	287 17	44 82	1 55	178 00
EC5	194 00	307 00	255 20	25 02	1 83	113 00
EC6	229 00	392 00	278 25	46 25	2 01	163 00
EC7	202 00	344 00	247 14	32 48	1 78	142 00
EC8	204 00	344 00	254 86	34 94	2 19	140 00
EC9	196 00	384 00	264 28	52 21	2 13	188 00
MEAN	202 78	360 56	**267 69**	38 86	**17 30**	157 78

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	210 00	400 00	276 03	49 95	3 13	190 00
EN2	170 00	259 00	223 41	18 64	1 06	89 00
EN3	227 00	400 00	307 77	45 99	1 86	173 00
EN4	194 00	303 00	245 58	20 71	2 22	109 00
EN5	200 00	338 00	281 13	31 60	2 01	138 00
EN6	200 00	289 00	238 82	19 26	2 24	89 00
EN7	200 00	327 00	259 84	31 06	4 00	127 00
MEAN	200 14	330 86	**261 80**	31 03	**16 51**	130 71

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EF1, Recording 3

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	194 00	363 00	270 48	43 17	1 83	169 00
JC2	165 00	350 00	247 26	46 05	3 36	185 00
JC3	169 00	363 00	259 08	40 29	4 01	194 00
JC4	194 00	370 00	263 88	44 30	4 40	176 00
JC5	170 00	357 00	245 05	39 57	3 31	187 00
JC6	173 00	344 00	273 27	49 80	0 94	171 00
JC7	166 00	357 00	277 54	45 32	4 52	191 00
JC8	194 00	357 00	258 71	42 03	4 37	163 00
JC9	172 00	350 00	244 47	38 84	4 59	178 00
MEAN	177 44	356 78	**259 97**	43 26	**31 31**	179 33

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	183 00	344 00	270 79	38 26	5 44	161 00
JN2	194 00	357 00	276 06	35 99	4 34	163 00
JN3	186 00	370 00	267 39	35 12	5 58	184 00
JN4	176 00	344 00	260 32	34 94	7 70	168 00
JN5	190 00	377 00	275 95	40 80	4 80	187 00
JN6	175 00	327 00	261 23	34 14	4 56	152 00
JN7	188 00	357 00	253 43	37 52	5 68	169 00
MEAN	184 57	353 71	**266 45**	36 68	**38 09**	169 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	229 00	454 00	301 87	51 43	1 85	225 00
EC2	186 00	285 00	235 46	15 72	2 17	99 00
EC3	198 00	327 00	274 43	32 42	1 49	129 00
EC4	190 00	370 00	283 78	45 99	1 47	180 00
EC5	188 00	312 00	249 47	27 26	1 72	124 00
EC6	180 00	400 00	297 65	56 96	1 69	220 00
EC7	198 00	317 00	248 01	30 09	1 76	119 00
EC8	200 00	344 00	256 27	36 78	2 06	144 00
EC9	175 00	370 00	249 82	46 89	2 09	195 00
MEAN	193 78	353 22	**266.31**	38 17	**16 30**	159 44

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	206 00	408 00	287 58	56 24	2 86	202 00
EN2	180 00	266 00	226 59	17 29	1 05	86 00
EN3	212 00	400 00	309 62	48 29	1 79	188 00
EN4	192 00	307 00	246 15	21 91	2 27	115 00
EN5	222 00	416 00	299 50	55 05	2 08	194 00
EN6	188 00	303 00	232 98	30 32	2 13	115 00
EN7	204 00	344 00	257 57	32 57	4 06	140 00
MEAN	200 57	349 14	**265.71**	37 38	**16 23**	148 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EF2 , Recording 1a

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	175 00	312 00	227 17	31 15	1 75	137 00
JC2	168 00	289 00	213 00	29 61	3 70	121 00
JC3	145 00	344 00	220 81	34 40	4 74	199 00
JC4	163 00	370 00	221 69	31 66	5 33	207 00
JC5	136 00	263 00	196 90	23 47	4 10	127 00
JC6	185 00	289 00	239 75	26 51	0 79	104 00
JC7	168 00	344 00	231 60	42 54	5 42	176 00
JC8	163 00	392 00	233 82	42 08	5 64	229 00
JC9	166 00	392 00	235 41	40 55	6 35	226 00
MEAN	163 22	332 78	**224 46**	33 55	**37 80**	169 56

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	165 00	307 00	229 61	37 30	6 60	142 00
JN2	168 00	357 00	248 38	46 20	7 35	189 00
JN3	158 00	298 00	231 94	30 86	10 23	140 00
JN4	151 00	303 00	225 42	31 11	11 35	152 00
JN5	172 00	327 00	240 44	39 40	5 83	155 00
JN6	175 00	338 00	228 17	29 57	7 60	163 00
JN7	148 00	294 00	219 58	26 60	8 81	146 00
MEAN	162 43	317 71	**231 93**	34 43	**57 77**	155 29

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	158 00	434 00	263 49	78 99	2 36	276 00
EC2	170 00	333 00	231 51	45 62	2 65	163 00
EC3	172 00	454 00	232 64	58 87	1 63	282 00
EC4	152 00	384 00	244 51	61 44	1 94	232 00
EC5	156 00	307 00	205 68	34 71	2 36	151 00
EC6	152 00	425 00	264 02	67 65	1 77	273 00
EC7	170 00	303 00	205 03	22 80	2 38	133 00
EC8	155 00	243 00	190 18	22 00	2 39	88 00
EC9	143 00	357 00	230 55	56 63	2 57	214 00
MEAN	158 67	360 00	**229.73**	49 86	**20 05**	201 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	175 00	363 00	256 84	56 44	3 33	188 00
EN2	168 00	263 00	199 49	19 39	1 10	95 00
EN3	163 00	454 00	267 66	65 66	2 04	291 00
EN4	170 00	344 00	231 92	44 86	2 32	174 00
EN5	170 00	357 00	255 86	56 89	2 46	187 00
EN6	162 00	281 00	217 34	34 62	2 38	119 00
EN7	162 00	377 00	232 27	44 05	4 34	215 00
MEAN	167 14	348 43	**237.34**	45 99	**17 96**	181 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EF2 , Recording 1b

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	185 00	363 00	263 17	53 13	2 35	178 00
JC2	152 00	289 00	231 13	33 67	4 39	137 00
JC3	175 00	377 00	247 34	44 41	5 23	202 00
JC4	173 00	357 00	230 83	34 85	5 04	184 00
JC5	168 00	307 00	225 84	31 97	3 97	139 00
JC6	167 00	307 00	227 52	38 87	0 95	140 00
JC7	153 00	425 00	253 15	56 39	4 62	272 00
JC8	123 00	338 00	232 96	42 54	4 45	215 00
JC9	160 00	377 00	229 97	37 47	5 14	217 00
MEAN	161 78	348 89	**237 99**	41 48	**36.14**	187 11

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	155 00	312 00	248 30	40 28	5 82	157 00
JN2	157 00	377 00	247 88	51 17	5 69	220 00
JN3	162 00	307 00	227 33	32 07	6 61	145 00
JN4	153 00	370 00	235 24	42 82	9 63	217 00
JN5	173 00	338 00	237 47	37 38	5 45	165 00
JN6	158 00	307 00	205 75	23 87	6 32	149 00
JN7	152 00	363 00	228 33	42 74	6 65	211 00
MEAN	158 57	339 14	**232 90**	38 62	**46 18**	180 57

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	176 00	454 00	279 18	78 08	2 49	278 00
EC2	173 00	344 00	233 96	35 15	2 40	171 00
EC3	176 00	454 00	299 71	80 79	2 05	278 00
EC4	176 00	454 00	242 72	69 62	1 94	278 00
EC5	165 00	298 00	223 36	33 90	2 07	133 00
EC6	170 00	416 00	252 95	57 90	2 20	246 00
EC7	163 00	416 00	245 56	62 92	1 98	253 00
EC8	169 00	444 00	235 89	73 47	2 52	275 00
EC9	168 00	322 00	233 21	47 35	2 97	154 00
MEAN	170 67	400 22	**249.62**	59 91	**20 62**	229 56

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	176 00	384 00	251 62	53 06	2 61	208 00
EN2	151 00	289 00	211 45	37 60	1 18	138 00
EN3	178 00	454 00	277 18	71 94	1 99	276 00
EN4	165 00	363 00	228 28	47 29	2 37	198 00
EN5	162 00	350 00	257 51	51 93	2 61	188 00
EN6	168 00	377 00	222 14	42 44	2 37	209 00
EN7	170 00	425 00	248 54	59 04	4 45	255 00
MEAN	167 14	377 43	**242 39**	51 90	**17 59**	210 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EF2 , Recording 2

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	165 00	344 00	233 09	47 38	2 22	179 00
JC2	153 00	317 00	219 14	38 41	4 30	164 00
JC3	156 00	384 00	225 34	41 48	4 64	228 00
JC4	160 00	370 00	226 75	38 18	4 65	210 00
JC5	151 00	281 00	213 07	26 98	4 11	130 00
JC6	148 00	266 00	214 74	25 97	0 90	118 00
JC7	160 00	357 00	223 90	45 87	4 33	197 00
JC8	163 00	370 00	228 42	49 49	4 15	207 00
JC9	168 00	338 00	233 30	41 13	4 99	170 00
MEAN	158 22	336 33	**224 19**	39 43	**34 30**	178 11

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	161 00	392 00	255 30	60 25	6 16	231 00
JN2	162 00	363 00	241 86	43 32	5 67	201 00
JN3	162 00	338 00	225 24	39 21	7 38	176 00
JN4	156 00	350 00	240 80	40 79	9 96	194 00
JN5	170 00	333 00	243 03	42 83	5 14	163 00
JN6	155 00	327 00	235 80	36 78	5 71	172 00
JN7	144 00	338 00	224 37	40 11	7 14	194 00
MEAN	158 57	348 71	**238 06**	43 33	**47 14**	190 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	158 00	454 00	267 39	88 86	2 49	296 00
EC2	163 00	370 00	237 40	48 29	2 65	207 00
EC3	168 00	434 00	268 32	66 39	1 85	266 00
EC4	183 00	434 00	269 44	69 48	1 76	251 00
EC5	139 00	273 00	215 61	29 14	2 00	134 00
EC6	166 00	444 00	261 28	71 23	1 98	278 00
EC7	153 00	363 00	234 40	51 80	2 02	210 00
EC8	158 00	454 00	239 19	91 82	2 64	296 00
EC9	138 00	317 00	230 68	47 04	2 75	179 00
MEAN	158 44	393 67	**247.08**	62 67	**20.15**	235 22

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	169 00	444 00	283 93	68 35	3 44	275 00
EN2	166 00	253 00	205 89	26 72	1 14	87 00
EN3	170 00	392 00	300 49	54 30	2 02	222 00
EN4	158 00	307 00	219 72	32 53	2 34	149 00
EN5	173 00	370 00	275 24	50 96	2 28	197 00
EN6	170 00	317 00	224 71	35 08	2 34	147 00
EN7	140 00	363 00	247 34	55 70	4 31	223 00
MEAN	163 71	349 43	**251.05**	46 23	**17 87**	185 71

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EF2, Recording 3

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	166 00	327 00	224 37	34 15	2 03	161 00
JC2	153 00	307 00	199 03	33 75	4 23	154 00
JC3	144 00	322 00	211 02	37 36	4 72	178 00
JC4	158 00	333 00	229 02	34 61	5 04	175 00
JC5	151 00	281 00	203 06	22 36	4 11	130 00
JC6	141 00	259 00	212 72	29 11	0 92	118 00
JC7	149 00	363 00	211 59	44 55	4 51	214 00
JC8	139 00	338 00	221 80	37 12	4 19	199 00
JC9	148 00	294 00	207 89	30 15	4 98	146 00
MEAN	149 89	313 78	**213 39**	33 68	**34.71**	163 89

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	151 00	307 00	225 55	38 86	6 06	156 00
JN2	161 00	294 00	224 50	33 69	5 20	133 00
JN3	163 00	298 00	212 22	31 34	6 33	135 00
JN4	137 00	327 00	219 39	33 59	9 06	190 00
JN5	158 00	307 00	234 83	39 30	5 55	149 00
JN6	155 00	322 00	221 93	37 32	5 22	167 00
JN7	140 00	289 00	210 58	32 61	6 76	149 00
MEAN	152 14	306 29	**221 29**	35 24	**44 16**	154 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	166 00	416 00	266 24	77 06	2 19	250 00
EC2	162 00	363 00	221 02	49 00	2 58	201 00
EC3	162 00	303 00	221 84	38 35	1 71	141 00
EC4	157 00	344 00	228 33	58 37	1 76	187 00
EC5	152 00	235 00	198 25	21 06	2 15	83 00
EC6	162 00	317 00	220 42	41 57	2 09	155 00
EC7	153 00	344 00	206 14	42 33	2 13	191 00
EC8	141 00	384 00	212 62	66 25	2 54	243 00
EC9	136 00	285 00	208 84	40 17	2 65	149 00
MEAN	154 56	332 33	**220.41**	48 24	**19 80**	177 78

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	163 00	454 00	279 72	83 12	3 22	291 00
EN2	148 00	240 00	192 15	28 87	1 21	92 00
EN3	172 00	363 00	254 13	53 72	2 20	191 00
EN4	151 00	312 00	227 25	46 92	2 35	161 00
EN5	161 00	363 00	248 80	58 02	2 43	202 00
EN6	149 00	285 00	208 24	26 29	2 34	136 00
EN7	149 00	338 00	249 42	46 09	4 31	189 00
MEAN	156 14	336 43	**237.10**	49 00	**18 05**	180 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EF3, Recording 1a

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	161 00	322 00	226 52	45 68	2 03	161 00
JC2	143 00	263 00	189 13	26 97	3 49	120 00
JC3	133 00	370 00	217 69	54 61	4 06	237 00
JC4	149 00	377 00	207 65	50 78	4 36	228 00
JC5	126 00	317 00	192 35	31 47	3 60	191 00
JC6	151 00	338 00	232 34	58 12	0 91	187 00
JC7	147 00	303 00	198 87	39 60	5 33	156 00
JC8	143 00	344 00	218 64	52 19	5 33	201 00
JC9	152 00	350 00	214 83	43 07	5 24	198 00
MEAN	145 00	331 56	**210 89**	44 72	**34 34**	186 56

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	158 00	344 00	233 65	39 38	4 88	186 00
JN2	158 00	273 00	213 03	31 80	4 45	115 00
JN3	156 00	294 00	212 36	30 89	6 32	138 00
JN4	152 00	317 00	219 67	38 20	7 34	165 00
JN5	157 00	327 00	240 13	46 90	4 88	170 00
JN6	162 00	273 00	213 82	30 29	6 69	111 00
JN7	156 00	312 00	220 65	41 35	6 67	156 00
MEAN	157 00	305 71	221 90	36 97	**41 23**	148 71

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	161 00	377 00	235 70	56 09	1 68	216 00
EC2	136 00	238 00	177 44	17 66	2 15	102 00
EC3	170 00	357 00	251 59	57 21	1 52	187 00
EC4	165 00	317 00	229 67	47 29	1 43	152 00
EC5	136 00	224 00	184 06	18 21	1 55	88 00
EC6	149 00	370 00	235 86	57 38	1 62	221 00
EC7	147 00	307 00	206 06	35 94	1 63	160 00
EC8	153 00	408 00	232 67	73 84	1 95	255 00
EC9	137 00	246 00	188 42	27 05	1 96	109 00
MEAN	150 44	316 00	**215.72**	43 41	**15 48**	165 56

