THE RELATIONSHIP BETWEEN THE VOCAL CHARACTERISTICS OF MEN
AND THEIR RATINGS OF THE VOCAL CHARACTERISTICS OF OTHER MEN

Dissertation

Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Philosophy in the
Graduate School of The Ohio State
University

By

ROY EDWARDS TEW, B.A.E., M.A.

The Ohio State University

1953

Approved by

Adviser

OHIO STATE
UNIVERSITY

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION	1
II. THE PROBLEM	4
The Hypotheses	4
Definition of Terms	5
III. PROCEDURES	7
Apparatus	8
Judges	14
The Stimulus Test	16
Subjects	38
Collecting the Data	50
Analysis of Data	51
IV. SUMMARY, RESULTS, AND DISCUSSION	53
Summary	53
Results and Discussion	58
V. CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH	72
BIBLIOGRAPHY	75
APPENDIX A	78
APPENDIX B	87
APPENDIX C Number 1	88
Number 2	89
Number 3	90
Number 4	91
APPENDIX D	92
APPENDIX E	94
APPENDIX F	95

TABLE OF CONTENTS (Continued)

Chapter	Page
APPENDIX G Number 1	96
Number 2	97
Number 3	98
Number 4	99
Number 5	100
Number 6	101
AUTOBIOGRAPHY	102

LIST OF TABLES

Table	Page
I. Median Ratings of the 15 Judges on the Voices of the 30 Stimulus Readers; Classification of the Voices with Respect to Pitch Level and Rate Level	26
II. Split-Half Reliability Corrected by Spearman-Brown Prophecy Formula of Ratings of 14 Judges on 30 Stimulus Readers for Pitch Level and Rate Level of Voice	27
III. Rate-Rerate Reliability of Ratings by 16 Judges of Items Used in Stimulus Test	32
IV. Rate Variation Items Selected for the Stimulus Test ...	33
V. Loudness Level Items Selected for the Stimulus Test ...	35
VI. Loudness Variation Items Selected for the Stimulus Test	37
VII. Pitch Variation Items Selected for the Stimulus Test ..	39
VIII. Pitch Level Items Selected for the Stimulus Test	41
IX. Rate Level Items Selected for the Stimulus Test	42
X. Rate-Rerate Reliability of Ratings by Three Judges on Fifty Randomly-Chosen Subjects	43
XI. Arrangement of Items in the Stimulus Test; Variables Represented; Voices Speaking the Items; and Phrases Used in the Items	46
XII. Mean Sums of Ratings on the 15 Pitch Level Items in the Stimulus Test	58
XIII. Analysis of Variance on the Scores of the Subjects for the Pitch Level Items in the Stimulus Test	59
XIV. Mean Sums of Ratings on the 15 Pitch Variation Items in the Stimulus Test	59
XV. Analysis of Variance on the Scores of the Subjects for the Pitch Variation Items in the Stimulus Test	60

LIST OF TABLES (Continued)

Table	Page
XVI. Mean Sums of Ratings on the 15 Loudness Level Items in the Stimulus Test	60
XVII. Analysis of Variance on the Scores of the Subjects for the Loudness Level Items in the Stimulus Test	61
XVIII. Mean Sums of Ratings on the 15 Loudness Variation Items in the Stimulus Test	61
XIX. Analysis of Variance on the Scores of the Subjects for the Loudness Variation Items in the Stimulus Test.	62
XX. Mean Sums of Ratings on the 15 Rate Level Items in the Stimulus Test	62
XXI. Analysis of Variance on the Scores of the Subjects for the Rate Level Items in the Stimulus Test	63
XXII. Mean Sums of Ratings on the 15 Rate Variation Items in the Stimulus Test	63
XXIII. Analysis of Variance on the Scores of the Subjects for the Rate Variation Items in the Stimulus Test	64
XXIV. Summary of Analysis of Variance on the Scores of the Subjects for the Six Vocal Characteristics Investigated	65
XXV. Summary of Mean Sums of Ratings of the Items on the Six Vocal Characteristics in the Stimulus Test ...	65
XXVI. Ranks of Mean Sums of Ratings of the Items on the Six Vocal Characteristics in the Stimulus Test	66
XXVII. Summary of Variances of Ratings of the Items on the Six Vocal Characteristics in the Stimulus Test	67

LIST OF FIGURES

Figure	Page
1. Diagram of Apparatus and Arrangement for Recording the Part of the Stimulus Material Presented to the Stimulus Readers by Disc Recording	9
2. Diagram of Apparatus and Arrangement for Presenting the Stimulus Material to the Stimulus Readers and for Recording Their Responses	11
3. Diagram of Apparatus and Arrangement for Rerecording the Recorded Stimulus Material Spoken by the Stimulus Readers	13
4. Diagram of Apparatus and Arrangement for Presenting Example Stimulus Items to Judges for Reliability Ratings; for Obtaining Measurements on Pitch Level, Pitch Variation, Loudness Variation, and Rate Variation on the Samples of the Voices of the Subjects; and for Presenting the Stimulus Test to the Subjects ...	15
5. Diagram of Apparatus and Arrangement for Recording the Samples of the Voices of the Subjects	17
6. Diagram of Apparatus and Arrangement for Obtaining Measurements of Rate Level and Sound Pressure Level on the Samples of the Voices of the Subjects	19

CHAPTER I

INTRODUCTION

Teachers and clinicians, working with voice improvement and speech correction, at times seem to evaluate other voices in terms of their own voices, and apparently do so unconsciously. Thus, the descriptions of a voice by two or more observers will often be different. A judge, for example, with a high voice may describe another voice as being lower in pitch than would a judge with a low voice.

