DURATIONAL DIMENSIONS OF ENGLISH SYNTAX SPOKEN BY VIETNAMESE SPEAKERS

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SPOKEN BY VIETNAMESE SPEAKERS

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PREFACE

Temporal dimensions of English syntax as spoken by native Vietnamese speakers were studied. The durations of pausal, vowel, and utterance lengths were taken from a sentence within the "Rainbow Passage" and measured spectrographically. The measures from the Vietnamese and English groups were compared and found to differ significantly. The durations were significantly longer when spoken by the Vietnamese subjects.

I wish to express my sincere gratitude to the individuals who assisted me in this study and encouraged me throughout my education at Oklahoma State University. I would like to thank my thesis adviser, Dr. Arthur L. Pentz, Jr., for his continuous guidance. I would also like to thank the other committee members, Dr. Nancy Monroe and Dr. Guy Bailey for their additional advice.

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CHAPTER I

INTRODUCTION

When the Vietnam War ended in April, 1975, more than 150,000 Vietnamese people fled to the United States (Montero, 1979). Vietnamese people left behind a familiar way of life and came to a place where the language, customs, and lifestyles were different. Many learned the English language in order to socialize, gain employment, and become better assimilated. Since 1975, more Vietnamese are arriving in the U.S. either as refugees or as a result of family sponsorship. They too must learn English in order to communicate with others.

Despite being in the United States for several years, some Vietnamese speakers continue to have problems speaking English. Some of those difficulties can be due to differences between English and the native language. There are many features of the Vietnamese language that make it strikingly different from English.

First is that all Vietnamese words are monosyllabic and composed of vowels that are somewhat different than vowels used in English. The Vietnamese vowel may be simple, having one vowel sound, or complex, having 2 vowel sounds produced as a diphthong. There are 11 single vowels which are used alone or with diacritic marks. They are described as follows:

vowel	sound	example	definition
a	as in "ah"	ma	ghost
ă	as in "ah" with a rising tone	ăn	eat
â	as in "ah" with a high rising tone	ân	grace
e	as in "air"	xe	car
ê	as in "day"	lên	up
i,y	as in "see"	bi	marble
		ly	glass
o	as in "saw"	lo	worry
ô	as in "oh"	tô	bowl
ở	as in "dove"	bở	butter
u	as in "you"	thu	fall
ư	as in "book" without rounded lips	hư	spoiled

The following are examples of diphthongs where the pronunciation of the vowels together make up a sound (Nguyen, 1979). This is not an exhaustive list.

diphthong	sound	example	definition
ai	/aI/	tai	ear
ao	/aU/	cao	high
au	/ɔw/	mau	fast
ay	/eI/	tay	hand
âu	/aU:/	câu	sentence
eo	/ɛw/	keo	glue
ia	/I/	bia	beer
iêc	/Ik/	xiếc	circus
iêu	/Iw/	tiêu	pepper

A second major difference between the two languages is that Vietnamese does not contain the syllable stress patterns of English. In polysyllabic words, emphasis is given to one syllable over others. For example, stress is given to the second syllable in the word "depo<u>s</u>it", and the third syllable in "occu<u>pa</u>tion". Vietnamese, with only monosyllabic words, uses no syllable stress ("Refugee Education Guides: Teaching English to Speakers of Vietnamese," 1981). Words such as "tai", "cao" and

"keo" as used above are typical of all Vietnamese words that are composed of only one syllable.

The third feature of the Vietnamese language that makes it radically different from English is that Vietnamese is a tonal language. Words with unrelated meanings may have the same sound combinations but different tones of voice are used to produce them. More simply put, word differences can be expressed solely by the tone used (Nguyen, 1979). In English, tonal variations are also used, but only to indicate intonational patterns ("Refugee Education Guides: Teaching English to Speakers of Vietnamese", 1981).