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	170 00	338 00	223 79	43 76	2 57	168 00
EN2	156 00	104 00	176 92	10 99	1 01	-52 00
EN3	178 00	357 00	246 39	44 79	1 85	179 00
EN4	160 00	240 00	192 68	20 34	1 99	80 00
EN5	170 00	344 00	239 95	46 80	1 92	174 00
EN6	161 00	238 00	196 86	20 27	1 90	77 00
EN7	152 00	294 00	214 48	40 02	3 60	142 00
MEAN	163 86	273 57	**213.01**	32 42	**14 85**	109 71

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EF3, Recording 1b

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	161 00	322 00	238 74	52 74	1 93	161 00
JC2	150 00	289 00	193 61	33 16	3 32	139 00
JC3	158 00	370 00	221 62	50 62	3 98	212 00
JC4	151 00	350 00	223 10	57 72	4 64	199 00
JC5	129 00	270 00	187 47	26 70	3 57	141 00
JC6	165 00	344 00	249 76	61 14	0 86	179 00
JC7	153 00	322 00	214 24	51 25	4 51	169 00
JC8	148 00	344 00	221 81	43 27	3 81	196 00
JC9	153 00	392 00	223 40	45 80	4 96	239 00
MEAN	152 00	333 67	**219 31**	46 93	**31.57**	181 67

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	158 00	312 00	242 78	37 61	5 09	154 00
JN2	152 00	294 00	218 66	38 40	4 73	142 00
JN3	152 00	289 00	211 46	29 39	5 58	137 00
JN4	157 00	312 00	219 42	44 93	7 08	155 00
JN5	148 00	333 00	229 59	51 81	4 56	185 00
JN6	137 00	298 00	215 42	40 36	4 96	161 00
JN7	151 00	322 00	219 77	47 68	6 38	171 00
MEAN	150 71	308 57	**222 44**	41 45	**38.38**	157 86

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	151 00	370 00	233 37	45 37	1 66	219 00
EC2	137 00	253 00	181 39	17 16	2 21	116 00
EC3	141 00	333 00	219 92	50 80	1 57	192 00
EC4	136 00	408 00	242 60	74 36	1 46	272 00
EC5	136 00	219 00	179 08	17 22	1 83	83 00
EC6	152 00	307 00	217 61	47 21	1 54	155 00
EC7	136 00	384 00	210 94	62 62	1 76	248 00
EC8	136 00	357 00	208 83	57 50	2 19	221 00
EC9	123 00	215 00	172 24	17 29	2 04	92 00
MEAN	138 67	316 22	**207 33**	43 28	**16.26**	177 56

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	168 00	327 00	220 18	40 72	2 47	159 00
EN2	144 00	204 00	173 03	13 09	0 95	60 00
EN3	165 00	327 00	231 28	39 94	1 76	162 00
EN4	140 00	243 00	192 82	24 19	1 95	103 00
EN5	168 00	327 00	241 76	40 45	1 73	159 00
EN6	135 00	229 00	192 59	19 32	2 05	94 00
EN7	147 00	317 00	235 22	49 56	3 47	170 00
MEAN	152 43	282 00	**212.41**	32 47	**14 37**	129 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EF3, Recording 2

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	175 00	350 00	247 88	48 34	2 05	175 00
JC2	153 00	322 00	202 88	36 54	3 08	169 00
JC3	157 00	377 00	223 28	49 30	4 09	220 00
JC4	150 00	363 00	219 41	55 86	4 19	213 00
JC5	143 00	298 00	202 23	36 71	3 81	155 00
JC6	157 00	357 00	277 80	58 65	0 90	200 00
JC7	141 00	317 00	222 79	43 45	5 02	176 00
JC8	142 00	327 00	226 38	43 65	4 28	185 00
JC9	147 00	377 00	222 90	45 64	4 46	230 00
MEAN	151 67	343 11	**227 28**	46 46	**31.88**	191 44

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	163 00	327 00	239 69	34 96	5 15	164 00
JN2	156 00	298 00	221 63	39 00	4 33	142 00
JN3	158 00	298 00	217 64	31 64	4 97	140 00
JN4	150 00	307 00	228 89	40 01	7 13	157 00
JN5	148 00	363 00	239 82	51 68	4 55	215 00
JN6	158 00	303 00	226 19	34 95	4 77	145 00
JN7	155 00	327 00	231 14	41 61	6 06	172 00
MEAN	155 43	317 57	**229 29**	39 12	**36 95**	162 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	150 00	370 00	231 53	51 95	1 65	220 00
EC2	134 00	307 00	203 85	37 82	2 16	173 00
EC3	141 00	322 00	218 33	50 50	1 55	181 00
EC4	151 00	338 00	220 91	48 93	1 54	187 00
EC5	139 00	266 00	193 62	23 11	1 68	127 00
EC6	136 00	312 00	205 04	46 60	1 67	176 00
EC7	137 00	312 00	206 58	48 06	1 67	175 00
EC8	136 00	312 00	207 62	49 11	2 13	176 00
EC9	145 00	227 00	183 32	22 15	1 93	82 00
MEAN	141 00	307 33	**207 87**	42 03	**15 97**	166 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	161 00	357 00	235 26	47 13	2 59	196 00
EN2	142 00	208 00	172 67	12 43	0 93	66 00
EN3	170 00	338 00	241 73	39 01	1 79	168 00
EN4	155 00	250 00	203 11	25 45	2 03	95 00
EN5	170 00	322 00	246 56	39 80	1 87	152 00
EN6	137 00	246 00	200 49	22 68	1 99	109 00
EN7	130 00	312 00	216 93	42 14	3 90	182 00
MEAN	152 14	290 43	**216 68**	32 66	**15.08**	138 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EF3, Recording 3

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	180 00	350 00	244 88	38 37	2 02	170 00
JC2	158 00	273 00	203 91	23 79	3 42	115 00
JC3	161 00	363 00	229 97	48 67	4 31	202 00
JC4	153 00	370 00	226 57	44 98	4 49	217 00
JC5	161 00	303 00	210 48	34 43	3 56	142 00
JC6	178 00	327 00	265 69	49 17	0 89	149 00
JC7	152 00	294 00	219 40	39 54	4 48	142 00
JC8	166 00	350 00	219 58	41 24	4 07	184 00
JC9	165 00	333 00	231 39	42 75	4 45	168 00
MEAN	163 78	329 22	**227 99**	40 33	**31 70**	165 44

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	162 00	333 00	247 02	32 48	5 53	171 00
JN2	165 00	322 00	234 32	38 07	4 27	157 00
JN3	148 00	285 00	212 65	20 72	6 05	137 00
JN4	150 00	327 00	227 10	36 47	7 78	177 00
JN5	157 00	338 00	241 52	47 72	5 40	181 00
JN6	151 00	317 00	219 84	33 46	4 77	166 00
JN7	162 00	307 00	226 22	38 26	5 65	145 00
MEAN	156 43	318 43	**229 81**	35 31	**39 45**	162 00

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	170 00	384 00	231 86	45 83	1 56	214 00
EC2	147 00	281 00	196 54	23 53	2 15	134 00
EC3	151 00	289 00	204 61	37 14	1 49	138 00
EC4	165 00	253 00	207 92	22 19	1 48	88 00
EC5	144 00	232 00	198 62	17 92	1 70	88 00
EC6	147 00	333 00	238 53	39 14	1 57	186 00
EC7	140 00	303 00	205 41	39 49	1 65	163 00
EC8	138 00	363 00	218 39	56 29	2 00	225 00
EC9	147 00	243 00	189 96	20 74	1 85	96 00
MEAN	149 89	297 89	**210 20**	33 59	**15 45**	148 00

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	161 00	363 00	235 79	44 20	2 55	202 00
EN2	158 00	232 00	183 58	12 74	0 98	74 00
EN3	180 00	333 00	244 08	38 78	1 70	153 00
EN4	149 00	250 00	199 10	24 53	1 92	101 00
EN5	172 00	322 00	243 00	36 97	1 85	150 00
EN6	155 00	256 00	196 42	19 13	1 98	101 00
EN7	150 00	307 00	218 01	38 89	3 66	157 00
MEAN	160 71	294 71	217 14	30 75	**14 62**	134 00

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EM1, Recording 1a

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	105 00	210 00	147 94	28 19	2 09	105 00
JC2	95 00	172 00	127 47	20 41	3 46	77 00
JC3	101 00	194 00	131 86	19 37	6 07	93 00
JC4	102 00	204 00	128 02	17 37	6 81	102 00
JC5	100 00	162 00	121 57	13 72	4 55	62 00
JC6	107 00	202 00	154 77	29 78	0 91	95 00
JC7	95 00	166 00	125 98	17 61	5 65	71 00
JC8	86 00	169 00	129 25	14 25	5 56	83 00
JC9	101 00	175 00	132 54	18 68	5 27	74 00
MEAN	99 11	183 78	**133 27**	19 93	**40.37**	84 67

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	103 00	194 00	140 87	19 37	7 60	91 00
JN2	98 00	172 00	130 79	14 14	7 09	74 00
JN3	93 00	156 00	127 78	14 02	10 21	63 00
JN4	82 00	176 00	126 55	15 01	13 02	94 00
JN5	91 00	169 00	133 80	18 34	7 17	78 00
JN6	98 00	165 00	130 58	14 23	8 59	67 00
JN7	102 00	173 00	131 85	15 93	9 33	71 00
MEAN	95 29	172 14	**131.75**	15 86	**62 99**	76 86

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	109 00	215 00	148 28	32 24	1 81	106 00
EC2	93 00	138 00	116 25	8 31	2 27	45 00
EC3	105 00	190 00	142 12	25 85	1 44	85 00
EC4	98 00	161 00	127 37	17 12	1 43	63 00
EC5	106 00	176 00	132 90	19 14	1 50	70 00
EC6	98 00	206 00	136 95	26 96	1 69	108 00
EC7	108 00	156 00	124 55	11 69	1 70	48 00
EC8	98 00	162 00	121 26	14 53	2 13	64 00
EC9	100 00	160 00	135 37	15 91	1 61	60 00
MEAN	101 67	173 78	**131.67**	19 08	**15.58**	72 11

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	101 00	198 00	142 17	23 75	2 73	97 00
EN2	100 00	142 00	125 76	8 54	0 98	42 00
EN3	104 00	196 00	142 36	22 01	1 70	92 00
EN4	98 00	139 00	123 47	8 38	1 99	41 00
EN5	94 00	186 00	131 14	21 10	2 02	92 00
EN6	103 00	153 00	125 43	10 17	1 97	50 00
EN7	101 00	170 00	129 90	17 15	3 70	69 00
MEAN	100 14	169 14	**131.46**	15 87	**15.09**	69 00

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EM1, Recording 1b

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	102 00	181 00	135 94	21 42	1 93	79 00
JC2	103 00	178 00	128 53	19 77	3 17	75 00
JC3	96 00	200 00	128 81	15 13	5 10	104 00
JC4	93 00	181 00	128 52	16 85	6 45	88 00
JC5	81 00	170 00	124 30	16 80	4 20	89 00
JC6	95 00	185 00	148 73	24 41	0 92	90 00
JC7	91 00	173 00	126 45	18 80	4 38	82 00
JC8	96 00	173 00	132 77	15 44	4 76	77 00
JC9	104 00	172 00	124 18	15 25	4 42	68 00
MEAN	95 67	179 22	**130 91**	18 21	**35.32**	83 56

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	95 00	176 00	135 77	18 98	6 03	81 00
JN2	93 00	175 00	129 18	15 80	5 09	82 00
JN3	95 00	165 00	131 49	17 11	7 37	70 00
JN4	100 00	180 00	130 14	17 98	10 04	80 00
JN5	102 00	185 00	140 54	22 97	4 77	83 00
JN6	94 00	170 00	126 10	15 84	6 23	76 00
JN7	97 00	170 00	127 54	16 74	8 09	73 00
MEAN	96 57	174 43	**131 54**	17 92	**47 62**	77 86

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	109 00	210 00	140 96	27 07	1 78	101 00
EC2	98 00	165 00	120 54	11 65	2 21	67 00
EC3	101 00	178 00	129 84	24 19	1 36	77 00
EC4	103 00	163 00	131 34	16 18	1 30	60 00
EC5	103 00	140 00	117 50	10 41	1 45	37 00
EC6	102 00	190 00	132 80	20 83	1 60	88 00
EC7	105 00	156 00	124 55	13 11	1 52	51 00
EC8	95 00	160 00	121 57	14 74	2 28	65 00
EC9	93 00	152 00	125 36	14 88	1 58	59 00
MEAN	101 00	168 22	**127.16**	17 01	**15 08**	67 22

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	109 00	210 00	144 13	24 82	2 72	101 00
EN2	105 00	127 00	116 63	5 44	0 96	22 00
EN3	107 00	190 00	143 87	19 17	1 67	83 00
EN4	103 00	135 00	119 83	8 85	1 86	32 00
EN5	107 00	185 00	142 77	21 44	1 82	78 00
EN6	92 00	157 00	124 00	12 98	2 07	65 00
EN7	103 00	172 00	133 81	17 35	3 54	69 00
MEAN	103 71	168 00	**132.15**	15 72	**14 63**	64 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EM1, Recording 2

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	94 00	190 00	136 00	25 41	1 75	96 00
JC2	96 00	190 00	128 36	21 34	3 14	94 00
JC3	91 00	202 00	131 17	20 27	5 03	111 00
JC4	93 00	210 00	138 49	21 27	4 79	117 00
JC5	104 00	169 00	131 64	17 63	4 18	65 00
JC6	92 00	198 00	157 40	27 80	0 92	106 00
JC7	83 00	186 00	132 24	22 39	4 05	103 00
JC8	93 00	188 00	140 20	19 77	3 94	95 00
JC9	100 00	188 00	128 38	17 75	4 19	88 00
MEAN	94 00	191 22	**135.99**	21 51	**31 99**	97 22

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	97 00	198 00	147 66	24 68	5 19	101 00
JN2	92 00	178 00	127 85	20 54	4 68	86 00
JN3	97 00	170 00	130 22	16 59	6 23	73 00
JN4	99 00	210 00	139 08	24 24	8 34	111 00
JN5	90 00	190 00	141 93	24 02	4 59	100 00
JN6	100 00	175 00	131 64	18 71	5 73	75 00
JN7	103 00	180 00	129 69	18 29	6 26	77 00
MEAN	96 86	185 86	**135 44**	21 01	**41 01**	89 00

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	107 00	219 00	148 08	30 79	1 73	112 00
EC2	101 00	163 00	122 55	12 05	2 20	62 00
EC3	100 00	176 00	126 59	21 05	1 40	76 00
EC4	104 00	183 00	140 13	21 03	1 43	79 00
EC5	89 00	153 00	127 26	14 00	1 39	64 00
EC6	87 00	202 00	142 76	31 71	1 68	115 00
EC7	97 00	172 00	126 76	19 45	1 50	75 00
EC8	101 00	192 00	132 44	26 06	2 07	91 00
EC9	87 00	169 00	132 18	20 12	1 69	82 00
MEAN	97 00	181 00	**133 19**	21 81	**15 09**	84 00