A few physical attributes other than voice are known to influence the judgments of individuals. Marks (12) in his study with negro college students investigated (a) the relation between a judge's skin color and his ratings of skin color on a darkness-lightness scale and (b) the relation between the ratings of skin color and ratings of attractiveness and other personality characteristics. Only the former of these observations is relevant to the present study. Marks found that subjects' judgments of a skin color correlated highly with objective color measurements of their skin by matching it with a mixture of black, red, yellow, and white pigments. The measurements were expressed as percentages of black in the mixture. Judges of darker color tended to rate a subject as being lighter than did the lighter judges. Marks interpreted this as evidence that the judges were using an egocentric reference scale and in their striving to be average were displacing their own position toward the lighter end of the scale. He points out that they were also using an objective reference scale in that this

tendency for displacement was checked by the objective skin color of both the judges and those being rated. Marks suggests that this striving to be average is perhaps evident in the egocentricity of judgments of characteristics other than those investigated in his study.

Hinckley and Rethlingshafer (11) studied the relation between the heights of male raters and their judgments of the height of men in the United States. Their findings support the hypothesis of an egocentric basis for the judgment of heights. They found that short men tended to rate heights as being taller than did the tall men. The short men also judged the average height of men to be less than did the tall men. Hinckley and Rethlingshafer conclude that the meaning of the social value terms of "short" and "tall" is in part determined by the height of the judge, but that objective facts also operate as an anchor to control the egocentric influence particularly in judging the extreme heights.

Using an experimental design similar to that of Hinckley and Rethlingshafer, Rettie (14) also investigated the influence of a physical characteristic of individuals upon their judgments. His study investigated the relation between a woman's own age and her judgments of ages in other women. His basic assumption was that a woman's judgment of age in other women would be influenced by her own age. He found that the ages of the judges became the anchoring stimulus and, as a result, the judgments of ages of women were made in terms of the ages of the judges. Older women judged ages as being younger than did the younger women. This shift in scale values was greater for the middle range of the ages judged than for the extreme ages. The objective factors, however, checked the shift in judgment of the extreme ages.

The present study investigated the influence of men's vocal characteristics upon their judgments of the vocal characteristics of other men. The approach, however, was different from those used in the above mentioned investigations. In each of these, terms suggestive of social values were used. In the present experiment such terms were deliberately avoided. The subjects, for example, were instructed to rate on a five-point scale the stimulus voices with respect to whether they exhibited much, average, or little of the particular vocal characteristic under test. They were not asked to make value judgments of the voices. The term value is used here with the same meaning as given by Harrimon (10) who defines values as judgments concerning the worth of an entity or concept.

One objective, therefore, of the present study was to determine whether or not the vocal characteristics of the judges would have an effect on their ratings, even though the descriptive terms of the rating scale were relatively free from suggestions of value judgments. Consequently, subjects were selected who were untrained in rating vocal characteristics and who were comparatively unfamiliar with the established terminology, principles, and practices of voice training. Speech majors and minors were excluded as subjects because it was assumed that they, as a result of their training, probably would make value judgments of the voices, even though value terms were not used in the rating scale.

In the following chapters this method of employing objective measurements instead of value judgments of vocal characteristics will be discussed. The construction of the testing device, selection of subjects, and statistical analysis of the data will be detailed.

CHAPTER II

THE PROBLEM

The purpose of this study was to investigate the relationship between men's vocal characteristics and their judgments of the vocal characteristics of other men. (Women were arbitrarily excluded from the study.)

The six vocal attributes of pitch level, pitch variation, loudness level, loudness variation, rate level, and rate variation were investigated. Quality of voice was not included.

THE HYPOTHESES

Six null hypotheses were formulated, one relating to each of the six vocal characteristics as follows:

1. When male speakers are grouped according to their natural pitch level of voice (high, average, low), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the pitch level of voice of men whom they hear.
2. When male speakers are grouped according to their natural pitch variation of voice (much, average, little), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the pitch variation of voice of men whom they hear.
3. When male speakers are grouped according to their natural sound pressure level of voice (much, average, little), there

is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the loudness level of voice of men whom they hear.

4. When male speakers are grouped according to their natural loudness variation of voice (much, average, little), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the loudness variation of voice of men whom they hear.
5. When male speakers are grouped according to their natural rate of speaking (fast, average, slow), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the rate of speaking of men whom they hear.
6. When male speakers are grouped according to their natural rate variation of speaking (much, average, little), there is no significant difference in the mean ratings which the individuals of the three groups assign judgmentally to the rate variation of speaking of men whom they hear.

DEFINITION OF TERMS

Several terms used in this study are defined as follows:

- (1) Natural speech refers to the speech of the experimental subject when he attempted to talk naturally as instructed. Other suggestions with respect to the manner of reading or talking were avoided. (2) Pitch level, loudness level, and rate level of voice (words per minute) were defined as found in Fairbanks (6). The definitions are those

generally accepted by writers and teachers of speech. (3) Sound pressure level of voice refers to the sound pressure as measured by the power level recorder (Sound Apparatus Company). The term is recommended by the American Standards Association (1) for discussions of "sound measurements made with pressure or velocity microphones."

(4) The chief factor in the definitions of pitch variation, loudness variation, and rate variation of voice was the spread of pitch, loudness, or rate, as determined by judges. Thus, pitch variation was considered chiefly to be the range of pitch change from the highest to the lowest pitch; loudness variation was considered as the spread from the least to the greatest loudness; and rate variation, the spread from the slowest to the fastest rate. No attempt was made to define other factors which might have been considered by the judges as constituents of variety. It was thought that other attributes which they might have considered in addition to the spread would be valid, as all judges were either instructors, graduates, or undergraduate majors in speech.

(5) Free-reading items are those words or phrases in the stimulus material (Appendix A) which the stimulus readers read with as little variation of loudness, rate, or pitch as possible.

(6) Copy-reading items are those words or phrases in the stimulus material (Appendix A) recorded by the investigator and repeated by the stimulus readers in the same manner as they were spoken on the recording.

(7) Example items are those stimulus phrases composed by the experimenter through a tape-splicing technique as examples of pitch variation, rate variation, loudness level, and loudness variation.

CHAPTER III

PROCEDURES

The purpose of this study was to investigate the relationship between men's ratings of vocal characteristics in other men and their own vocal attributes. The factors investigated were pitch level, pitch variation, loudness level, loudness variation, rate level, and rate variation.