Intonation refers to the vocal pitch contour of an utterance and it can be heard when the fundamental frequency changes from syllable to syllable (Bernthal & Bankson, 1988). The vocal pitch contour may rise on the word that carries the central idea being expressed by the speaker. Usually, the contour rises at the end to indicate questions and falls to indicate statements. The intention of the utterance whether it be a comment, question, exclamation, or declaration can be expressed by intonational patterns that do not alter the basic meaning of the word(s) used. For instance, in the one-word sentences <u>This?</u> and <u>This!</u>, the comparison between tone and intonation can be more clearly made. These sentences would be said using different intonations to express

different semantic ideas; however, there is no difference in meaning between the actual words of the two sentences.

In contrast, when Vietnamese words are expressed in different tones, the meaning will be unrelated. Tone refers to the pitch variations that affect the lexical meaning of a word. Vietnamese is described as a "contour tone language" where the tones cannot be easily described in terms of single points on the pitch range; but instead, utilize gliding movements (Ladefoged, 1975). The pitch may glide and vary among the mid-level, high-rising, low-falling, mid-rising, low-up rising, and low rising points. Although Vietnamese is essentially one language, it is spoken differently by the people of the three parts of the country. There are three dialects of Vietnamese: Northern, Central, and Southern. This paper will focus on the six-tones of the Northern dialect. The six pitch tones are:

mid level a	high rising á	low falling à
mid rising ả	low uprising ã	low rising ạ

To illustrate how different tones can change the meaning of words spelled the same, the following words, although spelled the same, are pronounced with different tones as indicated by the diacritic marks:

ma means ghost mả means tomb

má means cheek mã means horse

mạ means rice seedling mà is a grammatical term

The pronunciation of each of the words differs only in the tone of voice used; therefore, in order to relate the appropriate meaning, each must be pronounced with its proper tone.

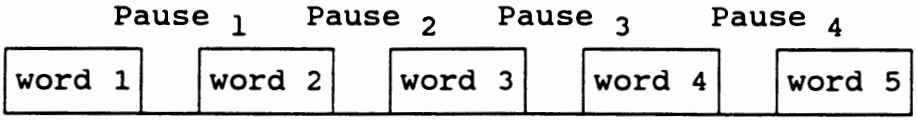
People learning to speak a foreign language often make mistakes which are carry-overs from their native tongue. For example, a listener can often recognize differences between French, German, or Australian accents in English. A foreign accent may be intriguing and pleasant, but when communication is hampered, it can be handicapping. Therefore, a student of a second language must learn to pronounce English well enough to be readily understood. Along with learning word meanings and pronunciations, the student must also learn how to combine words into sentences to express his/her thoughts. The learners' knowledge of English semantics, phonology, and syntax will enable them to develop fluency by mastering the structures of the language ("Refugee Education Guides: Teaching English to Speakers of Vietnamese", 1981).

Aside from general descriptions of the Vietnamese language and how it differs from English, little focus has been placed on the specific suprasegmental aspect of duration as ot relates to stress when Vietnamese speak

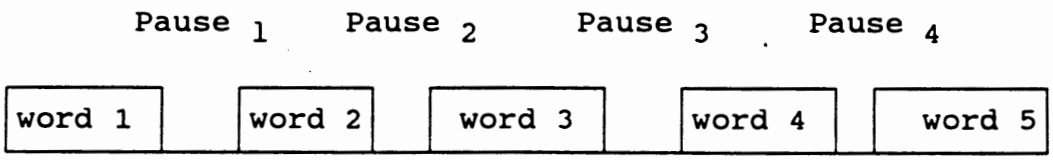
English. The paucity of material reflects the lack of research in this area.

Several pilot tape recordings of Vietnamese speakers reading an English text were obtained by the investigator. The preliminary recordings indicated that vowel duration and pause time was increased. The following diagram is a rough illustration of the difference in the vowel duration, and pause length of two American speakers and preliminary subjects.

American:



Vietnamese:



The diagrams show that the differences occurred in the utterance length, pausal length, and vowel duration. The vowels were lengthened and the pauses were increased by the Vietnamese speakers which caused the utterance length to increase; therefore, these features will be studied in the Vietnamese population.