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	105 00	217 00	141 93	29 63	2 71	112 00
EN2	96 00	148 00	120 93	14 66	1 02	52 00
EN3	107 00	194 00	150 99	21 33	1 80	87 00
EN4	93 00	143 00	123 34	9 45	2 08	50 00
EN5	108 00	169 00	141 16	19 87	1 89	61 00
EN6	100 00	155 00	127 33	13 83	2 12	55 00
EN7	102 00	190 00	145 89	22 06	3 69	88 00
MEAN	101 57	173 71	**135.94**	18 69	**15 32**	72 14

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EM1, Recording 3

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	110 00	210 00	148 70	24 20	1 78	100 00
JC2	111 00	192 00	144 96	20 23	3 05	81 00
JC3	112 00	200 00	152 62	22 29	4 04	88 00
JC4	105 00	222 00	145 02	23 76	4 43	117 00
JC5	59 00	178 00	137 47	20 87	3 29	119 00
JC6	108 00	210 00	161 33	26 15	0 83	102 00
JC7	112 00	188 00	141 12	21 11	3 86	76 00
JC8	105 00	172 00	144 03	16 23	3 89	67 00
JC9	106 00	202 00	138 61	23 00	4 15	96 00
MEAN	103 11	197 11	**145 98**	21 98	**29 31**	94 00

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	111 00	196 00	162 05	22 59	5 56	85 00
JN2	106 00	194 00	146 44	22 58	4 59	88 00
JN3	109 00	186 00	143 20	20 65	6 04	77 00
JN4	98 00	204 00	142 53	23 45	8 16	106 00
JN5	109 00	217 00	151 56	28 60	4 80	108 00
JN6	111 00	186 00	139 71	19 24	6 17	75 00
JN7	106 00	192 00	140 87	22 93	6 57	86 00
MEAN	107 14	196 43	**146 62**	22 86	**41 89**	89 29

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	108 00	215 00	154 84	33 67	1 81	107 00
EC2	108 00	180 00	131 11	16 33	2 18	72 00
EC3	106 00	210 00	142 45	30 32	1 36	104 00
EC4	94 00	206 00	147 24	28 90	1 43	112 00
EC5	103 00	161 00	128 31	14 20	1 57	58 00
EC6	102 00	219 00	156 37	31 87	1 65	117 00
EC7	105 00	183 00	134 59	20 68	1 48	78 00
EC8	102 00	206 00	140 82	28 97	2 08	104 00
EC9	108 00	172 00	135 57	19 02	1 67	64 00
MEAN	104 00	194 67	**141.26**	24 88	**15 21**	90 67

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	103 00	219 00	150 55	28 32	2 75	116 00
EN2	97 00	150 00	128 39	16 09	0 95	53 00
EN3	119 00	194 00	153 91	16 57	1 69	75 00
EN4	108 00	158 00	135 55	8 94	1 93	50 00
EN5	108 00	188 00	146 48	24 07	1 89	80 00
EN6	103 00	170 00	134 22	17 47	2 15	67 00
EN7	107 00	186 00	147 29	20 44	3 66	79 00
MEAN	106 43	180 71	**142.34**	18 84	**15.02**	74 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EM2, Recording 1a

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	76 00	153 00	113 25	22 19	1 84	77 00
JC2	79 00	133 00	103 42	14 05	2 50	54 00
JC3	73 00	160 00	106 44	16 28	3 75	87 00
JC4	75 00	155 00	109 16	13 65	4 37	80 00
JC5	71 00	122 00	95 33	9 70	3 24	51 00
JC6	81 00	130 00	107 38	15 77	0 81	49 00
JC7	81 00	124 00	102 36	8 43	4 37	43 00
JC8	85 00	126 00	102 69	7 26	3 50	41 00
JC9	79 00	132 00	100 12	9 79	3 75	53 00
MEAN	77 78	137 22	**104 46**	13 01	**28 14**	59 44

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	69 00	143 00	109 56	16 74	4 68	74 00
JN2	73 00	129 00	99 04	13 05	3 85	56 00
JN3	75 00	129 00	104 51	9 79	6 42	54 00
JN4	79 00	131 00	104 58	9 66	7 39	52 00
JN5	75 00	150 00	109 63	18 92	4 13	75 00
JN6	68 00	136 00	102 30	13 33	4 68	68 00
JN7	71 00	141 00	100 15	15 79	5 30	70 00
MEAN	72 86	137 00	**104 25**	13 90	**36 44**	64 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	88 00	172 00	123 43	25 46	1 69	84 00
EC2	73 00	136 00	105 25	13 07	2 18	63 00
EC3	80 00	166 00	118 13	19 95	1 28	86 00
EC4	74 00	149 00	111 83	19 01	1 29	75 00
EC5	68 00	130 00	100 22	15 32	1 31	62 00
EC6	69 00	175 00	113 77	21 10	1 82	106 00
EC7	78 00	153 00	110 45	15 04	1 55	75 00
EC8	69 00	145 00	102 94	18 80	1 94	76 00
EC9	74 00	144 00	106 62	19 20	1 59	70 00
MEAN	74 78	152 22	**110 29**	18 55	**14 63**	77 44

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	79 00	175 00	115 96	22 65	2 65	96 00
EN2	70 00	128 00	97 50	14 56	0 92	58 00
EN3	89 00	163 00	126 70	17 23	1 63	74 00
EN4	75 00	129 00	100 96	13 24	1 71	54 00
EN5	88 00	160 00	117 81	16 60	1 72	72 00
EN6	75 00	124 00	96 84	9 96	1 75	49 00
EN7	81 00	142 00	108 56	15 71	3 26	61 00
MEAN	79 57	145 86	**109.19**	15 71	**13 63**	66 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence.

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Subject EM2, Recording 1b

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	76 00	152 00	117 99	18 08	2 01	76 00
JC2	70 00	136 00	104 96	14 62	2 57	66 00
JC3	70 00	168 00	110 42	14 30	3 39	98 00
JC4	70 00	147 00	109 09	15 96	3 36	77 00
JC5	70 00	126 00	94 71	11 66	3 02	56 00
JC6	85 00	137 00	117 03	13 50	0 72	52 00
JC7	83 00	125 00	104 32	8 36	3 48	42 00
JC8	90 00	128 00	102 05	6 60	3 01	38 00
JC9	87 00	143 00	108 21	12 67	4 36	56 00
MEAN	77 89	140 22	**107 64**	12 86	**25 91**	62 33

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	72 00	148 00	110 74	17 35	4 51	76 00
JN2	80 00	150 00	112 33	16 55	4 10	70 00
JN3	76 00	145 00	107 92	16 25	4 92	69 00
JN4	71 00	142 00	104 58	14 54	5 37	71 00
JN5	75 00	144 00	109 16	17 88	4 44	69 00
JN6	77 00	135 00	104 62	12 28	4 34	58 00
JN7	79 00	132 00	99 38	13 21	5 21	53 00
MEAN	75 71	142 29	**106.96**	15 44	**32.89**	66 57

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	93 00	165 00	118 47	20 41	1 60	72 00
EC2	70 00	120 00	93 95	9 49	2 04	50 00
EC3	79 00	152 00	112 53	20 11	1 25	73 00
EC4	81 00	147 00	104 90	14 92	1 31	66 00
EC5	70 00	124 00	99 84	13 68	1 22	54 00
EC6	71 00	153 00	111 27	18 74	1 49	82 00
EC7	79 00	130 00	100 18	11 86	1 48	51 00
EC8	74 00	125 00	99 85	11 94	1 83	51 00
EC9	56 00	125 00	100 18	16 31	1 50	69 00
MEAN	74 78	137 89	**104.57**	15 27	**13 71**	63 11

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	90 00	165 00	114 88	20 12	2 65	75 00
EN2	72 00	123 00	96 44	13 21	0 88	51 00
EN3	93 00	148 00	119 24	14 25	1 67	55 00
EN4	72 00	129 00	96 20	11 61	1 82	57 00
EN5	92 00	150 00	117 63	15 51	1 67	58 00
EN6	77 00	121 00	97 78	9 31	1 73	44 00
EN7	73 00	135 00	103 78	13 30	3 21	62 00
MEAN	81 29	138 71	**106.56**	13 90	**13 62**	57 43

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EM2, Recording 2

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	80 00	150 00	115 29	19 47	1 91	70 00
JC2	74 00	147 00	104 24	15 94	2 58	73 00
JC3	76 00	152 00	105 83	14 35	3 45	76 00
JC4	80 00	149 00	112 62	16 54	3 72	69 00
JC5	78 00	120 00	96 20	9 53	2 87	42 00
JC6	86 00	134 00	111 80	13 48	0 76	48 00
JC7	80 00	134 00	104 99	10 98	3 56	54 00
JC8	80 00	132 00	105 99	10 11	2 97	52 00
JC9	88 00	166 00	107 73	15 16	3 96	78 00
MEAN	80 22	142 67	**107 19**	13 95	**25.78**	62 44

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	84 00	165 00	116 30	17 28	4 87	81 00
JN2	76 00	157 00	114 19	18 05	3 93	81 00
JN3	85 00	160 00	114 55	16 91	4 68	75 00
JN4	88 00	156 00	113 04	14 16	6 86	68 00
JN5	82 00	180 00	120 08	21 85	4 03	98 00
JN6	81 00	141 00	111 14	12 53	3 97	60 00
JN7	79 00	149 00	109 51	13 87	5 31	70 00
MEAN	82 14	158 29	**114 12**	16 38	**33 64**	76 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	90 00	155 00	115 51	19 20	1 66	65 00
EC2	76 00	140 00	101 50	10 04	1 93	64 00
EC3	83 00	162 00	117 51	20 62	1 29	79 00
EC4	81 00	147 00	111 38	20 87	1 21	66 00
EC5	77 00	128 00	100 42	11 26	1 28	51 00
EC6	80 00	168 00	110 35	18 34	1 50	88 00
EC7	76 00	136 00	101 85	13 84	1 47	60 00
EC8	81 00	149 00	102 98	17 56	1 92	68 00
EC9	82 00	138 00	106 80	15 27	1 49	56 00
MEAN	80 67	147 00	**107.59**	16 33	**13 75**	66 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	80 00	148 00	110 01	18 30	2 66	68 00
EN2	76 00	111 00	88 81	9 20	0 95	35 00
EN3	87 00	152 00	115 74	16 12	1 60	65 00
EN4	69 00	119 00	93 20	9 93	1 84	50 00
EN5	85 00	147 00	109 58	18 63	1 77	62 00
EN6	80 00	119 00	99 51	8 81	1 73	39 00
EN7	77 00	130 00	101 63	13 92	3 23	53 00
MEAN	79 14	132 29	**102.64**	13 56	**13.77**	53 14

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EM2, Recording 3

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	77 00	155 00	108 70	20 87	1 84	78 00
JC2	57 00	122 00	93 36	11 07	2 58	65 00
JC3	58 00	134 00	98 13	12 88	3 30	76 00
JC4	64 00	127 00	97 41	13 01	3 41	63 00
JC5	72 00	118 00	89 15	8 26	2 56	46 00
JC6	78 00	137 00	115 53	14 40	0 68	59 00
JC7	57 00	124 00	98 34	11 83	3 39	67 00
JC8	63 00	129 00	95 15	11 39	2 88	66 00
JC9	79 00	127 00	96 65	11 12	3 52	48 00
MEAN	67 22	130 33	**99 16**	12 76	**24 16**	63 11

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	72 00	150 00	103 82	16 07	4 24	78 00
JN2	75 00	133 00	98 78	12 23	3 26	58 00
JN3	70 00	130 00	99 86	11 90	3 46	60 00
JN4	68 00	131 00	102 44	11 50	5 65	63 00
JN5	70 00	143 00	103 05	18 81	3 87	73 00
JN6	76 00	133 00	100 59	13 48	3 44	57 00
JN7	76 00	136 00	96 25	10 89	4 86	60 00
MEAN	72 43	136 57	**100.68**	13 55	**28.78**	64 14

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	79 00	149 00	104 10	19 29	1 83	70 00
EC2	70 00	140 00	97 10	10 69	1 98	70 00
EC3	71 00	152 00	113 05	19 93	1 31	81 00
EC4	79 00	129 00	102 47	13 00	1 28	50 00
EC5	73 00	139 00	102 59	12 16	1 52	66 00
EC6	79 00	156 00	111 97	17 59	1 47	77 00
EC7	88 00	148 00	110 14	12 73	1 55	60 00
EC8	74 00	133 00	96 71	13 94	1 72	59 00
EC9	71 00	122 00	93 40	13 18	1 47	51 00
MEAN	76 00	140 89	**103 50**	14 72	**14 13**	64 89

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	81 00	157 00	110 46	18 09	2 51	76 00
EN2	77 00	116 00	93 78	9 77	0 93	39 00
EN3	93 00	149 00	116 95	16 50	1 60	56 00
EN4	79 00	114 00	95 01	8 34	1 77	35 00
EN5	80 00	148 00	113 86	14 64	1 70	68 00
EN6	79 00	111 00	96 17	8 13	1 75	32 00
EN7	80 00	147 00	104 30	14 85	3 35	67 00
MEAN	81 29	134 57	**104.36**	12 90	**13 61**	53 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EM3, Recording 1a

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	91 00	170 00	126 38	17 77	2 23	79 00
JC2	76 00	141 00	109 71	14 11	5 15	65 00
JC3	81 00	185 00	122 38	23 91	5 76	104 00
JC4	94 00	170 00	120 64	15 05	5 63	76 00
JC5	88 00	138 00	108 33	8 73	6 72	50 00
JC6	95 00	151 00	119 94	16 19	1 26	56 00
JC7	87 00	152 00	119 65	15 96	6 42	65 00
JC8	92 00	168 00	128 08	21 61	7 44	76 00
JC9	85 00	148 00	110 81	15 02	6 80	63 00
MEAN	87 67	158 11	**118.44**	16 48	**47 40**	70 44

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	93 00	165 00	128 05	16 92	5 87	72 00
JN2	82 00	166 00	125 55	16 52	5 43	84 00
JN3	92 00	150 00	118 98	13 73	9 21	58 00
JN4	82 00	166 00	125 65	16 49	5 43	84 00
JN5	83 00	151 00	122 51	14 31	5 31	68 00
JN6	91 00	157 00	120 13	14 02	7 50	66 00
JN7	92 00	160 00	120 03	14 96	7 89	68 00
MEAN	87 86	159 29	**122 99**	15 28	**46 65**	71 43

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	88 00	175 00	122 13	22 36	2 08	87 00
EC2	84 00	169 00	106 43	12 59	2 77	85 00
EC3	83 00	158 00	117 33	16 08	1 73	75 00
EC4	90 00	158 00	112 71	15 46	1 77	68 00
EC5	88 00	125 00	106 58	10 44	2 43	37 00
EC6	93 00	157 00	121 33	17 02	1 67	64 00
EC7	90 00	140 00	109 49	8 83	1 80	50 00
EC8	87 00	173 00	123 11	18 67	2 19	86 00
EC9	90 00	150 00	118 69	14 90	2 52	60 00
MEAN	88 11	156 11	**115.31**	15 15	**18 96**	68 00

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	90 00	185 00	126 34	25 73	2 63	95 00
EN2	95 00	135 00	108 29	10 96	0 99	40 00
EN3	94 00	161 00	116 50	19 08	1 64	67 00
EN4	85 00	147 00	104 78	12 10	2 70	62 00
EN5	84 00	181 00	125 27	25 47	2 03	97 00
EN6	91 00	153 00	115 44	17 16	2 04	62 00
EN7	79 00	170 00	116 26	17 84	3 30	91 00
MEAN	88 29	161 71	**116.13**	18 33	**15 33**	73 43