To test the six hypotheses a stimulus "test" was composed and presented by tape recording to the experimental subjects. Each of the 90 items in the test was rated by the subjects on a five-point scale with respect to one of the six vocal attributes of pitch level, pitch variation, rate level, rate variation, loudness level, or loudness variation.

The experimental subjects were 335 male college students at the University of Florida, all of normal hearing and speech as determined by screening tests. The age spread was 16 to 43 years; median age, 18.3 years. All read and spoke the same material for recording the samples of their speech. The recording conditions, including the operation of the recording instrument, were constant from subject to subject.

The sample of speech of each subject was recorded on magnetic tape. Measurements were taken on the sample consisting of ratings by judges on a seven-point scale of the four vocal factors of pitch level, pitch variation, rate variation, and loudness variation. Measurements of rate level and sound pressure level were taken on

the sample by employing a power level recorder (Sound Apparatus Company). This was accomplished by transferring the sample from the magnetic tape to the tape of the power level recorder and then taking the measurements on rate level and sound pressure level. From the ratings given by the judges and the measurements yielded by the power level recorder, the voice of each subject was classified in one of three categories: average, above average, or below average for each of the six vocal characteristics. For example, the voices were classified as fast, average, or slow for rate level. For rate variation they were classified as exhibiting much, average, or little variation.

The mean ratings which each of the three categories of subjects assigned to each vocal characteristic in the stimulus test were treated in an analysis of variance to determine whether or not there was a significant difference between the mean ratings.

APPARATUS

The following equipment was employed for: (I.) constructing the stimulus test, (II.) gathering the measurements on the voices of the subjects, and (III.) presenting the stimulus test to the subjects.

I. For constructing the stimulus test:

1. Apparatus for recording the part of the stimulus material presented by disc recording to the stimulus readers (Figure 1, page 9):
 - a. Disc recorder (Presto, type 8-K).
 - b. Microphone

- A. EXPERIMENTER
- B. MICROPHONE
- C. DISC RECORDER
- D. PITCH PIPE
- E. STOP WATCH
- F. SOUND-TREATED RECORDING ROOM
- G. DOOR

FIGURE 1

DIAGRAM OF APPARATUS AND ARRANGEMENT
FOR RECORDING THE PART OF THE STIMULUS MATERIAL PRESENTED TO THE
STIMULUS READERS BY DISC RECORDINGS

- c. Pitch pipe containing all steps of the octave.
 - d. Stop watch.
2. Apparatus for presenting the stimulus material to the stimulus readers and for recording their responses (Figure 2, page 11):
- a. Decibeloscope (Syracuse University Laboratories).
 - b. Condenser microphone.
 - c. Disc recorder (Presto, type 8-D-G).
 - d. Turntable and pickup (Presto, type 64-A).
 - e. Loudspeaker.
 - f. Earphone.
 - g. Stop watch.
 - h. Flash light signaling system.
 - i. Amplifiers.
3. Apparatus for rerecording the recorded stimulus material spoken by the stimulus readers (Figure 3, page 13):
- a. Disc recording playback-amplifier-attenuator system of broadcast quality. (Measured response characteristic varied 4 db from 50 cps to 5,000 cps).
 - b. Loudspeaker (Western Electric 755A).
 - c. Tape recorder (Magne recorder, type PT6-J-AH, 600 OHM output).
4. Apparatus for presenting the example stimulus items to the judges for determining the reliability of the items (Figure 4, page 15):

A. STIMULUS READER
 B. MICROPHONE
 C. AMPLIFIER
 D. RECORDER
 E. TURNTABLE AND PICKUP
 F. AMPLIFIER

G. EARPHONE
 H. EXPERIMENTER
 I. STOP WATCH
 J. SIGNAL LIGHT BUTTON
 K. SIGNAL LIGHT
 L. DECIBELSCOPE

M. DOORS
 N. OPERATOR
 O. OBSERVATION WINDOW
 P. SOUND-TREATED RECORDING ROOM
 Q. LOUDSPEAKER

FIGURE 2

DIAGRAM OF APPARATUS AND ARRANGEMENT
 FOR PRESENTING THE STIMULUS MATERIAL TO THE STIMULUS READERS
 AND FOR RECORDING THEIR RESPONSES

- a. Tape recorder (Magne recorder, type PT6-J-AH, 600 OHM output).
- b. Amplifier (Langevin, type 128, 20 watts).
- c. Loudspeaker (R.C.A., type 515sl, 15" Duo-Cone, mounted in a Jensen bass reflex cabinet).

II. For gathering the measurements on the voices of the subjects:

1. Apparatus for recording the samples of the voices of the subjects (Figure 5, page 17):
 - a. Tape recorder (Magne recorder, type PT6-J-AH, 600 ohm output).
 - b. Pressure microphone, (R.C.A., type 88A).
 - c. Chair with head positioner.
 - d. Flashlight.
2. Apparatus for obtaining measurements on the pitch level, pitch variation, loudness variation, and rate variation on the samples of the voices of the subjects:

This was the same apparatus as used for constructing the stimulus test (Figure 4, page 15).

3. Apparatus for obtaining measurements on the rate level and sound pressure level on the samples of the voices of the subjects (Figure 6, page 19):
 - a. Tape recorder (Magne recorder, type PT6-J-AH, 600 ohm output).
 - b. Amplifier (McIntosh, 50 watt).
 - c. Power level recorder (Sound Apparatus Company, Model PL, No. 159, 50 db potentiometer).

FIGURE 3

DIAGRAM OF APPARATUS AND ARRANGEMENT FOR RERECORDING
THE RECORDED STIMULUS MATERIAL SPOKEN BY THE STIMULUS READERS

III. For presenting the stimulus test to the subjects:

This was the same apparatus as used for constructing the stimulus test (Figure 4, page 15).

JUDGES

Three separate groups of judges were used in this study. The function of each group will be explained as it arises in the remainder of the present chapter on procedures:

1. Judges of the voices of the stimulus readers.

These were 15 male faculty members and graduate students of the Department of Speech, The Ohio State University.

2. Judges of the items used in the stimulus test.

These 16 males were secured from the faculty, graduate students, and undergraduate speech majors in the Department of Speech, University of Florida.