Research in speech-language pathology has not typically focused on multicultural populations. However, communication specialists are becoming more aware of the changing make-up of our population (Cole, 1989). The 1990

United States Population Statistics as described by Battle indicates that Asian/Pacific Islanders make up 2.78% of the population (Battle, 1993). Of that population, Vietnamese-Americans comprise a major portion.

The extent in which the Vietnamese use the English language to become assimilated in the American way of life varies from person to person. However, as the existing population becomes more familiar with the English language, more information regarding specific speaking characteristics will help the refugees who came in the 1970's and 1980's and the Vietnamese immigrants who continue to come. In schools, churches, public offices, and work places, Vietnamese must be able to speak with their American counterparts. The ability to meet other nationals, make friends, find a job, and learn the history and culture of the American people will increase as English proficiency improves (Strouse, 1988). For the Vietnamese that have learned English vocabulary and syntax, reducing the accent would help to increase intelligibility and self confidence in effectiveness of speech.

As the Vietnamese population grows, more information pertaining to the unique language is needed. Data regarding temporal dimensions will be valuable in accent reduction therapy and will provide a knowledge base for

further research. The purpose of this study is to describe the temporal dimensions of English syntax when spoken by Vietnamese speakers.

CHAPTER II

METHODS

Subjects

Subjects included forty college-aged students, consisting of eleven male and eleven female native Vietnamese speakers, and eighteen female native English speakers. The native English data set was extracted from a larger sample gathered previously (Linton, 1991). All subjects in that sample met the same criteria as the native Vietnamese speakers in the present investigation. A native Vietnamese speaker in this study was defined as a person whose first language is Vietnamese and whose family speaks it in the home.

Each subject participated in the informed consent process by reading information about the study and signifying their permission to be engaged as a human subject. Each volunteer completed a questionnaire requesting information about age and any history of a communication disorder. The subjects did not participate if they were taking any medications directed at remediation of a medical problem, or if they presented evidence of a communication disorder or voice pathology.

Each potential subject participated in a hearing screening, which was conducted in an acoustically treated auditory test suite. The experimenter screened at 15 dB

HLT for the frequencies of 500 Hz., 1000 Hz., 2000 Hz., 4000 Hz., and 6000 Hz. A subject did not participate further if he/she failed to pass the screening at the designated intensity level for the frequencies in either ear.

Procedure

Each subject was seated in a quiet room and listened to directions that were pre-recorded in English. That was done in order to keep directions consistent. Afterwards, the subjects were given an opportunity to request further clarification if needed. Each subject read the 470-syllable "Rainbow Passage" silently (See Appendix A). The reading allowed the students to practice any words that were unfamiliar to them. The second reading was recorded real-time in a sound-treated room while each subject read the paragraphs out loud into a standing microphone. No time constraints were applied. None of the passage's words were spoken by the examiner to give assistance in pronunciation.

The recording equipment included a ECM-22 Sony microphone and a TC-650 stereo tape recorder. Recordings were made on Scotch 806 reel-to-reel tapes. Next, the recordings were analyzed using Kay Elemetrics CSL 4300 Computerized Speech Lab.

Target Sentence

Spectrograms of the seventh sentence which is located

approximately in the middle of the text were made. The sentence was "Throughout the centuries men have explained the rainbow in various ways." In the spectrographic analysis of the Vietnamese speakers and English speakers, the utterance length, pause length, and vowel durations were measured and compared using broad-band spectrograms.

Analysis

The vowels (V1, V2, V3, V4) which are considered to offer points of contrast are the [ɛ] in "centuries", [æ] in "have", [o] in "rainbow", and [e] in "ways". The utterance length was found by measuring the sentence at its point of onset until it was terminated. Pause length (P1) was measured by locating the absence of acoustic energy preceding and following the prepositional phrase. The vowel was defined as the point at the onset and offset of the vowel, marked by the presence of the first and second formant transitions; aspirations were included as part of the vowel only if first and second formants were well defined (House, 1961).

Table 1 shows the average formant frequencies of vowels of 76 speakers (Peterson and Barney, 1954). Although specific average frequencies are given, it should be noted that formant frequencies will vary somewhat from person to person.