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EM3, Recording 1b

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	98 00	172 00	125 07	15 36	2 01	74 00
JC2	76 00	192 00	117 45	21 14	3 99	116 00
JC3	92 00	165 00	117 94	15 16	4 10	73 00
JC4	95 00	157 00	114 39	12 43	4 48	62 00
JC5	91 00	150 00	107 35	10 14	4 46	59 00
JC6	77 00	141 00	118 45	12 70	0 89	64 00
JC7	78 00	163 00	116 62	19 11	5 41	85 00
JC8	84 00	145 00	111 88	12 23	5 80	61 00
JC9	90 00	140 00	108 17	10 93	6 46	50 00
MEAN	86 78	158 33	**115 26**	14 36	**37 58**	71 56

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	83 00	163 00	121 37	15 89	4 96	80 00
JN2	90 00	176 00	122 24	17 43	3 92	86 00
JN3	81 00	155 00	114 28	17 06	6 60	74 00
JN4	93 00	170 00	126 20	18 68	8 06	77 00
JN5	82 00	153 00	113 49	14 72	4 38	71 00
JN6	88 00	176 00	121 17	19 49	6 26	88 00
JN7	81 00	170 00	121 11	18 50	5 58	89 00
MEAN	85 43	166 14	**119 98**	17 40	**39 76**	80 71

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	88 00	156 00	114 16	21 53	2 20	68 00
EC2	91 00	135 00	109 72	12 00	2 24	44 00
EC3	90 00	165 00	116 03	21 03	1 41	75 00
EC4	91 00	168 00	118 83	17 98	2 12	77 00
EC5	85 00	133 00	106 57	10 28	2 44	48 00
EC6	62 00	192 00	133 12	29 16	1 70	130 00
EC7	95 00	131 00	106 87	5 26	1 51	36 00
EC8	53 00	217 00	133 88	29 57	2 00	164 00
EC9	84 00	133 00	107 63	11 30	2 51	49 00
MEAN	82 11	158 89	**116.31**	17 57	**18.13**	76 78

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	82 00	165 00	121 13	23 44	2 64	83 00
EN2	89 00	123 00	106 37	8 31	0 93	34 00
EN3	98 00	133 00	112 31	9 96	1 66	35 00
EN4	92 00	160 00	120 11	16 31	2 70	68 00
EN5	92 00	178 00	122 40	24 25	1 85	86 00
EN6	94 00	142 00	108 98	14 04	2 03	48 00
EN7	91 00	192 00	129 08	25 80	3 70	101 00
MEAN	91 14	156 14	**117.20**	17 44	**15 51**	65 00

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject EM3, Recording 2

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	96 00	148 00	121 58	13 87	2 45	52 00
JC2	89 00	129 00	107 76	9 74	4 03	40 00
JC3	86 00	173 00	119 35	18 13	5 36	87 00
JC4	88 00	162 00	114 93	13 68	5 22	74 00
JC5	86 00	147 00	108 96	10 47	4 91	61 00
JC6	86 00	134 00	116 14	12 85	1 00	48 00
JC7	89 00	153 00	115 97	14 37	5 60	64 00
JC8	89 00	151 00	117 10	15 13	6 36	62 00
JC9	85 00	145 00	112 31	14 67	6 39	60 00
MEAN	88 22	149 11	**114 90**	13 66	**41 31**	60 89

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	90 00	170 00	127 10	15 81	6 33	80 00
JN2	93 00	176 00	126 19	17 56	5 54	83 00
JN3	91 00	163 00	120 96	12 47	6 68	72 00
JN4	87 00	161 00	120 73	15 57	8 88	74 00
JN5	84 00	155 00	116 97	16 41	5 00	71 00
JN6	85 00	175 00	125 78	14 34	6 90	90 00
JN7	82 00	157 00	118 08	14 91	7 11	75 00
MEAN	87 43	165 29	**122 26**	15 30	**46 43**	77 86

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	96 00	162 00	120 07	18 20	1 99	66 00
EC2	88 00	148 00	109 70	11 62	2 21	60 00
EC3	80 00	157 00	111 69	15 14	1 51	77 00
EC4	88 00	168 00	122 37	19 24	1 44	80 00
EC5	93 00	168 00	118 37	16 28	2 01	75 00
EC6	91 00	163 00	130 27	16 84	1 50	72 00
EC7	97 00	141 00	113 85	7 54	1 81	44 00
EC8	100 00	183 00	129 29	19 57	2 05	83 00
EC9	100 00	147 00	119 07	11 33	2 35	47 00
MEAN	92 56	159 67	**119.41**	15 08	**16 88**	67 11

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	88 00	190 00	121 24	22 21	2 60	102 00
EN2	101 00	141 00	111 44	10 21	0 93	40 00
EN3	94 00	168 00	119 80	19 80	1 92	74 00
EN4	93 00	152 00	114 89	15 31	1 90	59 00
EN5	92 00	175 00	119 58	22 93	1 81	83 00
EN6	95 00	153 00	112 17	15 09	1 97	58 00
EN7	79 00	157 00	113 66	18 53	3 74	78 00
MEAN	91 71	162 29	**116.11**	17 73	**14 88**	70 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject EM3, Recording 3

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	82 00	136 00	112 38	13 17	2 31	54 00
JC2	80 00	136 00	105 09	10 79	3 72	56 00
JC3	85 00	144 00	114 63	14 89	4 25	59 00
JC4	88 00	147 00	112 55	12 72	4 77	59 00
JC5	89 00	130 00	105 34	7 73	4 18	41 00
JC6	86 00	139 00	117 69	11 76	0 93	53 00
JC7	86 00	142 00	110 83	13 85	4 72	56 00
JC8	82 00	151 00	111 75	17 10	4 82	69 00
JC9	81 00	134 00	106 77	11 87	4 90	53 00
MEAN	84 33	139 89	**110 78**	12 65	**34 60**	55 56

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	87 00	161 00	122 27	14 05	6 14	74 00
JN2	94 00	150 00	118 41	12 40	5 21	56 00
JN3	80 00	144 00	112 42	11 98	7 10	64 00
JN4	90 00	147 00	115 59	13 47	9 63	57 00
JN5	89 00	136 00	113 50	10 63	5 95	47 00
JN6	93 00	147 00	114 84	11 30	8 88	54 00
JN7	82 00	147 00	114 42	11 63	9 15	65 00
MEAN	87 86	147 43	**115.92**	12 21	**52.06**	59 57

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	90 00	162 00	118 42	19 45	1 77	72 00
EC2	85 00	143 00	113 38	14 40	2 15	58 00
EC3	86 00	139 00	104 45	10 73	1 42	53 00
EC4	91 00	157 00	116 47	18 08	1 55	66 00
EC5	81 00	130 00	102 84	11 50	2 25	49 00
EC6	72 00	131 00	105 69	13 34	1 58	59 00
EC7	93 00	134 00	108 15	6 33	1 59	41 00
EC8	93 00	162 00	127 03	18 36	1 86	69 00
EC9	90 00	130 00	109 18	9 26	2 37	40 00
MEAN	86 78	143 11	**111 73**	13 49	**16 53**	56 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	88 00	194 00	117 65	23 08	2 71	106 00
EN2	86 00	162 00	120 21	18 90	1 06	76 00
EN3	87 00	157 00	120 12	19 52	1 80	70 00
EN4	91 00	143 00	114 84	14 42	2 00	52 00
EN5	90 00	158 00	116 70	17 55	1 82	68 00
EN6	88 00	144 00	108 99	15 48	2 29	56 00
EN7	88 00	151 00	114 65	17 20	3 81	63 00
MEAN	88 29	158 43	**116.17**	18 02	**15 49**	70 14

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject JF1, Recording 1a

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	156 00	322 00	222 90	46 50	2 46	166 00
EC2	131 00	227 00	185 27	18 89	3 77	96 00
EC3	140 00	263 00	203 02	28 80	2 37	123 00
EC4	162 00	256 00	200 36	24 96	1 75	94 00
EC5	74 00	219 00	178 11	25 27	2 16	145 00
EC6	82 00	298 00	197 77	41 06	2 29	216 00
EC7	143 00	277 00	205 22	26 60	2 32	134 00
EC8	145 00	263 00	190 74	28 21	2 75	118 00
EC9	81 00	259 00	190 42	26 17	3 16	178 00
MEAN	123 78	264 89	**197.09**	29 61	**23 02**	141 11

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	157 00	294 00	219 91	30 15	3 91	137 00
EN2	132 00	232 00	183 73	20 89	1 85	100 00
EN3	148 00	250 00	201 02	22 53	3 26	102 00
EN4	115 00	210 00	172 62	15 96	2 39	95 00
EN5	125 00	259 00	197 92	25 76	3 04	134 00
EN6	92 00	227 00	179 16	23 77	2 65	135 00
EN7	149 00	243 00	198 50	18 10	4 92	94 00
MEAN	131 14	245 00	**193.27**	22 45	**22 02**	113 86

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	126 00	263 00	201 13	29 01	1 49	137 00
JC2	113 00	263 00	185 24	38 48	2 55	150 00
JC3	121 00	273 00	191 15	32 97	3 28	152 00
JC4	116 00	307 00	212 70	33 20	3 49	191 00
JC5	123 00	289 00	189 39	40 81	2 47	166 00
JC6	138 00	294 00	208 00	50 10	0 71	156 00
JC7	136 00	289 00	199 81	40 81	2 98	153 00
JC8	114 00	294 00	221 03	35 39	3 44	180 00
JC9	127 00	259 00	193 32	30 63	3 04	132 00
MEAN	123 78	281 22	**200 20**	36 82	**23 45**	157 44

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	115 00	298 00	217 95	36 53	3 53	183 00
JN2	142 00	317 00	200 52	39 80	3 26	175 00
JN3	118 00	281 00	207 56	36 21	4 12	163 00
JN4	121 00	285 00	205 97	35 49	5 04	164 00
JN5	119 00	294 00	222 33	38 16	3 21	175 00
JN6	122 00	281 00	190 91	32 87	3 28	159 00
JN7	131 00	263 00	200 35	29 26	3 79	132 00
MEAN	124 00	288 43	**206 51**	35 47	**26 23**	164 43

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject JF1, Recording 1b

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	166 00	303 00	220 47	34 57	2 59	137 00
EC2	131 00	212 00	166 93	14 31	3 69	81 00
EC3	127 00	273 00	204 57	32 56	2 26	146 00
EC4	161 00	259 00	196 79	25 38	1 78	98 00
EC5	73 00	222 00	181 29	23 70	1 70	149 00
EC6	141 00	277 00	200 73	31 41	2 17	136 00
EC7	136 00	253 00	194 84	27 36	2 77	117 00
EC8	149 00	256 00	191 47	27 56	2 31	107 00
EC9	76 00	246 00	177 98	31 82	1 99	170 00
MEAN	128 89	255 67	**192 79**	27 63	**21.27**	126 78

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	160 00	312 00	216 38	38 36	3 14	152 00
EN2	125 00	215 00	170 61	19 79	1 24	90 00
EN3	160 00	263 00	206 72	23 36	2 15	103 00
EN4	112 00	235 00	183 20	17 99	2 69	123 00
EN5	136 00	259 00	200 86	25 95	2 93	123 00
EN6	78 00	238 00	180 80	21 97	2 24	160 00
EN7	152 00	246 00	198 27	20 91	4 12	94 00
MEAN	131 86	252 57	**193.83**	24 05	**18 51**	120 71

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	133 00	256 00	196 57	32 30	1 46	123 00
JC2	132 00	273 00	186 48	35 45	2 36	141 00
JC3	134 00	263 00	191 18	30 89	2 78	129 00
JC4	144 00	298 00	215 84	30 10	2 97	154 00
JC5	135 00	263 00	191 85	34 21	2 33	128 00
JC6	139 00	303 00	221 43	56 47	0 65	164 00
JC7	141 00	312 00	199 39	36 17	2 89	171 00
JC8	129 00	294 00	213 48	31 49	2 74	165 00
JC9	138 00	270 00	199 71	32 31	3 26	132 00
MEAN	136 11	281 33	**201.77**	35 49	**21.45**	145 22

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	111 00	298 00	210 45	37 31	3 40	187 00
JN2	130 00	273 00	193 69	33 95	2 96	143 00
JN3	108 00	263 00	195 60	31 69	3 60	155 00
JN4	112 00	285 00	199 31	32 58	4 68	173 00
JN5	139 00	281 00	215 54	32 37	3 14	142 00
JN6	115 00	253 00	189 24	30 53	3 31	138 00
JN7	139 00	253 00	196 99	27 16	3 89	114 00
MEAN	122 00	272 29	**200.12**	32 23	**24 96**	150 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject JF1, Recording 2

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	145 00	289 00	205 71	37 08	2 32	144 00
EC2	114 00	222 00	159 42	15 23	2 81	108 00
EC3	149 00	298 00	211 28	37 70	1 94	149 00
EC4	149 00	253 00	190 76	25 43	1 88	104 00
EC5	133 00	232 00	183 01	20 15	1 75	99 00
EC6	133 00	273 00	190 40	36 65	2 01	140 00
EC7	138 00	256 00	186 79	29 61	2 02	118 00
EC8	136 00	250 00	178 10	27 22	2 47	114 00
EC9	137 00	235 00	174 75	25 66	2 20	98 00
MEAN	137 11	256 44	**186 69**	28 30	**19 41**	119 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	141 00	259 00	190 02	25 32	3 75	118 00
EN2	111 00	183 00	155 10	13 54	1 11	72 00
EN3	121 00	153 00	187 16	23 66	2 31	32 00
EN4	125 00	198 00	163 39	13 86	2 86	73 00
EN5	136 00	238 00	185 49	25 68	2 44	102 00
EN6	96 00	206 00	163 75	20 38	2 35	110 00
EN7	123 00	215 00	177 80	16 43	4 15	92 00
MEAN	121 86	207 43	**174 67**	19 84	**18 97**	85 57

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	137 00	273 00	213 12	37 78	1 42	136 00
JC2	125 00	281 00	183 55	41 98	2 45	156 00
JC3	133 00	303 00	204 68	41 71	2 93	170 00
JC4	143 00	312 00	220 74	36 00	3 18	169 00
JC5	111 00	298 00	187 14	44 68	2 45	187 00
JC6	142 00	322 00	233 03	59 39	0 70	180 00
JC7	129 00	294 00	202 30	38 82	3 01	165 00
JC8	129 00	312 00	221 69	35 66	2 89	183 00
JC9	129 00	259 00	194 62	32 41	2 92	130 00
MEAN	130 89	294 89	**206 76**	40 94	**21 96**	164 00

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	114 00	273 00	212 81	32 33	4 00	159 00
JN2	136 00	270 00	184 70	34 02	2 98	134 00
JN3	117 00	263 00	191 35	32 75	3 64	146 00
JN4	121 00	263 00	201 36	33 01	5 20	142 00
JN5	121 00	289 00	215 79	39 37	3 19	168 00
JN6	121 00	250 00	187 37	32 10	3 16	129 00
JN7	116 00	266 00	194 64	32 26	3 95	150 00
MEAN	120 86	267 71	**198.29**	33 69	**26 11**	146 86