3. Judges of the voices of the subjects.

A total of 29 males served in this capacity. They were secured from the faculty, graduate students, and undergraduate speech majors in the Department of Speech, University of Florida. Each judge served as a member of one or more three-judge panels. The voice of each subject was rated by a different group of three judges on the four variables of pitch level, pitch variation, loudness variation, and rate variation.

A. MAGNETIC TAPE RECORDER	D. TABLE (HEIGHT - 28")	G. RADIO BROADCASTING	H. CONTROL ROOM
B. AMPLIFIER	E. OBSERVATION WINDOW	STUDIO; LENGTH 40';	I. CHAIRS
C. LOUDSPEAKER	F. DOORS	WIDTH 22'; HEIGHT 9'.	

FIGURE 4

DIAGRAM OF APPARATUS AND ARRANGEMENT FOR PRESENTING EXAMPLE STIMULUS ITEMS TO JUDGES FOR RELIABILITY RATINGS; FOR OBTAINING MEASUREMENTS ON PITCH LEVEL, PITCH VARIATION, LOUDNESS VARIATION AND RATE VARIATION ON THE SAMPLES OF THE VOICES OF THE SUBJECTS; AND FOR PRESENTING THE STIMULUS TEST TO THE SUBJECTS

THE STIMULUS TEST

The stimuli of this study were drawn up in the form of a ninety-item stimulus test recorded on magnetic tape for aural presentation. An answer sheet on which the subjects rated each item on a five-point scale accompanied the stimulus test.

The test contained the following 18 variables:

1. Slow rate level
2. Average rate level
3. Fast rate level
4. Little rate variation
5. Average rate variation
6. Much rate variation
7. Little loudness level
8. Average loudness level
9. Much loudness level
10. Little loudness variation
11. Average loudness variation
12. Much loudness variation
13. Low pitch level
14. Average pitch level
15. High pitch level
16. Little pitch variation
17. Average pitch variation
18. Much pitch variation

Each of these 18 variables was presented five times throughout the test. This made the total of 90 items.

A. SUBJECT	E. FLASHLIGHT
B. MICROPHONE	F. EXPERIMENTER
C. MAGNETIC TAPE RECORDER	G. DOOR
D. CHAIR WITH HEAD POSITIONER	H. RADIO BROADCASTING STUDIO
	LENGTH 18'; WIDTH 15'; HEIGHT 8'.

FIGURE 5

DIAGRAM OF APPARATUS AND ARRANGEMENT
FOR RECORDING THE SAMPLES OF THE VOICES OF THE SUBJECTS

The following is a preliminary summary of the steps involved in constructing the stimulus test:

Order

Step

Stimulus Material

1. Selection of
2. Organization of
3. Recording copy-reading items of

Stimulus Readers

4. Selection of
5. Recording responses of
6. Classifying voices of

Example Stimulus Items

7. Composition of
8. Establishing reliability of

Selection and Arrangement of Items

in Stimulus Test

9. Selection from example items
10. Selection from pitch level and rate level items
11. Arrangement of all items selected for stimulus test

Each of the above steps will be discussed in detail and in the same chronological order in the following pages.

A. MAGNETIC TAPE RECORDER, 600 OHM OUTPUT	C. RESISTOR, 5 WATT, 16 OHM
B. AMPLIFIER, 50 WATT, 600 OHM INPUT, 16 OHM OUTPUT	D. POWER LEVEL RECORDER, 50 DB
POTENTIOMETER

FIGURE 6

DIAGRAM OF APPARATUS AND ARRANGEMENT
FOR OBTAINING MEASUREMENTS OF RATE LEVEL AND SOUND PRESSURE LEVEL
ON THE SAMPLES OF THE VOICES OF THE SUBJECTS

Step One: Selection of the Stimulus Material

The standardized five-syllable phrases by Black (3) were selected. These were chosen because they afforded a large number of short statements all of the same number of syllables, but of different wording, and as discussed by Walker and Black (16), of similar intensity. A total of 429 phrases was used.

Step Two: Organization of the Stimulus Material

The material was organized into 13 separate forms, all identical, with the exception of the words of the phrases. Appendix A contains the Experimenter's Copy and the Stimulus Reader's Copy of Form Number One and is presented in the appendix as an example of all forms.

Each of these 13 forms of stimulus material was arranged into two chief categories of items. The first category consisted of free-reading items, the second of copy-reading items. The stimulus readers read the free-reading items with natural pitch, rate, and loudness but with as little variation as possible. The readers, as instructed (Appendix A), also monitored the loudness of their voices by observing a Decibeloscope.

Step Three: Recording the Copy-Reading Items

The copy-reading items in each of the 13 forms were first recorded, as shown in Figure 1 (page 9), by the experimenter. He monitored the loudness of his voice by ear and attempted to produce a loudness level for all items which approximated his average loudness. Loudness variation was kept as constant as possible.

As shown on the Experimenter's Copy of Form Number One in Appendix A, there were 26 five-syllable phrases in the copy-reading items. These were organized into five types and recorded by the experimenter as follows:

In type one, phrases 11, 12, and 13, (Appendix A), were recorded as examples of slow, average, and fast rates respectively. In making the recordings the experimenter used as a basis for all rate items the norms found by Darley (4). His 50-percentile rate of 166 words per minute was employed in recording items of average rate. For fast rate, 250 words per minute were used (Darley's fastest was 222); for slow rate, 110 words per minute were used (Darley's slowest was 129). The purpose of using faster and slower rates than those found by Darley was to increase the chances of securing examples of slow and fast rates. Critical listeners, as found by Franke (8), are almost certain to judge a rate which exceeds 185 words per minute as too rapid, and a rate of less than 140 words per minute as too slow, when one is reading statements comparable to those of the stimulus material in this study. For establishing the rate of each item, a stop watch was used as indicated on the Experimenter's Copy of Form Number One in Appendix A.

In type two, six phrases (Nos. 14, 15, 16, 17, 18, and 19 in Appendix A), were broken into three parts each. One part was recorded at the fast rate of 250 words per minute, one part at the average rate of 166 words per minute, and one part at the slow rate of 110 words per minute.