TABLE 1

Formant Frequencies of Vowels

Formant Frequencies		Vowels ɛ	æ	o	e
F1	Male	530	660	570	730
	Female	610	860	590	850
F2	Male	1890	1720	840	1090
	Female	2330	2050	920	1220

Source: G.E. Peterson and H.L. Barney, Control methods used in a study of the identification of vowels. Journal of the Acoustical Society of America, 24, 1954, 183.

The measure of two groups of speakers were compared using several analyses of variance. The first contrast included two subject groups, Vietnamese and native English speakers, which formed two levels of the grouping variable. The durational measure, of average pause time formed one level of a dependent or repeated measure. The second contrast was utterance length which formed one level of a dependent or repeated measure. The third contrast of vowel durations (ɛ, æ, o, e) composed 4 levels of the repeated measure.

Reliability

Inter-judge reliability was estimated by having another individual independently measure the utterance length, pause length, and vowel durations of the target sentence. Five sentences from the Vietnamese group and five sentences from the native speaking group were used.

Comparisons of these measurements revealed Pearson r correlations of .98 for utterance length, .99 for pause length, .72 for /ɛ/, .80 for /æ/, .88 for /o/, and .82 for /e/.

CHAPTER III

RESULTS

Utterance lengths were subjected to a one factor (duration) analysis of variance. Pausal lengths were also subjected to a one factor (duration) analysis of variance. Two subject groups, Vietnamese speakers and native English speakers, formed two levels of the grouping variable. The four vowels, /ɛ, æ, o, e/, formed four levels of the repeated measure.

Table 2 contains the mean utterance lengths and pause lengths for each group. The means show that both the utterance and pause time for the Vietnamese group were longer. The Vietnamese group's mean utterance length (489 msec.) and pause length (24 msec.) was significantly longer than the English group's utterance length (370 msec.) and pause length (7 msec.). Appendix B lists the individual utterance lengths and pause lengths for all subjects.

Table 2

Mean Utterance Length and Pause Length of Vietnamese and English Speakers in Milliseconds

Subjects	Utterance Length Mean	Utterance Length SD	Pause Length Mean	Pause Length SD
Vietnamese	489	99	24	16
English	370	41	7	7

Note: N = 22 for the Vietnamese group and N = 18 for the English group.

A summary of the analysis-of-variance findings for utterance length is included in Table 3. The results of the analysis revealed that the utterance lengths of each group differed significantly from each other in duration (F-ratio = 16.97). They were significant at the <.01 level.

Table 3

Analysis of Variance Summary Table for Utterance Length in Seconds

Source	Mean Square	df	F-ratio	P
Between Groups (Vtms. and Eng.)	14.19	1	16.97	<.01

A summary of the analysis-of-variance findings for pausal length is included in Table 4. The results of the

analysis revealed that the pausal lengths of each group differed significantly from each other in duration (F-ratio = 11.10). They were significant at the <.01 level.

Table 4

Analysis of Variance Summary Table for Pausal Length in Seconds

Source	Mean Square	df	F-ratio	P
Between Groups (Vtms. and Eng.)	.30	1	11.10	<.01

Table 5 contains the mean vowel lengths and their standard deviations. As a whole, the vowels spoken by the Vietnamese group were longer in duration than the vowels spoken by the native English speakers. Appendix C lists individual vowel lengths.

Table 5

Mean Vowel Duration of Vietnamese and English Speakers in Milliseconds

	V1/ɛ/		V2/æ/		V3/o/		V4/e/	
Subjects	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Vietnamese	76	26	71	32	153	33	135	38
English	64	15	61	18	125	28	137	47

Note: N = 22 for the Vietnamese group and N = 18 for the English group.

Vowel durations of the subjects were subjected to a one factor (duration) analysis of variance. A summary of the analysis-of-variance findings is included in Table 6. The results of those analyses revealed that there was a between-subjects difference in the two groups (F-ratio = 4.30), <.05. The table also showed that there was a within subjects difference in the vowel durations (F-ratio = 72.34), <.05. The vowel x group interaction was not significant.