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject JF1, Recording 3

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	163 00	312 00	224 03	34 40	2 18	149 00
EC2	136 00	235 00	177 56	20 66	2 59	99 00
EC3	160 00	303 00	217 29	35 00	1 80	143 00
EC4	151 00	256 00	201 57	31 72	2 18	105 00
EC5	136 00	253 00	188 37	26 21	1 82	117 00
EC6	138 00	270 00	193 77	28 92	2 22	132 00
EC7	151 00	289 00	206 52	36 10	1 97	138 00
EC8	78 00	281 00	198 24	45 21	2 23	203 00
EC9	75 00	250 00	176 58	30 89	2 08	175 00
MEAN	132 00	272 11	**198 21**	32 12	**19 08**	140 11

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	144 00	266 00	192 06	31 91	3 31	122 00
EN2	125 00	202 00	164 61	19 35	1 11	77 00
EN3	169 00	259 00	207 62	19 71	2 44	90 00
EN4	121 00	208 00	175 45	13 72	2 15	87 00
EN5	137 00	259 00	198 10	26 35	2 63	122 00
EN6	66 00	238 00	170 92	28 68	2 25	172 00
EN7	118 00	246 00	191 18	21 96	4 71	128 00
MEAN	125 71	239 71	**185.71**	23 10	**18 59**	114 00

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	133 00	298 00	200 78	34 96	1 61	165 00
JC2	125 00	277 00	188 50	41 64	2 46	152 00
JC3	125 00	298 00	205 31	43 15	2 73	173 00
JC4	125 00	312 00	221 39	39 71	2 84	187 00
JC5	70 00	303 00	187 33	45 59	2 28	233 00
JC6	151 00	294 00	222 66	50 98	0 68	143 00
JC7	145 00	298 00	204 48	42 61	2 72	153 00
JC8	142 00	285 00	214 08	31 94	2 59	143 00
JC9	135 00	281 00	199 01	35 09	2 86	146 00
MEAN	127 89	294 00	**204 84**	40 63	**20 74**	166 11

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	139 00	256 00	203 51	24 77	3 62	117 00
JN2	135 00	266 00	186 03	34 30	2 81	131 00
JN3	113 00	246 00	187 37	31 52	3 35	133 00
JN4	133 00	253 00	193 09	28 94	5 12	120 00
JN5	136 00	281 00	206 06	37 30	3 14	145 00
JN6	96 00	229 00	178 10	29 44	2 98	133 00
JN7	100 00	256 00	186 34	30 70	3 77	156 00
MEAN	121 71	255 29	**191.50**	31 00	**24 78**	133 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JF2, Recording 1a

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	131 00	370 00	249 36	62 75	3 16	239 00
EC2	135 00	263 00	205 70	29 21	3 44	128 00
EC3	155 00	403 00	234 05	56 16	2 15	248 00
EC4	152 00	363 00	217 92	49 67	2 52	211 00
EC5	129 00	289 00	199 81	33 51	2 81	160 00
EC6	126 00	357 00	215 24	42 55	3 08	231 00
EC7	153 00	350 00	237 28	50 42	2 67	197 00
EC8	126 00	370 00	215 01	53 44	3 29	244 00
EC9	130 00	322 00	206 71	44 90	4 44	192 00
MEAN	137 44	343 00	**220 12**	46 96	**27 56**	205 56

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	157 00	350 00	237 78	47 60	3 46	193 00
EN2	144 00	253 00	186 08	22 10	1 50	109 00
EN3	135 00	344 00	228 74	49 24	2 34	209 00
EN4	139 00	370 00	206 53	31 60	2 45	231 00
EN5	152 00	322 00	247 98	42 27	2 59	170 00
EN6	142 00	266 00	193 72	22 21	2 63	124 00
EN7	157 00	307 00	222 50	25 89	4 52	150 00
MEAN	146 57	316 00	**217.62**	34 42	**19 48**	169 43

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	157 00	350 00	267 29	53 43	1 63	193 00
JC2	155 00	338 00	228 81	47 33	3 02	183 00
JC3	143 00	408 00	263 02	73 03	3 66	265 00
JC4	144 00	357 00	256 76	57 66	3 47	213 00
JC5	139 00	444 00	226 33	62 96	2 72	305 00
JC6	152 00	384 00	240 54	70 04	0 89	232 00
JC7	140 00	370 00	241 95	68 10	3 35	230 00
JC8	169 00	416 00	250 16	34 32	2 98	247 00
JC9	130 00	384 00	240 90	59 73	3 47	254 00
MEAN	147 67	383 44	**246.20**	58 51	**25.18**	235 78

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	131 00	344 00	258 28	48 78	4 38	213 00
JN2	155 00	357 00	243 90	51 98	3 23	202 00
JN3	144 00	370 00	258 69	48 98	3 93	226 00
JN4	163 00	363 00	258 90	43 27	5 69	200 00
JN5	145 00	384 00	273 52	67 67	4 06	239 00
JN6	149 00	344 00	226 21	47 32	3 26	195 00
JN7	158 00	350 00	254 64	42 87	4 76	192 00
MEAN	149 29	358 86	**253.45**	50 12	**29 32**	209 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JF2, Recording 1b

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	106 00	392 00	271 86	69 88	3 88	286 00
EC2	152 00	408 00	224 38	45 68	3 51	256 00
EC3	149 00	434 00	255 57	70 73	2 41	285 00
EC4	149 00	416 00	242 97	78 18	2 37	267 00
EC5	129 00	350 00	234 59	53 38	3 22	221 00
EC6	142 00	384 00	225 75	55 99	2 67	242 00
EC7	152 00	408 00	248 72	67 48	2 57	256 00
EC8	138 00	434 00	235 90	76 56	3 40	296 00
EC9	140 00	333 00	212 79	44 52	3 53	193 00
MEAN	139 67	395 44	**239.17**	62 49	**27 54**	255 78

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	158 00	338 00	232 53	39 93	3 33	180 00
EN2	144 00	235 00	193 58	21 69	1 34	91 00
EN3	175 00	307 00	227 65	37 59	2 19	132 00
EN4	162 00	246 00	198 07	15 14	2 17	84 00
EN5	170 00	277 00	232 20	32 06	2 36	107 00
EN6	169 00	240 00	200 56	19 01	2 40	71 00
EN7	166 00	270 00	216 20	22 11	4 63	104 00
MEAN	163 43	273 29	**214 40**	26 79	**18.42**	109 86

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	135 00	338 00	258 52	55 48	1 97	203 00
JC2	141 00	363 00	246 58	61 39	3 06	222 00
JC3	129 00	425 00	271 91	76 84	3 89	296 00
JC4	157 00	327 00	260 48	50 49	3 27	170 00
JC5	152 00	454 00	247 68	71 58	2 73	302 00
JC6	151 00	392 00	252 14	74 39	0 90	241 00
JC7	147 00	384 00	255 97	73 89	3 15	237 00
JC8	156 00	350 00	277 99	38 70	3 26	194 00
JC9	141 00	370 00	252 41	55 28	3 39	229 00
MEAN	145 44	378 11	**258 19**	62 00	**25 63**	232 67

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	149 00	344 00	264 31	46 71	4 35	195 00
JN2	163 00	350 00	243 21	48 93	3 14	187 00
JN3	151 00	350 00	256 57	45 31	3 75	199 00
JN4	153 00	338 00	253 10	41 72	5 36	185 00
JN5	135 00	377 00	256 93	56 48	3 86	242 00
JN6	132 00	338 00	236 94	46 30	3 16	206 00
JN7	125 00	357 00	241 94	41 90	4 64	232 00
MEAN	144 00	350 57	**250 43**	46 76	**28 24**	206 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JF2, Recording 2

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	157 00	357 00	235 97	55 68	3 71	200 00
EC2	151 00	294 00	204 74	37 21	3 11	143 00
EC3	158 00	425 00	263 19	64 92	2 12	267 00
EC4	156 00	416 00	229 63	63 59	2 26	260 00
EC5	144 00	303 00	215 65	45 33	2 21	159 00
EC6	144 00	338 00	229 06	49 67	2 16	194 00
EC7	156 00	363 00	248 60	58 92	2 39	207 00
EC8	151 00	408 00	233 02	66 03	2 94	257 00
EC9	135 00	333 00	208 36	45 66	3 05	198 00
MEAN	150 22	359 67	**229 80**	54 11	**23 95**	209 44

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	166 00	363 00	257 18	49 66	3 27	197 00
EN2	148 00	224 00	178 76	14 76	1 38	76 00
EN3	168 00	333 00	238 67	45 77	1 98	165 00
EN4	157 00	259 00	199 50	20 96	2 42	102 00
EN5	170 00	307 00	238 71	39 36	2 59	137 00
EN6	141 00	281 00	206 64	27 04	2 78	140 00
EN7	158 00	338 00	239 41	32 93	4 24	180 00
MEAN	158 29	300 71	**222 70**	32 93	**18.66**	142 43

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	156 00	370 00	264 17	53 46	1 99	214 00
JC2	142 00	408 00	241 09	63 12	2 84	266 00
JC3	128 00	434 00	280 67	80 22	3 69	306 00
JC4	147 00	416 00	281 64	76 89	3 74	269 00
JC5	148 00	444 00	244 98	71 85	2 94	296 00
JC6	152 00	434 00	280 05	99 73	0 89	282 00
JC7	143 00	400 00	259 89	82 20	3 29	257 00
JC8	136 00	377 00	276 30	48 01	3 26	241 00
JC9	127 00	363 00	248 78	57 34	3 92	236 00
MEAN	142 11	405 11	**264 17**	70 31	**26 56**	263 00

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	156 00	357 00	273 52	51 01	4 66	201 00
JN2	148 00	384 00	244 90	57 86	3 00	236 00
JN3	137 00	377 00	255 88	54 11	3 62	240 00
JN4	133 00	350 00	262 80	49 18	5 56	217 00
JN5	140 00	400 00	266 65	68 82	4 22	260 00
JN6	141 00	357 00	242 20	58 46	3 53	216 00
JN7	147 00	357 00	249 60	49 28	4 55	210 00
MEAN	143 14	368 86	**256.51**	55 53	**29 14**	225 71

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject JF2, Recording 3

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	150 00	384 00	249 95	63 79	3 54	234 00
EC2	144 00	377 00	218 78	44 52	3 53	233 00
EC3	155 00	408 00	269 05	66 43	2 26	253 00
EC4	144 00	392 00	238 14	70 50	2 23	248 00
EC5	137 00	392 00	230 67	62 02	2 99	255 00
EC6	163 00	333 00	223 72	37 33	2 57	170 00
EC7	151 00	384 00	258 78	62 97	2 55	233 00
EC8	151 00	400 00	241 57	65 92	3 39	249 00
EC9	139 00	377 00	216 32	56 27	3 79	238 00
MEAN	148 22	383 00	**238 55**	58 86	**26 84**	234 78

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	160 00	344 00	247 23	48 12	3 11	184 00
EN2	128 00	246 00	169 94	17 29	1 37	118 00
EN3	161 00	370 00	246 89	56 72	2 25	209 00
EN4	122 00	317 00	204 19	39 13	2 95	195 00
EN5	169 00	333 00	241 83	41 51	2 48	164 00
EN6	125 00	250 00	198 21	26 77	2 40	125 00
EN7	166 00	333 00	238 04	31 34	4 27	167 00
MEAN	147 29	313 29	**220 90**	37 27	**18 80**	166 00

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	125 00	434 00	271 95	60 03	2 09	309 00
JC2	136 00	425 00	248 25	70 15	3 01	289 00
JC3	123 00	444 00	280 99	88 12	3 69	321 00
JC4	137 00	416 00	285 84	78 50	3 34	279 00
JC5	136 00	444 00	248 35	72 25	2 85	308 00
JC6	151 00	454 00	278 64	99 80	0 84	303 00
JC7	132 00	434 00	282 68	84 66	2 97	302 00
JC8	156 00	408 00	291 45	49 85	3 14	252 00
JC9	158 00	416 00	280 55	68 47	3 42	258 00
MEAN	139 33	430 56	**274.30**	74 65	**25.36**	291 22

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	149 00	357 00	274 30	49 22	4 51	208 00
JN2	125 00	370 00	239 87	54 41	2 97	245 00
JN3	136 00	392 00	249 38	55 82	3 76	256 00
JN4	125 00	363 00	265 21	51 96	5 62	238 00
JN5	145 00	384 00	263 35	66 28	4 11	239 00
JN6	136 00	333 00	232 68	49 58	3 37	197 00
JN7	145 00	363 00	245 63	47 33	4 53	218 00
MEAN	137 29	366 00	**252.92**	53 51	**28 87**	228 71

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JF3, Recording 1a

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	144 00	338 00	228 60	48 34	2 82	194 00
EC2	121 00	273 00	189 07	29 76	3 15	152 00
EC3	147 00	384 00	227 25	65 09	2 17	237 00
EC4	149 00	289 00	206 60	39 00	1 95	140 00
EC5	145 00	350 00	214 36	53 04	2 34	205 00
EC6	112 00	357 00	207 80	51 26	2 57	245 00
EC7	142 00	327 00	218 78	46 40	2 32	185 00
EC8	147 00	327 00	214 17	48 57	2 99	180 00
EC9	132 00	312 00	201 11	44 13	2 66	180 00
MEAN	137 67	328 56	**211.97**	47 29	**22 96**	190 89

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	158 00	377 00	251 35	62 82	3 70	219 00
EN2	139 00	281 00	199 28	35 40	1 40	142 00
EN3	148 00	444 00	267 74	65 85	3 15	296 00
EN4	148 00	303 00	221 06	30 59	3 21	155 00
EN5	141 00	408 00	235 63	63 21	3 17	267 00
EN6	163 00	307 00	213 57	38 27	2 95	144 00
EN7	157 00	408 00	233 70	48 71	5 38	251 00
MEAN	150 57	361 14	**231.76**	49 26	**22.96**	210 57

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	145 00	392 00	252 67	66 13	1 82	247 00
JC2	136 00	333 00	212 47	61 73	3 02	197 00
JC3	135 00	400 00	242 59	66 64	3 26	265 00
JC4	133 00	377 00	245 77	46 67	3 20	244 00
JC5	128 00	307 00	204 71	42 37	2 92	179 00
JC6	155 00	434 00	301 60	91 14	0 75	279 00
JC7	142 00	425 00	240 73	73 26	2 88	283 00
JC8	136 00	377 00	251 63	51 74	3 03	241 00
JC9	156 00	357 00	233 62	45 68	3 26	201 00
MEAN	140 67	378 00	**242.87**	60 60	**24 13**	237 33

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	108 00	370 00	263 55	54 78	4 53	262 00
JN2	138 00	384 00	240 04	63 33	3 70	246 00
JN3	111 00	317 00	220 37	51 66	3 78	206 00
JN4	126 00	350 00	246 86	48 61	5 28	224 00
JN5	130 00	363 00	241 75	63 89	3 80	233 00
JN6	148 00	338 00	217 74	50 77	3 34	190 00
JN7	134 00	338 00	217 22	46 65	4 87	204 00
MEAN	127 86	351 43	**235.36**	54 24	**29 30**	223 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JF3, Recording 1b