By the use of a rerecording and tape-splicing technique each of these six phrases in type two was spliced later as shown in Appendix A to form one of the six permutations of the three rates of fast, average, and slow.

In type three, four phrases (Nos. 20, 21, 22, and 23 in Appendix A), to be used as examples of average rate variation, were broken into three parts. Each part was recorded at a rate which would give the four possible combinations of average with fast or average with slow when the phrases were spliced later, as shown in Appendix A. A combination including both slow and fast at one time with average was arbitrarily avoided.

In type four, six phrases (Nos. 24, 25, 26, 27, 28, and 29 in Appendix A) to be used as examples of much pitch variation, were broken into three parts each. Using a pitch pipe as a reference, the experimenter recorded one part of each phrase at a high pitch with a terminating upward inflection; one part at average pitch; and one part at low pitch with a terminating downward inflection. The amount of change on each inflection was approximately five semi-tones on the musical scale from the starting pitch of the inflection. The pitch of C_3 , one octave below middle C on the musical scale, was used as the level for the average pitch. This was chosen arbitrarily because it was found by Pronovost (13) to be the approximate pitch level of superior adult male speakers. G_3 , which is eight semi-tones above C_3 , was selected as the level for high pitch; and G_2 , which is six semi-tones below C_3 , was selected as the level for low pitch. This arbitrary choice of levels for high and low pitches, and choice of the

additional raising by five semi-tones in the upward inflection, and lowering by five semi-tones in the downward inflection, was based on the decision that the spread of pitch should approximate the range of one and two-thirds octaves in superior voices as found by Pronovost (13) and Snidecor (15). In the present study the range of one octave from the high to the low level, plus the five semi-tones contained in the upward inflection and the five included in the downward inflection, came to a total of slightly more than one and two-thirds octaves.

By employing a rerecording and tape-splicing technique, each of these six phrases in type four was spliced, as shown in Appendix A, to form one of the six permutations of the three pitches of high, average, and low.

In type five, four phrases (Nos. 30, 31, 32, and 33 in Appendix A), to be used as examples of average pitch variation, were broken into three parts. Each part was recorded at a pitch which would give the four possible combinations of average with high or average with low when the phrases were spliced later as shown in Appendix A.

Step Four: Selection of Stimulus Readers

Thirty male readers were secured from among the faculty and graduate students of the Department of Speech, The Ohio State University, and from the undergraduates at large in the student body of the same institution. An approximately equal number of high, average, and low; fast, average, and slow speakers as judged by the experimenter was obtained. All readers had normal voices and articulation.

Step Five: Recording the Responses of the Stimulus Readers

The apparatus and arrangement shown in Figure 2 (page 11), was employed in recording the responses of the stimulus readers. With their mouths positioned 12 inches from the microphone they read each of the free-reading items (Appendix A) in their normal pitch, rate, and loudness levels, and with as little variation as possible. They were instructed to read in this manner because the experimental design required that the "level" items contain relatively little variation.

The responses of the stimulus readers to the copy-reading items were next recorded. These were fed through the earphone (Figure 2, page 11) to the reader who repeated them in the same manner as they were spoken by the voice on the recording.

A separate 12" Presto disc was used for recording the responses of each stimulus reader.

Step Six: Classifying the Voices of the Stimulus Readers

The voices were classified with respect to their natural rate levels and pitch levels through ratings on a seven-point scale by 15 judges, who were given instructions (Appendix B) at the beginning of the rating session.

A Presto recorder-playback instrument, Type 8-K, was employed for presenting three of the items recorded by the stimulus readers. To determine the setting of the tone control in order to give the highest possible fidelity to the playback, three judges were called in before the rating session began to listen to a portion of the free-reading items recorded by one of the stimulus readers with whom the

judges were well acquainted. The control was set at that point which, in the opinion of the judges, gave the quality of voice nearest to the natural quality of the stimulus reader.

Based on the medians of the ratings given by the 15 judges, as shown in Table I (page 26), the voices of the readers were classified as follows:

High or Fast: Those whose medians fell at 5.50 or above.

High Average or Fast Average: Those whose medians fell within
4.50 to 5.49, inclusive.

Average: Those whose medians fell within 3.50 to 4.50, inclusive.

Low Average or Slow Average: Those whose medians fell within
2.50 to 3.49, inclusive.

Low or Slow: Those whose medians fell at 2.50 and below.

Those voices whose medians in pitch level and rate level fell within 2.50 to 3.49, inclusive, or within 4.50 to 5.49, inclusive, were not used in items representing pitch level and rate level variables.

The reliability of the ratings by the 15 judges was determined by split-half correlation corrected by Spearman-Brown prophecy formula. The names of the 15 judges were arranged alphabetically and the fifteenth judge eliminated. Ratings of the first seven were correlated with those of judges eight through 14. As shown in Table II (page 27) the ratings were highly reliable for both pitch level and rate level.

TABLE I. MEDIAN RATINGS OF THE 15 JUDGES ON THE VOICES OF THE 30
STIMULUS READERS; CLASSIFICATION OF THE VOICES WITH RESPECT
TO PITCH LEVEL AND RATE LEVEL