Table 6

Analysis of Variance Summary Table for Vowel Duration

Source	Mean Square	df	F-ratio	P
Between Subjects (Vtms. and Eng.)	.006	1	4.30	.045
Within Subjects (vowels /e, æ,o,e/)	.064	3	72.34	.000
Interactions (vowel x group)	.001	3	1.69	.174

WSD follow-up Tukey tests were used to contrast the mean durations of the vowels. The vowel /o/ exhibited the longest duration followed by /e/, /ɛ/, and /æ/. As noted in Table 7, the overall durations for the vowels /e/ and /o/ did not differ significantly from each other. Also, the durations of /ɛ/ and /æ/ did not differ significantly from each other. However, both /e/ and /o/ were significantly longer than /ɛ/ and /æ/.

Table 7

Follow-up Analysis: Vowel Durations Between Groups

Vowel	/æ/	/ɛ/	/e/	/o/
	66	71 <----*---->	136	140

Note: The asterisk (*) indicates duration differences exceeding the critical difference value. Duration in milliseconds.

CHAPTER IV

DISCUSSION

General Findings

The results of this investigation indicated that there were significant differences in the pause lengths. The Vietnamese speakers as a group had significantly longer pausal lengths than the native English speakers. Many of the Vietnamese subjects expressed concern about their ability to read all the words accurately. This anxiety and the desire to be accurate may have contributed to some pausal lengthening in the Vietnamese.

In addition to dealing with unfamiliar vocabulary and syntax, some linguistic interference may also have been present. Linguistic interference, the carryover of phonological and grammatical patterns from one language to another, can cause difficulties (Holzman, 1979). The Vietnamese subjects may have been using the "sing song" pattern of their native tongue where long pauses are often used. The "sing song" reading style is used when reading aloud and is more dramatic compared to the English pattern of reading quickly to absorb the information. For example, the following is an illustration of how the first sentence of the Rainbow Passage may be read by speakers from the two groups. As illustrated, more pauses are

likely to be used for a longer period of time. The * indicates pauses.

Vietnamese: "When the sunlight strikes raindrops * in the air ** they act like a prism ** and form a rainbow."

English: "When the sunlight strikes raindrops in the air * they act like a prism * and form a rainbow.

Second, the results indicated that the vowel durations in both groups differed significantly. The WSD follow-up test of vowel durations between groups showed that the /e/ and /o/ vowels were significantly longer than the /ɛ/ and /æ/ vowels. The durational differences between the two sets of vowels exceeded the critical difference value. Different vowels have different inherent durations. The /e/ and /o/ are tense mid vowels while the /ɛ/ and /æ/ are lax front vowels. The tense mid vowels are produced with the middle of the tongue which is not as mobile as the tip of the tongue (House, 1961). The /ɛ/ and /æ/ however, are produced in a lax front tongue position where there is less mass and more innervation making it more mobile.

Third, the results indicated that the Vietnamese speakers had significantly longer vowel durations than the English group. The only exception was the vowel /e/ which was approximately equal for both groups. The Vietnamese speakers may have prolonged the vowels because they seem to enunciate each word carefully when they read English

text. Also, because it is their second language, the process of seeing the word, pronouncing it, and comprehending it takes longer for this group. This is not an unexpected problem. Regardless of a person's native tongue, if they encounter a language that is extremely different from their own, there will be difficulty.

Again the "sing song" reading style may have affected the results. The Vietnamese group may have been using the typical reading style which was taught to them at an early age. This style encourages the reader to read slowly, almost as if he/she were delivering a poem; thus, the vowels are prolonged.

Finally, the results indicated that the Vietnamese speakers had longer utterance lengths than the English speakers. If taken as a whole, the native Vietnamese speakers produced utterances that were longer than the utterances of the native English speakers. This was not unexpected. The vowel and pausal durations were increased, thus causing an increase in the utterance length. The native English speakers on the other hand had shorter vowel and pausal lengths which would contribute to the comparatively shorter utterance length.