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	142 00	377 00	248 12	56 78	2 73	235 00
EC2	109 00	322 00	203 61	36 16	3 22	213 00
EC3	140 00	416 00	223 70	60 79	2 09	276 00
EC4	136 00	281 00	211 13	43 06	2 00	145 00
EC5	135 00	350 00	207 51	49 68	2 08	215 00
EC6	130 00	434 00	223 44	64 95	2 26	304 00
EC7	148 00	338 00	218 62	49 84	2 24	190 00
EC8	138 00	357 00	232 27	53 84	2 60	219 00
EC9	121 00	298 00	206 34	40 90	2 47	177 00
MEAN	133 22	352 56	**219 42**	50 67	**21 70**	219 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	155 00	370 00	250 63	60 58	3 64	215 00
EN2	139 00	270 00	197 54	35 81	1 48	131 00
EN3	161 00	434 00	256 40	69 29	2 43	273 00
EN4	136 00	289 00	224 97	31 91	3 41	153 00
EN5	165 00	333 00	229 76	49 54	2 87	168 00
EN6	168 00	266 00	210 68	32 02	2 63	98 00
EN7	141 00	384 00	221 43	43 41	5 01	243 00
MEAN	152 14	335 14	**227 34**	46 08	**21.46**	183 00

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	136 00	344 00	252 05	58 93	2 05	208 00
JC2	136 00	363 00	228 34	65 87	3 24	227 00
JC3	123 00	392 00	252 29	75 50	3 59	269 00
JC4	145 00	344 00	252 86	45 35	3 44	199 00
JC5	138 00	322 00	210 10	43 12	3 42	184 00
JC6	136 00	392 00	270 49	85 52	0 76	256 00
JC7	134 00	338 00	236 75	57 17	2 96	204 00
JC8	123 00	357 00	262 89	53 66	3 25	234 00
JC9	122 00	338 00	226 13	51 29	3 81	216 00
MEAN	132 56	354 44	**243 54**	59 60	**26 51**	221 89

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	128 00	357 00	253 66	54 09	4 84	229 00
JN2	149 00	384 00	228 18	58 82	3 34	235 00
JN3	130 00	344 00	221 85	48 41	3 65	214 00
JN4	117 00	370 00	240 23	49 42	5 89	253 00
JN5	137 00	344 00	240 70	58 03	3 83	207 00
JN6	144 00	307 00	221 79	47 18	3 31	163 00
JN7	141 00	312 00	213 66	37 25	4 67	171 00
MEAN	135 14	345 43	**231.44**	50 46	**29 53**	210 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject: JF3, Recording: 2

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	148.00	384.00	251.77	62.06	2.73	236.00
EC2	126.00	307.00	200.52	42.74	3.07	181.00
EC3	148.00	392.00	230.59	59.88	2.18	244.00
EC4	138.00	312.00	214.59	47.02	1.87	174.00
EC5	141.00	312.00	206.17	40.29	2.31	171.00
EC6	148.00	350.00	198.56	42.99	3.00	202.00
EC7	145.00	322.00	212.34	45.15	2.23	177.00
EC8	144.00	327.00	215.71	46.34	2.88	183.00
EC9	135.00	317.00	200.54	41.94	2.76	182.00
MEAN	141.44	335.89	**214.53**	47.60	**23.03**	194.44

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	148.00	363.00	242.76	55.63	4.18	215.00
EN2	136.00	285.00	197.76	41.59	1.62	149.00
EN3	130.00	400.00	246.58	60.07	2.33	270.00
EN4	112.00	285.00	221.33	30.95	3.05	173.00
EN5	147.00	377.00	225.99	55.17	3.21	230.00
EN6	121.00	266.00	197.56	30.35	2.98	145.00
EN7	121.00	357.00	214.03	41.15	5.35	236.00
MEAN	130.71	333.29	**220.86**	44.99	**22.72**	202.57

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	129.00	392.00	257.12	66.63	1.66	263.00
JC2	140.00	370.00	225.58	64.12	2.89	230.00
JC3	135.00	400.00	255.88	73.43	3.34	265.00
JC4	139.00	307.00	239.49	37.40	3.41	168.00
JC5	129.00	338.00	206.19	47.50	3.15	209.00
JC6	153.00	408.00	285.98	82.44	0.78	255.00
JC7	136.00	377.00	236.04	63.24	2.99	241.00
JC8	136.00	333.00	249.93	46.50	3.00	197.00
JC9	141.00	322.00	229.95	43.74	3.79	181.00
MEAN	137.56	360.78	**242.91**	58.33	**25.02**	223.22

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	125.00	357.00	250.31	54.61	4.41	232.00
JN2	149.00	377.00	230.94	58.74	3.44	228.00
JN3	137.00	312.00	222.24	44.72	3.80	175.00
JN4	125.00	350.00	239.74	48.02	5.88	225.00
JN5	145.00	370.00	243.77	62.61	4.01	225.00
JN6	125.00	322.00	222.44	47.18	3.49	197.00
JN7	137.00	317.00	213.66	38.70	4.78	180.00
MEAN	134.71	343.57	**231.87**	50.65	**29.81**	208.86

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JF3, Recording 3

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	150 00	327 00	230 08	55 26	2 80	177 00
EC2	140 00	307 00	194 72	34 55	3 73	167 00
EC3	141 00	370 00	225 29	63 52	2 15	229 00
EC4	140 00	298 00	209 07	41 13	2 10	158 00
EC5	141 00	338 00	211 11	49 35	2 59	197 00
EC6	139 00	377 00	210 86	54 45	2 27	238 00
EC7	142 00	338 00	218 20	51 02	2 35	196 00
EC8	137 00	317 00	213 55	47 17	2 76	180 00
EC9	137 00	281 00	211 59	43 38	2 71	144 00
MEAN	140 78	328 11	**213 83**	48 87	**23.46**	187 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	150 00	350 00	241 43	56 22	3 99	200 00
EN2	136 00	303 00	198 57	40 58	1 42	167 00
EN3	145 00	408 00	246 57	68 00	2 45	263 00
EN4	120 00	285 00	209 31	32 54	3 14	165 00
EN5	152 00	350 00	222 19	50 14	2 92	198 00
EN6	137 00	294 00	201 50	37 03	2 52	157 00
EN7	147 00	392 00	214 71	45 59	4 85	245 00
MEAN	141 00	340 29	**219 18**	47 16	**21.29**	199 29

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	136 00	363 00	235 39	59 64	1 95	227 00
JC2	128 00	333 00	215 75	55 56	3 28	205 00
JC3	117 00	392 00	259 99	79 65	3 65	275 00
JC4	125 00	317 00	233 32	40 93	3 59	192 00
JC5	134 00	298 00	199 96	44 95	3 55	164 00
JC6	141 00	416 00	270 19	88 42	0 77	275 00
JC7	145 00	357 00	235 32	57 17	3 44	212 00
JC8	138 00	357 00	250 45	45 89	3 16	219 00
JC9	145 00	338 00	225 32	49 29	3 91	193 00
MEAN	134 33	352 33	**236.19**	57 94	**27.28**	218 00

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	129 00	327 00	245 56	50 84	4 88	198 00
JN2	127 00	338 00	215 34	52 37	3 53	211 00
JN3	133 00	298 00	215 41	45 48	3 80	165 00
JN4	128 00	307 00	226 25	44 83	6 04	179 00
JN5	138 00	327 00	232 30	53 69	3 94	189 00
JN6	125 00	333 00	216 83	52 66	3 46	208 00
JN7	139 00	307 00	209 66	40 33	5 18	168 00
MEAN	131 29	319 57	**223.05**	48 60	**30.83**	188 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM1, Recording 1a

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	102 00	165 00	132 20	13 80	2 71	63 00
EC2	84 00	129 00	111 34	9 59	3 25	45 00
EC3	88 00	178 00	129 54	20 53	2 32	90 00
EC4	81 00	151 00	117 98	17 99	2 62	70 00
EC5	79 00	148 00	106 55	15 72	2 43	69 00
EC6	79 00	148 00	108 76	16 24	2 43	69 00
EC7	82 00	166 00	115 69	19 40	2 52	84 00
EC8	80 00	165 00	112 35	18 10	3 47	85 00
EC9	78 00	140 00	105 25	15 33	2 82	62 00
MEAN	83 67	154 44	**115.52**	16 30	**24 57**	70 78

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	79 00	157 00	121 94	18 61	3 21	78 00
EN2	80 00	137 00	102 93	15 44	1 28	57 00
EN3	84 00	163 00	127 67	19 74	2 44	79 00
EN4	89 00	144 00	113 65	12 60	2 41	55 00
EN5	84 00	150 00	117 43	17 89	2 93	66 00
EN6	83 00	141 00	112 44	13 21	2 65	58 00
EN7	76 00	138 00	114 60	11 64	4 61	62 00
MEAN	82 14	147 14	**115 81**	15 59	**19 52**	65 00

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	77 00	136 00	115 72	18 65	1 40	59 00
JC2	79 00	176 00	113 74	21 54	2 54	97 00
JC3	75 00	165 00	125 51	26 19	2 79	90 00
JC4	81 00	158 00	131 83	15 93	3 49	77 00
JC5	64 00	155 00	110 79	21 36	2 63	91 00
JC6	90 00	178 00	146 24	31 04	0 63	88 00
JC7	79 00	155 00	114 13	20 26	2 89	76 00
JC8	68 00	155 00	125 72	15 39	2 75	87 00
JC9	79 00	162 00	120 76	23 60	3 30	83 00
MEAN	76 89	160 00	**122.72**	21 55	**22 43**	83 11

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	77 00	157 00	137 54	17 40	3 56	80 00
JN2	73 00	180 00	126 34	24 03	2 99	107 00
JN3	80 00	181 00	129 18	19 38	3 63	101 00
JN4	86 00	175 00	137 65	20 26	5 01	89 00
JN5	74 00	181 00	147 42	24 96	3 71	107 00
JN6	81 00	176 00	126 16	24 41	2 75	95 00
JN7	69 00	178 00	133 29	21 35	3 91	109 00
MEAN	77 14	175 43	**133.94**	21 68	**25.54**	98 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM1, Recording 1b

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	100 00	166 00	130 18	16 06	2 83	66 00
EC2	64 00	134 00	107 44	16 07	3 25	70 00
EC3	84 00	168 00	121 91	19 93	2 24	84 00
EC4	81 00	148 00	115 18	17 92	2 56	67 00
EC5	72 00	145 00	112 07	16 65	2 35	73 00
EC6	81 00	170 00	119 09	17 75	2 51	89 00
EC7	68 00	150 00	106 18	18 02	2 33	82 00
EC8	75 00	160 00	109 36	21 41	2 90	85 00
EC9	69 00	139 00	101 62	16 71	2 75	70 00
MEAN	77 11	153 33	**113 67**	17 84	**23.72**	76 22

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	82 00	153 00	124 20	15 64	3 03	71 00
EN2	65 00	134 00	106 35	14 57	1 27	69 00
EN3	77 00	153 00	121 63	13 82	2 22	76 00
EN4	78 00	149 00	113 83	14 00	2 56	71 00
EN5	89 00	162 00	125 03	20 04	2 30	73 00
EN6	72 00	142 00	111 54	14 08	2 37	70 00
EN7	88 00	142 00	114 40	10 78	4 04	54 00
MEAN	78 71	147 86	**116.71**	14 70	**17 79**	69 14

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	77 00	170 00	129 35	27 25	1 52	93 00
JC2	69 00	173 00	119 52	28 17	2 57	104 00
JC3	82 00	185 00	130 24	23 76	2 92	103 00
JC4	83 00	180 00	141 74	21 10	3 17	97 00
JC5	68 00	160 00	118 77	19 83	2 47	92 00
JC6	84 00	178 00	140 14	26 76	0 69	94 00
JC7	75 00	186 00	122 48	29 11	2 71	111 00
JC8	82 00	163 00	137 21	16 65	2 83	81 00
JC9	75 00	172 00	127 28	24 08	3 44	97 00
MEAN	77 22	174 11	**129.64**	24 08	**22.31**	96 89

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	86 00	190 00	149 35	22 69	3 65	104 00
JN2	84 00	190 00	135 72	24 93	2 85	106 00
JN3	71 00	190 00	143 48	23 67	3 31	119 00
JN4	70 00	183 00	140 96	22 47	4 81	113 00
JN5	83 00	176 00	145 21	26 38	3 19	93 00
JN6	65 00	185 00	129 33	28 10	2 67	120 00
JN7	63 00	180 00	133 05	24 91	4 45	117 00
MEAN	74 57	184 86	**139.59**	24 74	**24 94**	110 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM1, Recording 2

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	94 00	166 00	127 51	16 89	2 99	72 00
EC2	84 00	142 00	112 44	15 97	3 79	58 00
EC3	92 00	168 00	125 75	18 62	2 06	76 00
EC4	85 00	152 00	118 04	17 60	2 34	67 00
EC5	67 00	148 00	111 98	17 83	1 96	81 00
EC6	84 00	166 00	119 10	19 04	2 55	82 00
EC7	82 00	166 00	119 38	17 98	2 33	84 00
EC8	88 00	162 00	119 64	19 08	2 50	74 00
EC9	78 00	156 00	114 48	17 06	2 46	78 00
MEAN	83 78	158 44	**118.70**	17 79	**22 98**	74 67

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	90 00	168 00	129 43	17 09	3 16	78 00
EN2	84 00	145 00	124 25	15 14	1 12	61 00
EN3	98 00	165 00	135 63	17 59	2 40	67 00
EN4	98 00	155 00	120 67	13 74	2 56	57 00
EN5	95 00	170 00	130 43	18 33	2 30	75 00
EN6	88 00	138 00	118 40	12 74	2 30	50 00
EN7	84 00	158 00	128 14	11 77	4 14	74 00
MEAN	91 00	157 00	**126 71**	15 20	**17 97**	66 00

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	83 00	173 00	133 56	24 52	1 65	90 00
JC2	86 00	178 00	129 98	25 71	2 72	92 00
JC3	81 00	188 00	137 51	25 33	2 96	107 00
JC4	87 00	165 00	139 13	16 37	3 19	78 00
JC5	88 00	162 00	122 40	20 72	2 62	74 00
JC6	90 00	200 00	155 51	35 80	0 73	110 00
JC7	81 00	170 00	123 75	22 34	2 79	89 00
JC8	97 00	173 00	142 15	17 11	3 06	76 00
JC9	81 00	185 00	132 08	25 78	3 64	104 00
MEAN	86 00	177 11	**135.12**	23 74	**23.35**	91 11

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	85 00	188 00	155 75	24 17	3 52	103 00
JN2	87 00	198 00	138 12	27 87	2 89	111 00
JN3	84 00	192 00	141 19	24 02	3 23	108 00
JN4	77 00	190 00	148 14	23 25	4 72	113 00
JN5	85 00	190 00	155 39	30 27	3 36	105 00
JN6	84 00	196 00	135 24	30 12	2 81	112 00
JN7	88 00	186 00	139 08	24 75	3 98	98 00
MEAN	84 29	191 43	**144.70**	26 35	**24 50**	107 14

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM1, Recording 3

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	97 00	168 00	134 71	16 50	2 39	71 00
EC2	76 00	160 00	115 46	17 63	3 03	84 00
EC3	82 00	188 00	129 86	24 73	1 95	106 00
EC4	83 00	157 00	118 63	20 36	1 96	74 00
EC5	63 00	156 00	110 94	20 27	1 87	93 00
EC6	83 00	172 00	116 44	21 47	2 35	89 00
EC7	86 00	178 00	124 24	18 28	2 39	92 00
EC8	88 00	170 00	118 26	22 26	2 96	82 00
EC9	63 00	155 00	107 61	18 38	2 91	92 00
MEAN	80 11	167 11	**119 57**	19 99	**21 82**	87 00