PITCH LEVEL			::	RATE LEVEL		
Identification Number of the Stimulus Reader	Median :		::	Median :		
	Rating :		::	Rating :		
	on 7- :	Classification	::	on 7- :	Classification	
	point :		::	point :		
	scale :		::	scale :		
1.	: 4.08	: Average	::	3.00	: Slow average	
2.	: 3.37	: Low average	::	3.41	: Slow average	
3.	: 3.88	: Average	::	4.25	: Average	
4.	: 3.75	: Average	::	4.75	: Fast average	
5.	: 2.75	: Low average	::	5.18	: Fast average	
6.	: 3.28	: Low average	::	4.00	: Average	
7.	: 4.81	: High average	::	4.00	: Average	
8.	: 3.93	: Average	::	5.00	: Fast average	
9.	: 2.15	: Low	::	3.40	: Slow average	
10.	: 5.31	: High average	::	2.75	: Slow average	
11.	: 3.60	: Average	::	4.00	: Average	
12.	: 4.06	: Average	::	3.93	: Average	
13.	: 3.58	: Average	::	4.68	: Fast average	
14.	: 2.00	: Low	::	3.28	: Slow average	
15.	: 3.15	: Low average	::	3.60	: Average	
16.	: 6.33	: High	::	5.56	: Fast	
17.	: 4.88	: High average	::	4.81	: Fast average	
18.	: 2.15	: Low	::	2.75	: Slow average	
19.	: 4.20	: Average	::	5.41	: Fast average	
20.	: 3.58	: Average	::	4.77	: Fast average	
21.	: 3.18	: Low average	::	3.62	: Average	
22.	: 3.88	: Average	::	4.04	: Average	
23.	: 1.91	: Low	::	2.06	: Slow	
24.	: 2.87	: Low average	::	3.31	: Slow average	
25.	: 4.41	: Average	::	3.11	: Slow average	
26.	: 4.95	: High average	::	4.31	: Average	
27.	: 1.75	: Low	::	3.66	: Average	
28.	: 1.25	: Low	::	4.57	: Fast average	
29.	: 3.28	: Low average	::	4.15	: Average	
30.	: 6.05	: High	::	5.31	: Fast average	

TABLE II. SPLIT-HALF RELIABILITY CORRECTED BY SPEARMAN-BROWN PROPHECY FORMULA OF RATINGS OF 14 JUDGES ON 30 STIMULUS READERS FOR PITCH LEVEL AND RATE LEVEL OF VOICE

	N	r*
PITCH LEVEL	30	+ .979
RATE LEVEL	30	+ .947

*An r of .463 is significant at the 1% level of confidence.

Step Seven: Composing the Example Items

As defined on page 6, the example items were those stimulus phrases put together by a rerecording and tape-splicing technique as examples of pitch variation, rate variation, loudness level, and loudness variation.

The disc playback-amplifier-attenuator-tape recorder system (Figure 3, page 13) was used in the composition. Tone and attenuator controls were so set as to give the best fidelity and operational leeway for playing back and recording the weakest and strongest voices without overloading the amplifiers.

In constructing all example items the experimenter was guided by several criteria for selecting phrases from the 13 forms recorded previously by the 30 stimulus readers. All items were so selected as to avoid repetition of any phrase. In addition, the voices were chosen in order to present as many different types as possible. Another criterion was that of the accuracy with which the stimulus readers had repeated the copy-reading items. Furthermore, items were avoided which were so worded as to suggest scale markings for the

judges. For instance, a phrase containing the word "high" would not be selected as an example of high pitch.

The final criteria of selection for each example item was the freedom from errors in pronunciation and articulation on the part of the stimulus reader; and defective spots on the recording.

In constructing the example items, twice the number of examples of each type of variable were composed as would be needed in the stimulus test. It was estimated that this amount would be sufficient to yield the necessary number of reliable items. These were taken from the disc-recorded supply of stimulus material (Appendix A) and recorded on tape as follows:

For the loudness level variables ten items were recorded as examples of average loudness level; ten as examples of much loudness level; and four as examples of little loudness level.

For the loudness variation variables twelve items were recorded and spliced as examples of much variation; eight as examples of average variation. Ten were recorded but not spliced as examples of little variation. In the examples of much loudness variation the principle of presenting all six permutations of much, average, and little was observed in recording the three parts of the phrases and splicing them in proper order. Two items were composed for each of the six combinations. (See Appendix A.) In the examples of average variation the principle of presenting all four combinations of average with either much or little, without using much and little with average, was observed. Two items were joined for each of the four combinations.

For the rate variation variable 12 items were recorded and arranged by the tape-splicing technique as examples of much rate variation; eight as examples of average variation. Ten were taken from discs as they were, which did not necessitate tape-splicing, as examples of little variation. In all much- and average-rate-variation items the principle of presenting all permutations of the spliced parts was observed. Two examples of each combination were composed.

For the pitch variation variable 12 items were recorded and spliced as examples of much pitch variation; eight as examples of average variation. Ten were taken from the discs as they were, which did not necessitate tape splicing, as examples of little variation. In all much- and average-pitch-variation items the principle of presenting all permutations of the spliced parts was observed. Two examples of each combination were composed.

All example items were spliced and recorded from one recorder to another in order to obtain two duplicates of the original. This was accomplished by aligning the recording heads and matching the gain controls. These copies were marked, separated, and spliced so that the three duplicates of each item followed one another but were separated by one second of silent tape. The third duplicate was followed by ten seconds of silent tape for the purpose of giving the judges time to mark the rating scale and to read the instructions pertaining to the next example. The purpose of having three duplicates was to give the judges time to hear the item. Spoken identification numbers were inserted in front of the first duplicate.

The last step in preparation of the examples for presentation to the judges for reliability ratings was that of making up one practice phrase of average variation in each of rate, pitch, and loudness. The same techniques used in the example items were employed.

Step Eight: Establishing the Reliability of the Example Items

The examples were presented to the 16 judges who rated them for reliability on a seven-point scale. The system shown in Figure 4 (page 15) was used and calibrated for loudness. The problem in the calibration was to determine the attenuator settings which would play back at an average loudness level the example phrases which had been recorded as examples of average loudness on the system shown in Figure 3 (page 13). This problem was solved by presenting some of the average loudness example items to three preliminary judges through the system shown in Figure 4 (page 15). The system was prepared for the presentation by setting the VU meter on the tape recorder so that it read 40 when playing back a 1000 cycle tone. This gave sufficient operational leeway for the loudest and softest voices which would later be played in the stimulus test. The gain control on the Langevin amplifier was then set at that point which fed the average loudness phrases from the tape recorder into the studio to the judges at a loudness level which they agreed was average. This level was obtained with the gain control on the Langevin amplifier set on number 3. All attenuator settings were carefully noted for future loudness calibration of the system.