In this investigation, measures from only one sentence in the "Rainbow Passage" were used. However, if measures from several sentences in the passage were taken and averaged, the results would likely correlate with

those presented in this study. The Vietnamese subjects would still show greater average pausal, vowel, and utterance lengths than the English subjects. The same factors of anxiety and reading style would influence duration.

Clinical Implications

Linguistically, English and Vietnamese do not share familial ties. English is from the Germanic group of the Indo-European family and Vietnamese is an independent language having no relationship with other languages. Consequently, the two are very dissimilar (Holzman, 1979).

Speech language pathologists must have some knowledge of their client's native language in order to anticipate problems and account for the specific difficulties a non-native speaker will have learning English. The present investigation provided information concerning durational aspects of English as spoken by native Vietnamese speakers. The results indicated greater pausal, vowel, and utterance lengths which should be considered when therapy is undertaken with Vietnamese clients.

Clinicians working with Vietnamese clients in accent reduction should first ensure that the client can at least use English vocabulary and syntax functionally. Most Vietnamese realize that knowing English words and how to use them will help in their every day lives and are often willing to invest time, money, and effort into this task.

Basic vocabulary and syntax are taught through various programs at colleges or universities, public schools, churches, and small Vietnamese organizations.

Clients who are competent in English vocabulary and syntax may benefit from accent reduction therapy. Initially, work in reducing pausal durations may be useful for those who pause too frequently or who extend the pauses. Since Vietnamese speakers are used to lengthening their pauses, they may not even realize that they are doing it until it is brought to their attention. Techniques such as reading aloud, and choral reading with the clinician in a hierarchy of phrases, sentences, and paragraphs may help to reduce pause times.

Vowel durations of the Vietnamese clients also need to be addressed. Because it is not as noticeable as pausal lengthening, visual techniques to reduce vowel durations may need to be employed. The spectrogram is one form of visual feedback where the client tries to match the vowel durations of the clinician. Again, a hierarchy of words, phrases, and sentences should be used depending on the client's level.

Reducing the durations of the pauses and vowels will likely reduce the utterance lengths. With practice and time, linguistic competence of the Vietnamese speaker will allow for improved pause, vowel, and utterance durations.

CHAPTER V

SUMMARY

Tape recorded samples of the speech of a group of native Vietnamese speakers and native English speakers were used to study temporal dimensions of English syntax when spoken by Vietnamese. The Vietnamese group consisted of eleven males and eleven females while the English group was made up of eighteen females. Pausal, vowel, and utterance durations were measured for a sentence embedded approximately in the middle of the "Rainbow Passage".

The durations of the pauses, vowels, and utterances were determined, and analysis of variance contrasting those values revealed the following: first, the pausal lengths of each group differed significantly from each other in duration. The Vietnamese subjects had longer pause times than the native English speaking subjects. Second, the vowels differed significantly from each other in duration. The /o/ was the longest, /e/ the next longest, then /ɛ/ and /æ/ becoming progressively shorter. Third, significant between-groups differences were evident in vowel duration patterns. The Vietnamese group had longer vowel lengths than the English group.

Finally, there was a significant difference in utterance duration with the Vietnamese group having longer utterance lengths than the English group.

The current information would indicate that there are significant durational differences between the speech of native English speakers and Vietnamese speakers who have learned English as a second language. Future research involving the interaction of these temporal dimensions will need to address age and amount of exposure to English of the Vietnamese subjects.

The age at which a person is first exposed to his/her second language often influences his/her ability to speak English. Those who have been in the U.S. longer tend to use the standard pattern of English more (Wolfram, Christian, & Hatfield, 1986). Krashen (1980) states that "Children who acquired English at a younger age may have an easier time speaking English because the exposure to English occurred before the physiological and affective changes influencing language acquisition were established." Older Vietnamese, on the other hand, may have more difficulty using temporal aspects of English if their Vietnamese accent carries over strongly.

Future investigations should also address length and amount of exposure to English. For example, children who have language training in the schools have more exposure to English where the exposure is long term. Adults, however, do not have the same opportunity to attend school for extended periods of time. They often have jobs that

require very little English and therefore receive minimal exposure to English.