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	90 00	173 00	132 29	18 41	3 28	83 00
EN2	70 00	129 00	110 91	17 86	1 17	59 00
EN3	86 00	172 00	127 05	19 73	2 37	86 00
EN4	68 00	158 00	118 67	17 65	2 60	90 00
EN5	84 00	180 00	128 55	23 27	2 33	96 00
EN6	88 00	144 00	117 71	13 39	2 45	56 00
EN7	83 00	152 00	118 77	13 10	4 17	69 00
MEAN	81 29	158 29	**121.99**	17 63	**18 36**	77 00

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	82 00	180 00	135 52	27 51	1 53	98 00
JC2	72 00	181 00	129 42	30 45	2 45	109 00
JC3	81 00	180 00	134 59	27 65	2 72	99 00
JC4	79 00	168 00	140 20	19 58	3 07	89 00
JC5	66 00	165 00	118 18	22 77	2 63	99 00
JC6	95 00	210 00	159 29	36 35	0 70	115 00
JC7	77 00	175 00	126 45	26 22	2 57	98 00
JC8	91 00	169 00	137 28	15 82	2 79	78 00
JC9	80 00	202 00	132 37	31 11	3 31	122 00
MEAN	80 33	181 11	**134.81**	26 38	**21 76**	100 78

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	69 00	180 00	152 17	26 04	3 68	111 00
JN2	74 00	186 00	129 02	27 00	2 75	112 00
JN3	79 00	185 00	134 34	25 81	3 20	106 00
JN4	72 00	194 00	138 63	26 15	5 19	122 00
JN5	71 00	190 00	149 92	32 77	3 36	119 00
JN6	77 00	186 00	129 90	30 76	2 73	109 00
JN7	36 00	186 00	137 11	28 42	4 21	150 00
MEAN	68 29	186 71	**138.73**	28 14	**25 13**	118 43

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM2, Recording 1a

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	85 00	160 00	122 87	15 97	2 95	75 00
EC2	80 00	149 00	117 69	15 02	4 51	69 00
EC3	90 00	157 00	120 20	18 14	3 04	67 00
EC4	90 00	145 00	113 27	12 96	2 31	55 00
EC5	80 00	139 00	107 86	13 83	2 41	59 00
EC6	86 00	155 00	125 61	15 63	4 27	69 00
EC7	98 00	158 00	123 43	11 58	3 13	60 00
EC8	90 00	185 00	125 39	16 32	3 36	95 00
EC9	79 00	170 00	114 93	16 23	3 52	91 00
MEAN	86 44	157 56	**119 03**	15 08	**29.49**	71 11

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	101 00	200 00	151 74	20 33	4 37	99 00
EN2	82 00	168 00	130 75	17 68	1 78	86 00
EN3	112 00	178 00	144 23	16 48	3 28	66 00
EN4	96 00	173 00	134 27	12 61	4 53	77 00
EN5	112 00	176 00	141 97	13 86	3 55	64 00
EN6	82 00	166 00	131 57	18 40	2 96	84 00
EN7	90 00	190 00	139 86	14 67	7 20	100 00
MEAN	96 43	178 71	**139.20**	16 29	**27 66**	82 29

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	112 00	178 00	152 06	17 00	1 60	66 00
JC2	84 00	168 00	128 82	18 07	2 76	84 00
JC3	90 00	160 00	122 73	14 31	3 17	70 00
JC4	97 00	157 00	124 27	10 08	3 03	60 00
JC5	92 00	136 00	112 47	10 96	2 91	44 00
JC6	103 00	168 00	127 42	18 58	0 74	65 00
JC7	96 00	150 00	122 78	12 37	2 97	54 00
JC8	90 00	156 00	122 69	15 21	2 96	66 00
JC9	84 00	160 00	118 34	13 69	3 49	76 00
MEAN	94 22	159 22	**125.73**	14 47	**23 64**	65 00

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	97 00	163 00	133 43	14 62	4 80	66 00
JN2	81 00	153 00	117 08	13 48	3 48	72 00
JN3	93 00	138 00	116 88	8 54	4 53	45 00
JN4	99 00	160 00	121 01	10 40	5 51	61 00
JN5	92 00	161 00	124 08	13 36	4 46	69 00
JN6	83 00	143 00	115 21	12 06	3 26	60 00
JN7	81 00	152 00	116 29	12 23	6 00	71 00
MEAN	89 43	152 86	**120.57**	12 10	**32.03**	63 43

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject JM2, Recording 1b

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	91 00	190 00	143 53	20 31	2 78	99 00
EC2	86 00	181 00	135 64	18 55	4 17	95 00
EC3	96 00	178 00	130 10	19 55	2 70	82 00
EC4	85 00	162 00	124 70	20 20	2 64	77 00
EC5	82 00	161 00	117 36	17 81	2 73	79 00
EC6	86 00	161 00	126 46	18 80	3 34	75 00
EC7	96 00	181 00	139 73	18 48	2 83	85 00
EC8	90 00	168 00	131 91	16 95	3 32	78 00
EC9	85 00	162 00	122 81	15 81	3 74	77 00
MEAN	88 56	171 56	**130 25**	18 50	**28.25**	83 00

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	103 00	180 00	144 24	16 59	4 30	77 00
EN2	94 00	165 00	128 56	15 49	1 67	71 00
EN3	108 00	186 00	139 23	16 91	2 93	78 00
EN4	103 00	160 00	131 26	11 19	3 48	57 00
EN5	103 00	173 00	137 00	14 29	3 13	70 00
EN6	92 00	161 00	128 35	16 11	2 85	69 00
EN7	95 00	175 00	135 45	13 56	5 64	80 00
MEAN	99 71	171 43	**134 87**	14 88	**24 00**	71 71

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	103 00	161 00	129 04	11 78	1 53	58 00
JC2	90 00	145 00	111 12	12 81	2 79	55 00
JC3	85 00	152 00	109 60	11 44	3 26	67 00
JC4	98 00	141 00	113 50	9 34	3 11	43 00
JC5	93 00	153 00	109 27	14 00	3 01	60 00
JC6	94 00	153 00	125 73	18 56	0 87	59 00
JC7	91 00	144 00	110 83	10 35	2 98	53 00
JC8	82 00	141 00	104 70	12 07	2 90	59 00
JC9	83 00	178 00	107 17	17 85	3 24	95 00
MEAN	91 00	152 00	**113.44**	13 13	**23.69**	61 00

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	89 00	168 00	124 58	15 57	4 70	79 00
JN2	85 00	151 00	112 84	13 45	3 64	66 00
JN3	91 00	138 00	115 18	10 49	4 49	47 00
JN4	87 00	141 00	114 01	10 53	5 59	54 00
JN5	89 00	145 00	116 60	12 89	4 41	56 00
JN6	92 00	138 00	112 91	10 57	3 38	46 00
JN7	90 00	148 00	114 72	12 02	5 15	58 00
MEAN	89 00	147 00	**115.83**	12 22	**31 36**	58 00

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

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Subject JM2, Recording 2

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	100 00	190 00	137 97	17 48	2 69	90 00
EC2	84 00	161 00	124 44	13 67	4 32	77 00
EC3	93 00	162 00	122 26	15 40	2 26	69 00
EC4	88 00	145 00	117 35	12 01	2 33	57 00
EC5	83 00	143 00	112 67	13 62	2 40	60 00
EC6	78 00	162 00	120 31	16 85	3 07	84 00
EC7	93 00	153 00	120 53	12 68	2 87	60 00
EC8	97 00	157 00	119 47	12 27	3 27	60 00
EC9	78 00	145 00	109 28	14 53	3 34	67 00
MEAN	88 22	157 56	**120 48**	14 28	**26 55**	69 33

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	97 00	183 00	142 42	17 88	4 18	86 00
EN2	96 00	152 00	127 69	14 75	1 73	56 00
EN3	110 00	170 00	139 19	13 13	2 76	60 00
EN4	104 00	165 00	127 99	10 62	3 74	61 00
EN5	106 00	170 00	134 51	13 95	3 01	64 00
EN6	83 00	155 00	122 56	15 80	2 97	72 00
EN7	78 00	166 00	128 33	12 51	5 57	88 00
MEAN	96 29	165 86	**131.81**	14 09	**23.94**	69 57

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	97 00	158 00	128 53	13 79	1 57	61 00
JC2	82 00	151 00	110 99	16 29	2 69	69 00
JC3	80 00	160 00	113 71	15 28	3 33	80 00
JC4	98 00	158 00	118 85	9 30	2 99	60 00
JC5	81 00	166 00	111 35	18 41	2 93	85 00
JC6	98 00	157 00	124 17	14 38	0 75	59 00
JC7	90 00	135 00	113 42	11 03	2 95	45 00
JC8	79 00	176 00	114 77	19 92	3 08	97 00
JC9	85 00	156 00	114 60	13 62	3 32	71 00
MEAN	87 78	157 44	**116 71**	14 67	**23 61**	69 67

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	94 00	163 00	128 73	15 02	4 84	69 00
JN2	88 00	157 00	118 32	13 21	3 62	69 00
JN3	86 00	139 00	116 94	9 93	4 94	53 00
JN4	86 00	151 00	116 77	11 99	5 94	65 00
JN5	89 00	149 00	117 48	13 75	3 99	60 00
JN6	89 00	145 00	112 09	10 96	3 54	56 00
JN7	83 00	151 00	115 96	12 94	4 53	68 00
MEAN	87 86	150 71	**118.04**	12 54	**31.40**	62 86

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM2, Recording 3

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	111 00	190 00	154 43	18 21	2 85	79 00
EC2	101 00	170 00	140 08	14 76	3 94	69 00
EC3	100 00	176 00	132 51	18 91	2 30	76 00
EC4	96 00	161 00	128 91	16 06	2 34	65 00
EC5	80 00	161 00	120 44	16 33	2 50	81 00
EC6	94 00	172 00	134 55	17 24	2 97	78 00
EC7	109 00	181 00	136 77	14 69	3 13	72 00
EC8	99 00	161 00	128 87	11 07	2 96	62 00
EC9	86 00	151 00	119 75	13 83	3 05	65 00
MEAN	97 33	169 22	**132.92**	15 68	**26 03**	71 89

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	105 00	196 00	156 04	18 99	4 52	91 00
EN2	93 00	176 00	137 69	18 54	1 68	83 00
EN3	104 00	181 00	147 53	17 32	2 92	77 00
EN4	105 00	173 00	135 29	13 04	3 49	68 00
EN5	104 00	180 00	143 91	14 12	3 50	76 00
EN6	87 00	175 00	141 24	18 83	3 42	88 00
EN7	87 00	166 00	140 89	13 13	5 51	79 00
MEAN	97 86	178 14	**143 23**	16 28	**25.05**	80 29

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	99 00	163 00	132 85	13 87	1 61	64 00
JC2	78 00	151 00	113 64	15 83	2 75	73 00
JC3	80 00	166 00	113 72	15 46	3 17	86 00
JC4	88 00	144 00	115 89	9 93	3 13	56 00
JC5	89 00	156 00	109 41	13 06	3 27	67 00
JC6	97 00	144 00	121 40	13 03	0 78	47 00
JC7	94 00	145 00	116 34	9 83	3 50	51 00
JC8	88 00	165 00	114 33	16 22	3 00	77 00
JC9	88 00	157 00	118 28	14 85	3 73	69 00
MEAN	89 00	154 56	**117 32**	13 56	**24 93**	65 56

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	87 00	169 00	131 83	16 09	4 32	82 00
JN2	88 00	157 00	119 20	13 22	3 44	69 00
JN3	90 00	149 00	118 41	11 63	4 23	59 00
JN4	85 00	153 00	120 48	12 82	5 77	68 00
JN5	89 00	160 00	122 74	15 76	3 76	71 00
JN6	93 00	141 00	117 32	11 16	4 30	48 00
JN7	84 00	148 00	119 52	12 99	4 82	64 00
MEAN	88 00	153 86	**121.36**	13 38	**30.64**	65 86

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM3, Recording 1a

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	66 00	129 00	99 78	14 38	2 39	63 00
EC2	72 00	116 00	88 83	10 85	3 06	44 00
EC3	66 00	124 00	97 23	13 66	1 95	58 00
EC4	74 00	121 00	98 18	11 85	3 27	47 00
EC5	68 00	113 00	93 61	9 58	2 11	45 00
EC6	79 00	116 00	95 55	10 21	3 32	37 00
EC7	78 00	120 00	99 21	10 56	2 37	42 00
EC8	74 00	108 00	92 04	7 18	3 48	34 00
EC9	69 00	112 00	88 86	8 58	3 54	43 00
MEAN	71 78	117 67	**94 81**	10 76	**25.48**	45 89

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	63 00	125 00	95 40	11 73	4 08	62 00
EN2	71 00	110 00	91 24	7 68	1 37	39 00
EN3	75 00	118 00	92 71	9 73	2 50	43 00
EN4	71 00	96 00	85 64	5 04	3 21	25 00
EN5	66 00	111 00	89 33	9 34	2 95	45 00
EN6	70 00	99 00	84 96	5 79	2 37	29 00
EN7	71 00	118 00	87 74	7 04	5 29	47 00
MEAN	69 57	111 00	**89 57**	8 05	**21 77**	41 43

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	78 00	118 00	96 43	9 28	1 82	40 00
JC2	65 00	128 00	92 56	12 76	2 69	63 00
JC3	66 00	142 00	92 20	11 06	4 41	76 00
JC4	69 00	116 00	96 94	7 97	3 24	47 00
JC5	68 00	107 00	88 91	8 01	2 59	39 00
JC6	78 00	119 00	102 27	12 49	0 68	41 00
JC7	70 00	109 00	91 13	9 66	2 69	39 00
JC8	56 00	114 00	93 96	14 22	3 23	58 00
JC9	69 00	112 00	93 98	10 76	3 09	43 00
MEAN	68 78	118 33	**94.26**	10 69	**24 43**	49 56

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	74 00	122 00	99 13	11 29	3 58	48 00
JN2	58 00	123 00	90 72	12 48	3 03	65 00
JN3	72 00	112 00	92 14	7 34	3 42	40 00
JN4	68 00	114 00	94 55	9 39	5 19	46 00
JN5	69 00	126 00	97 17	10 55	3 04	57 00
JN6	71 00	123 00	97 97	10 38	3 01	52 00
JN7	68 00	121 00	91 83	8 14	4 40	53 00
MEAN	68 57	120 14	**94.79**	9 94	**25 68**	51 57

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM3, Recording 1b

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	63 00	119 00	98 20	9 65	2 70	56 00
EC2	74 00	114 00	91 85	7 80	3 75	40 00
EC3	50 00	117 00	92 00	12 93	3 63	67 00
EC4	52 00	118 00	91 58	13 25	2 01	66 00
EC5	54 00	105 00	89 85	9 56	2 25	51 00
EC6	76 00	112 00	91 29	9 15	2 74	36 00
EC7	76 00	119 00	95 70	11 16	2 11	43 00
EC8	58 00	128 00	89 89	10 43	2 67	70 00
EC9	74 00	112 00	90 04	7 44	2 97	38 00
MEAN	64 11	116 00	**92 27**	10 15	**24.84**	51 89

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	74 00	114 00	93 23	9 80	3 80	40 00
EN2	71 00	103 00	85 05	4 88	1 24	32 00
EN3	65 00	114 00	89 72	11 43	2 26	49 00
EN4	68 00	104 00	82 52	5 98	2 09	36 00
EN5	71 00	106 00	90 26	7 16	3 58	35 00
EN6	62 00	104 00	83 16	7 24	2 80	42 00
EN7	71 00	108 00	88 09	6 53	5 18	37 00
MEAN	68 86	107 57	**87.43**	7 57	**20 95**	38 71