When the judges had completed the first rating of all example items they took a fifteen-minute rest period and then returned for the rerating session, the purpose of which was to determine the reliability of the ratings. All items were used in the rerating and presented in the same order as in the first presentation. All conditions, including the seating of the judges, were constant from first to second rating sessions.

Step Nine: Selecting Items for the Stimulus Test from the Example Items

The following criteria were observed in making the selections:

1. Items were eliminated which received a relatively even spread in rating of five or more intervals on the seven-point scale.
2. Items were eliminated which had a difference of .5 points or more in the medians of the first and second ratings.
3. Items were so selected as to use as many different types of voices as possible.
4. Items whose medians fell within 3.50 to 4.50, inclusive, were chosen as representing an average amount of the particular vocal factor.
5. Items whose medians fell at 5.50 or above were selected as exemplifying much of the particular characteristic.

6. Items whose medians fell at 2.50 or below were selected as representing little of the particular vocal attribute.

Because of these criteria the items selected from the examples for the stimulus test were of high reliability as shown in Table III.

TABLE III. RATE-RERATE RELIABILITY OF RATINGS BY 16 JUDGES OF ITEMS USED IN STIMULUS TEST

TYPE OF ITEM	NO. OF ITEMS USED IN THE TEST	N	r
Pitch Variation	11	176	+ .775*
Rate Variation	8	128	+ .593**
Loudness Level	15	240	+ .924***
Loudness Variation	10	160	+ .809****

*An r of .194 is significant at the 1% level of confidence.

**An r of .226 is significant at the 1% level of confidence.

***An r of .168 is significant at the 1% level of confidence.

****An r of .203 is significant at the 1% level of confidence.

Table IV (page 33) shows the rate variation items selected for the stimulus test. There was not an adequate number of items of sufficiently high reliability to make the selection of a different one for each of the 15 rate variation variables. Eight items had sufficient reliability to warrant their selection. Three of these had to be repeated in order to have the 15 presentations, as shown in Table IV (page 33).

TABLE IV. RATE VARIATION ITEMS SELECTED FOR THE STIMULUS TEST

Presen- tation Number	Identi- fication No. of the Stimulus Reader Speaking the Item	Classification of Voice of Stimulus Reader		Median Rating of the Item by the Judges on the 7- point Scale	Classifi- cation of the Item as to Rate Variation
		Pitch Level	Rate Level		
1.	2	Low average	Slow average	1.90	Little
2.	19	Average	Fast average	2.16	Little
3.	2	Low average	Slow average	1.90	Little
4.	19	Average	Fast average	2.16	Little
5.	2	Low average	Slow average	1.90	Little
6.	18	Low	Slow average	4.23	Average
7.	11	Average	Average	4.14	Average
8.	29	Low average	Average	3.50	Average
9.	6	Low average	Average	3.50	Average
10.	7	High average	Average	3.50	Average
11.	10	High average	Slow average	5.70	Much
12.	10	High average	Slow average	5.70	Much
13.	10	High average	Slow average	5.70	Much
14.	10	High average	Slow average	5.70	Much
15.	10	High average	Slow average	5.70	Much

Table V (page 35) shows 15 loudness level items selected from the examples. None had to be repeated as there was a sufficient number of highly reliable items to provide for all 15 presentations.

Table VI (page 37) shows the ten loudness variation items of sufficient reliability to warrant their selection. Four of these had to be repeated in order to have the 15 presentations.

Table VII (page 39) shows the eleven pitch variation items chosen, three of which had to be repeated.

Step Ten: Selecting Items for the Stimulus Test from the Pitch Level and Rate Level Items

The following criteria were used as the basis of selection:

1. Items were chosen which were spoken by stimulus readers whose voices had been classified (Table I, page 26) as high, average, or low; fast, average, or slow.
2. Items were so selected as to use as many types of voices as available.

Table VIII (page 41) shows the 12 pitch level items selected, two of which were repeated.

Table IX (page 42) shows the seven rate level items selected. Two were repeated.

Step Eleven: Arranging the Items in the Stimulus Test

The arrangement of all items was based on the principle of spacing the repeated phrases and voices as far apart on the tape as possible. This resulted in having the repetitions of a phrase no

TABLE V. LOUDNESS LEVEL ITEMS SELECTED FOR THE STIMULUS TEST

Presentation Number	Identification No. of the Stimulus Reader Speaking the Item	Classification of Voice of Stimulus Reader		Median Rating of the Item by the Judges on the 7- point Scale	Classification of the Item as to Loudness Level
		Pitch Level	Rate Level		
1.	7	High average	Average	1.65	Little
2.	6	Low average	Average	1.97	Little
3.	12	Average	Average	2.37	Little
4.	2	Low average	Slow average	1.83	Little
5.	17	High average	Fast average	2.50	Little
6.	22	Average	Average	4.00	Average
7.	25	Average	Slow average	3.50	Average
8.	11	Average	Average	4.13	Average
9.	19	Average	Fast average	3.71	Average
10.	13	Average	Fast average	3.90	Average
11.	29	Low average	Average	6.88	Much
12.	8	Average	Fast average	5.93	Much
13.	10	High average	Slow average	6.15	Much
14.	20	Average	Fast average	6.77	Much
15.	3	Average	Average	6.00	Much

closer than ten items apart, and no voice repeated within eight items. To start the process of arrangement, those phrases which did not have to be repeated were randomly selected and laid out in that order. The items which had to be presented more than once were then arranged among those randomly chosen, and the latter so rearranged as to have no phrase repeated closer than ten items apart, or no voice closer than eight items, or no type of variable immediately following one of the same kind.

Ninety identification numbers with the word read /rɪd/ immediately following each number were recorded on tape. They were made at a sound pressure level closely matching that used in the items of the stimulus test representing average loudness level. Each number was preceded by the word number (for example, "number one, number two"). The sound pressure level, rate level, and other vocal characteristics were so controlled as to be approximately constant from number and word to number and word. All numbers and words were recorded on a continuous tape with seven seconds of silence between the word read and the next number in the series. The purpose of the silent tape was to give the subjects time to read the instructions (page 2 of Appendix D) pertaining to the item on the answer sheet. All items with their duplicates and their identification numbers were spliced in the proper order. Three seconds of silent tape were inserted after the duplicate to give the subjects time to mark the answer sheet. The purpose of the duplicate was to give the subjects time to hear the item.