Another factor that should be considered is the stimuli used. In addition to printed text, spontaneous speech samples could also be utilized. Data gathered from a spontaneous speech sample may allow for a more realistic comparision of experimental variables because the subjects will not be constrained by the printed word. They will have more opportunity to speak naturally in a conversational style.

The results of this investigation provided data regarding temporal dimensions of English syntax as spoken by Vietnamese speakers. These data can be used to develop better strategies for accent reduction therapy and can provide a knowledge base for future research involving the Vietnamese population. Once those additional issues have been better addressed, clinicians can develop even stronger strategies for use in therapy for accent reduction.

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APPENDIXES

APPENDIX A

THE RAINBOW PASSAGE

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, an its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Throughout the centuries men have explained the rainbow in various ways. Some have accepted it as a miracle without physical explanation. To the Hebrews it was a token that there would be no more universal floods. The Greeks used to imagine that it was a sign from the gods to foretell war or heavy rain. The Norsemen considered the rainbow as a bridge over which the gods passed from earth to their home in the sky. Other men have tried to explain the phenomenon physically. Aristotle thought that the rainbow was cause by reflection of the sun's rays by the rain. Since then physicists have found that it is not reflection but refraction by the raindrops which caused the rainbow. Many complicated ideas about the rainbow have been formed. The difference in the rainbow depends considerably upon the size of the water drops, and the width of the colored band increases as the size of the drops increased. The actual primary rainbow observed is said to be the effect of superposition of a number of bows. If the red of the second bow falls upon the green of the first, the result is to give a bow with an abnormally wide yellow band, since red and green lights when mixed form yellow. This is a very common type of bow, one showing mainly red and yellow, with little or no green or blue.

APPENDIX B

INDIVIDUAL UTTERANCE AND PAUSAL DURATIONS

VIETNAMESE SUBJECTS	UTTERANCE LENGTH	PAUSAL LENGTH
V1	538	035
V2	523	087
V3	476	026
V4	567	017
V5	443	028
V6	548	037
V7	533	067
V8	526	010
V9	548	054
V10	773	023
V11	611	017
V12	458	008
V13	363	005
V14	500	010
V15	355	004
V16	474	006
V17	370	012
V18	343	020
V19	318	007
V20	433	017
V21	351	012
V22	712	024

ENGLISH SUBJECTS	UTTERANCE LENGTH	PAUSAL LENGTH
E1	424	003
E2	355	002
E3	463	007
E4	350	002
E5	348	004
E6	360	006
E7	375	006
E8	357	006
E9	323	005
E10	364	006
E11	356	006
E12	332	005
E13	305	003
E14	370	004
E15	376	001
E16	453	030
E17	360	010
E18	380	012

APPENDIX C

INDIVIDUAL VOWEL DURATIONS

VIETNAMESE SUBJECTS	VOWELS			
	ɛ	æ	o	e
V1	008	006	017	060
V2	016	016	013	014
V3	009	006	013	012
V4	009	006	012	017
V5	006	090	024	013
V6	010	080	018	009
V7	009	060	015	008
V8	008	007	017	015
V9	007	005	016	013
V10	007	011	015	023
V11	007	009	020	013
V12	007	006	013	020
V13	006	005	014	011
V14	008	014	015	014
V15	005	004	011	012
V16	008	007	018	010
V17	003	005	010	014
V18	005	004	015	019
V19	004	003	011	013
V20	006	004	014	013
V21	008	006	015	014
V22	012	009	020	014

ENGLISH SUBJECTS	VOWELS			
	ɛ	æ	o	e
E1	007	008	017	018
E2	005	004	010	016
E3	009	009	010	014
E4	006	003	014	021
E5	007	004	009	015
E6	005	006	017	008
E7	007	004	012	008
E8	007	008	014	013
E9	004	004	016	016
E10	004	005	011	010
E11	007	009	008	007
E12	006	006	009	008
E13	005	006	012	008
E14	008	006	012	020
E15	009	007	014	015
E16	007	007	015	016
E17	006	007	014	013
E18	006	006	011	021

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