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	80 00	130 00	102 34	10 89	1 53	50 00
JC2	59 00	123 00	92 64	14 41	2 62	64 00
JC3	77 00	135 00	98 67	13 21	3 07	58 00
JC4	53 00	116 00	96 07	11 67	3 25	63 00
JC5	62 00	112 00	92 83	9 23	2 46	50 00
JC6	74 00	121 00	99 56	14 53	0 68	47 00
JC7	64 00	116 00	97 55	10 59	2 67	52 00
JC8	77 00	111 00	94 71	8 55	2 79	34 00
JC9	68 00	134 00	97 19	11 80	3 03	66 00
MEAN	68 22	122 00	**96 84**	11 65	**22 09**	53 78

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	69 00	125 00	100 40	10 50	3 39	56 00
JN2	71 00	133 00	95 41	10 28	2 94	62 00
JN3	72 00	116 00	97 93	9 01	3 24	44 00
JN4	73 00	130 00	98 18	10 68	5 35	57 00
JN5	74 00	121 00	98 54	11 06	3 10	47 00
JN6	77 00	116 00	99 70	9 43	2 76	39 00
JN7	77 00	124 00	98 09	6 82	4 09	47 00
MEAN	73 29	123 57	**98.32**	9 68	**24 86**	50 29

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

SFF WORKSHEET

Subject JM3, Recording 2

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	70 00	119 00	94 31	11 90	2 91	49 00
EC2	63 00	110 00	84 15	8 17	4 07	47 00
EC3	72 00	127 00	92 40	11 42	2 33	55 00
EC4	69 00	102 00	88 90	7 85	2 00	33 00
EC5	67 00	105 00	86 53	8 74	2 28	38 00
EC6	68 00	108 00	84 63	10 36	3 11	40 00
EC7	57 00	114 00	89 71	11 29	2 93	57 00
EC8	71 00	112 00	89 20	9 71	2 75	41 00
EC9	71 00	99 00	85 90	6 58	2 56	28 00
MEAN	67 56	110 67	**88.41**	9 56	**24 94**	43 11

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	71 00	118 00	93 62	10 50	4 03	47 00
EN2	72 00	99 00	83 27	5 92	1 33	27 00
EN3	69 00	106 00	88 90	8 39	2 25	37 00
EN4	64 00	109 00	85 84	8 03	2 59	45 00
EN5	60 00	112 00	91 39	9 52	2 99	52 00
EN6	63 00	109 00	88 08	7 91	2 31	46 00
EN7	68 00	113 00	91 71	9 05	4 84	45 00
MEAN	66 71	109 43	**88 97**	8 47	**20.34**	42 71

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	74 00	117 00	91 64	9 30	1 78	43 00
JC2	64 00	121 00	91 64	13 47	3 33	57 00
JC3	64 00	124 00	92 57	12 49	3 42	60 00
JC4	72 00	111 00	94 50	7 94	3 26	39 00
JC5	71 00	109 00	88 63	9 25	2 89	38 00
JC6	69 00	111 00	93 68	12 55	0 80	42 00
JC7	71 00	115 00	90 73	11 02	3 38	44 00
JC8	76 00	112 00	95 58	8 62	3 55	36 00
JC9	63 00	117 00	93 62	11 06	3 50	54 00
MEAN	69 33	115 22	**92.51**	10 63	**25.91**	45 89

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	68 00	110 00	92 58	10 32	4 03	42 00
JN2	67 00	112 00	85 11	10 46	3 13	45 00
JN3	66 00	109 00	90 57	9 91	3 34	43 00
JN4	67 00	118 00	91 41	9 53	5 80	51 00
JN5	69 00	115 00	95 37	11 91	3 44	46 00
JN6	64 00	109 00	90 21	10 58	3 23	45 00
JN7	68 00	118 00	90 54	9 63	4 25	50 00
MEAN	67 00	113 00	**90 83**	10 33	**27 22**	46 00

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence.

SFF WORKSHEET

Subject JM3, Recording 3

English Children's Story (EC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EC1	70 00	131 00	99 28	11 97	2 57	61 00
EC2	67 00	112 00	87 40	8 38	3 33	45 00
EC3	56 00	125 00	93 04	13 97	2 12	69 00
EC4	70 00	111 00	93 20	10 12	1 81	41 00
EC5	71 00	109 00	92 23	10 27	1 97	38 00
EC6	70 00	138 00	90 78	13 10	2 13	68 00
EC7	56 00	126 00	91 15	12 09	3 04	70 00
EC8	65 00	111 00	92 59	10 71	2 55	46 00
EC9	64 00	109 00	87 04	9 04	2 42	45 00
MEAN	65 44	119 11	**91.86**	11 07	**21 93**	53 67

English News Article (EN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
EN1	67 00	125 00	99 08	11 65	3 90	58 00
EN2	80 00	108 00	91 61	6 04	1 26	28 00
EN3	75 00	115 00	95 48	9 89	2 23	40 00
EN4	75 00	106 00	90 83	7 73	2 23	31 00
EN5	69 00	125 00	93 12	12 38	2 51	56 00
EN6	70 00	121 00	91 64	10 69	2 20	51 00
EN7	66 00	115 00	92 23	9 18	4 66	49 00
MEAN	71 71	116 43	**93 43**	9 65	**19 00**	44 71

Japanese Children's Story (JC)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JC1	70 00	126 00	99 06	11 86	1 56	56 00
JC2	74 00	116 00	95 12	12 94	3 23	42 00
JC3	73 00	110 00	95 77	10 54	3 18	37 00
JC4	62 00	122 00	96 53	11 37	2 95	60 00
JC5	71 00	119 00	96 42	10 46	2 48	48 00
JC6	68 00	119 00	99 14	14 55	0 69	51 00
JC7	69 00	126 00	96 35	10 86	2 66	57 00
JC8	75 00	116 00	95 84	8 77	2 77	41 00
JC9	69 00	125 00	101 15	11 59	3 18	56 00
MEAN	70 11	119 89	**97.26**	11 44	**22 70**	49 78

Japanese News Article (JN)

	MIN (Hz)	MAX (Hz)	MEAN (Hz)	SD (Hz)	SP DUR (s)	RANGE (Hz)
JN1	68 00	136 00	104 50	12 18	4 19	68 00
JN2	71 00	124 00	93 25	11 32	2 91	53 00
JN3	76 00	129 00	98 31	12 42	3 17	53 00
JN4	72 00	129 00	100 17	11 03	5 19	57 00
JN5	71 00	124 00	100 41	14 58	3 07	53 00
JN6	76 00	119 00	97 95	10 59	2 83	43 00
JN7	71 00	122 00	98 75	9 41	3 97	51 00
MEAN	72 14	126 14	**99.05**	11 65	**25 33**	54 00

* The last row of the SP DUR column in the tables shows the sum of the speech durations of each sentence

Appendix C

Japanese Children's Story

はなさかじいさん

むかしむかし、あるところに／しょうじきなおじいさんとおばあさんが、住んでいました。／ポチという犬をかって、子供のようにかわいがっていました。／

ポチは、小犬のとき、道ばたに捨てられていたのを、／おじいさんとおばあさんがひろってそだてたのです。／

ある日のこと、／おじいさんが、くわをかついて、畑に行こうとすると、／ポチがかけてきて、着物をくわえて引っ張りました。／

ポチは、裏の畑のすみに、おじいさんをつれて行きました。

Japanese News Article

NHK ニュース

今月２４日、アメリカのカリフォルニア州サクラメント市郊外で、／神戸の菓品会社の一行２２人が乗ったバスが／拳銃を持った２人組に襲われ、現金を奪われた事件で、／カリフォルニア州知事とサンフランシスコ市長が　ツアーの一行に謝罪の手紙を送りました。／

カリフォルニア州では、去年八月サンフランシスコ郊外で／日本人の留学生が撃たれて死亡する事件も起きており、／この手紙は、カリフォルニア州の　イメージの低下を心配したものとみられています。

English translation of the Japanese samples

Hanasakajiisan (Children's story)

Once upon a time, an honest old man and woman lived in the country They kept a dog named "Pochi", and loved the dog like their child

Pochi was abandoned beside a street when he was a puppy The old man and woman found, and raised him

One day, when the old man tried to go to a field carrying a hoe on his shoulder, Pochi ran at him and pulled his kimono holding in his mouth

Pochi took the old man to the corner of the field

NHK News (News article)

On the 24th of this month, in a suburb of Sacramento, California, in the United States, a bus carrying 22 pharmaceutical employees from Kobe was robbed by two gun-men The governor of California and the mayor of San Francisco sent a letter of apology to the tour participants

Also in California, last summer in a suburb of San Francisco, a Japanese student was shot to death The letter was delivered because officials seemed worried about the deterioration of the image of California

Japanese Children's Story

はなさかじいさん

1 むかしむかし、あるところに

2 しょうしきなおじいさんとおばあさんが、すんでいました。

3 ポチといういぬをかって、こどものようにかわいがっていました。

4 ポチは、こいぬのとき、みちばたにすてられていたのを

5 おじいさんとおばあさんがひろってそだてたのです。

6 あるひのこと

7 おじいさんが、くわをかついて、はたけにいこうとすると、

8 ポチがかけてきて、きものをくわえてひっぱりました。

9 ポチは、うらのはたけのすみに、おじいさんをつれていきました。

Japanese News Article

NHK ニュース

1 こんげつにじゅうよっか、アメリカのカリフォルニアしゅうサクラメントし こうがいて

2 こうべのやくひんがいしゃのいっこうにじゅうにんがのったバスが

3 けんしゅうをもったにんくみにおそわれ、げんきんをうばわれたじけんて、

4 カリフォルニアしゅうちじとサンフランシスコしちょうが ツアーのいっこうにしゃざいのてがみをおくりました。

5 カリフォルニアしゅうては、きょねんはちがつサンフランシスコこうがいて

6 にっぽんじんのりゅうがくせいがうたれてしぼうするしけんもおきており、

7 このてがみは、カリフォルニアしゅうのイメージのていかをしんぱいしたものとみられています。

Appendix D

English Children's story

The Three Bears (Children's story)

Once upon a time there were three bears / who lived together in a house of their own in the woods / One of them was a wee little bear,/ and one was a middle-sized bear / and the other was a great big bear /

They each had a bowl for their porridge /-- a little bowl for the wee little bear,/ a middle-sized bowl for the middle-sized bear,/ and a great big bowl for the great big bear

English News Article

CBC News World

The federal government saw thousands of dollars in tax revenue / go up in smoke today / Hundreds of cartons of smuggled cigarettes / went on sale tax-free in northern Quebec /

Store owners are openly defying the law / to protest the high taxes on cigarettes / Ottawa is considering several solutions including cutting cigarette taxes

Appendix E

Questionnaire (English)

Date _____ Time _____
Rec Site: UVic Linguistics Phonetics Laboratory

1 Identification number _____ 2 Sex: a) Male b) Female
3 Birth date _____
4 Height _____ 5 Weight _____
6 Birthplace (Prefecture/province & Country)
_____
7 What dialect of English do you speak?
a) Canadian b) American c) British d) Other _____
Any further specification
_____
8 How long have you been studying Japanese?
_____
9 Have you ever lived in a country where your second language is spoken?
a) Yes Duration _____
Place _____
b) No
10 Do you speak any other language(s)? (Please list)
_____
11 Do you smoke? a) Yes b) No
12 Have you ever received speech or singing training?
a) Yes b) No
Further specification (eg how long?) _____
13 Do you have a cold now, or have any kind of illness which affects your throat?
a) Yes b) No
14 What is your occupation?
a) Student (year) _____
b) other _____

Thank you for your cooperation

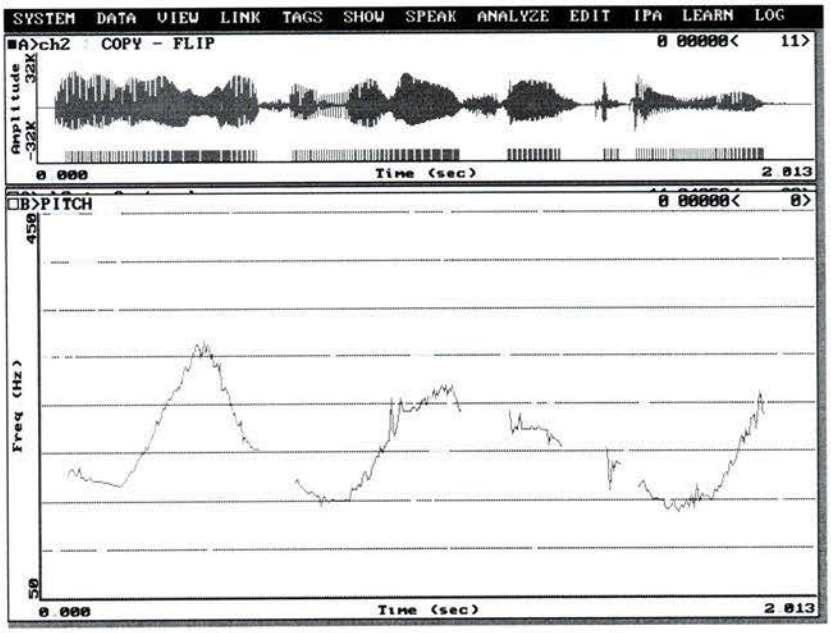
Questionnaire (Japanese)

Date _____ Time _____
Rec Site UVic Linguistics Phonetics Laboratory

1 Identification number _____ 2 Sex a) Male b) Female
3 Birth date _____
4 Height _____ 5 Weight _____
6 Birthplace (Prefecture/province & Country)
_____
7 What dialect of Japanese do you speak?
a) Tokyo b) Kansai c) Kyuushuu d) Toohoku
e) Other _____
Any further specification
_____
8 How long have you been studying English?
_____
9 Have you ever lived in a country where your second language is spoken?
a) Yes Duration _____
Place _____
b) No
10 Do you speak any other language(s)? (Please list)
_____
11 Do you smoke? a) Yes b) No
12 Have you ever received speech or singing training?
a) Yes b) No
Further specification (eg how long?) _____
13 Do you have a cold now, or have any kind of illness which affects your throat?
a) Yes b) No
14 What is your occupation?
a) Student (year) _____
b) other _____

Thank you for your cooperation

Appendix F



Subject JF3
Recording 2
Text English children's story
Sentence EC4 "and one was a middle-sized bear"

VITA

Surname Muta Given Names Yoshinobu

Place of Birth Omura, Nagasaki Date of Birth April 6, 1960

Educational Institutions Attended

University of Victoria	1991 to 1994
Aoyama Gakuin University, Tokyo	1986 to 1990
Kyoto School of Computer Science, Kyoto	1979 to 1982

Degrees Awarded

B A	Aoyama Gakuin University, Tokyo	1990
Diploma in Information Engineering	Kyoto School of Computer Science, Kyoto	1982

Honours and Awards

Publications

Cross-cultural and cross-gender SFF study Japanese and English *Working Papers of the Linguistics Circle of the University of Victoria, 12*, 39-47, 1994

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Title of Thesis/Dissertation:

Pitch Variation between L1 and L2: a Cross-Cultural/Gender Comparison - Japanese and English

Author [redacted]
(Signature)

YOSHINOBU MUTA
(Name in Block Letters)

January 11, 1995
(Date)