TABLE VI. LOUDNESS VARIATION ITEMS SELECTED FOR THE STIMULUS TEST

Presentation Number	Identification No. of the Stimulus Reader Speaking the Item	Classification of Voice of Stimulus Reader		Median Rating of the Item by the Judges on the 7- point Scale	Classifi- cation of the Item as to Loudness Variation
		Pitch Level	Rate Level		
1.	2	Low average	Slow average	2.00	Little
2.	12	Average	Average	1.50	Little
3.	25	Average	Slow average	1.34	Little
4.	24	Low average	Slow average	1.75	Little
5.	13	Average	Fast average	2.28	Little
6.	5	Low average	Fast average	3.68	Average
7.	11	Average	Average	4.20	Average
8.	9	Low	Slow average	3.50	Average
9.	11	Average	Average	4.20	Average
10.	9	Low	Slow average	3.50	Average
11.	21	Low average	Average	6.70	Much
12.	4	Average	Fast average	5.92	Much
13.	21	Low average	Average	6.70	Much
14.	4	Average	Fast average	5.92	Much
15.	21	Low average	Average	6.70	Much

Table XI (pages 46-47) shows the arrangement of all items in the stimulus test. Although it appears from the identification numbers that some phrases were repeated closer than ten items apart, such was not the case. Phrases with the same identification number were identical only if spoken by the same voice.

SUBJECTS

A total of 335 male college students were used as subjects. The age spread was 16-43 years, inclusive; the median, 18.3 years. All had normal hearing and speech as determined by screening tests. "Normal in voice and speech" was defined as having no defects of voice or articulation sufficiently severe, in the opinion of the screening judge, to warrant clinical treatment. No student with foreign dialect was included.

Normal in hearing was defined as having no loss greater than 20 db on any two frequencies from 125-8000 c.p.s. in either ear.

The subjects came from the student body at large of the University of Florida. Most of them were solicited during the speech and hearing tests of Orientation Week. On the basis of the preliminary ratings of the screening judges, requests were sent by letter to an approximately equal number of high, average, and low; fast, average, and slow voices. Two hundred subjects were secured in this manner. The remaining 135 were obtained through a process of visitation to classes in undergraduate and graduate courses in the university at large.

TABLE VII. PITCH VARIATION ITEMS SELECTED FOR THE STIMULUS TEST

Presentation Number	Identification No. of the Stimulus Reader Speaking the Item	Classification of Voice of Stimulus Reader		Median Rating of the Item by the Judges on the 7- point Scale	Classifi- cation of the Item as to Pitch Variation
		Pitch Level	Rate Level		
1.	4	Average	Fast average	1.44	Little
2.	28	Low	Fast average	1.50	Little
3.	21	Low average	Average	1.70	Little
4.	22	Average	Average	2.22	Little
5.	28	Low	Fast average	1.50	Little
6.	29	Low average	Average	4.50	Average
7.	9	Low	Slow average	3.73	Average
8.	27	Low	Average	4.50	Average
9.	7	High average	Average	3.96	Average
10.	14	Low	Slow average	4.05	Average
11.	16	High	Fast	5.87	Much
12.	8	Average	Fast average	5.92	Much
13.	16	High	Fast	5.87	Much
14.	8	Average	Fast average	5.92	Much
15.	16	High	Fast	5.87	Much

A sample of the speech of each subject was recorded on magnetic tape as shown in Figure 5 (page 17). He was instructed to read and talk naturally. No other suggestions relative to the manner of reading and speaking were given. General instructions both oral and written immediately preceded the recording session.

Recording conditions were constant from subject to subject. The material employed (Appendix E) consisted of three parts. In part one the subjects read two factual five-syllable phrases. In part two they completed from memory two familiar sayings. In part three the subjects spoke two short, spontaneous statements about a house which was pictured on the instruction sheet. This method was employed because it would tend to give a more valid sample of the subject's natural speech. The method was an adaptation of that used by Black (2) who found that a speaker's vocal intensity and rate vary according to the type of reading and speaking assignment. Fairbanks and Pronovost (7) also demonstrated that a speaker's vocal characteristics are not constant from one form of utterance to another. They found that in simulating emotions voice varied systematically in frequency and duration from the simulation of one emotion to another.

Measurements taken on the recorded samples of the subjects' speech consisted of the following:

1. Rate Level
2. Rate Variation
3. Sound Pressure Level
4. Loudness Variation

TABLE VIII. PITCH LEVEL ITEMS SELECTED FOR THE STIMULUS TEST

Presentation Number	Identification No. of the Stimulus Reader Speaking the Item	Classification of Voice of Stimulus Reader		Median Rating of the Item by the Judges on the 7- point Scale	Classifi- cation of the Item as to Pitch Level
		Pitch Level	Rate Level		
1.	28	Low	Fast average	1.25	Low
2.	23	Low	Slow	1.91	Low
3.	27	Low	Average	1.75	Low
4.	14	Low	Slow average	2.00	Low
5.	18	Low	Slow average	2.15	Low
6.	4	Average	Fast average	3.75	Average
7.	13	Average	Fast average	3.58	Average
8.	12	Average	Average	4.06	Average
9.	19	Average	Fast average	4.20	Average
10.	20	Average	Fast average	3.58	Average
11.	16	High	Fast	6.33	High
12.	30	High	Fast average	6.05	High
13.	16	High	Fast	6.33	High
14.	30	High	Fast average	6.05	High
15.	16	High	Fast	6.33	High

TABLE IX. RATE LEVEL ITEMS SELECTED FOR THE STIMULUS TEST

Presentation Number	Identification No. of the Stimulus Reader Speaking the Item	Classification of Voice of Stimulus Reader		Median Rating of the Item by the Judges on the 7- point Scale	Classifi- cation of the Item as to Rate Level
		Pitch Level	Rate Level		
1.	23	Low	Slow	2.06	Slow
2.	23	Low	Slow	2.06	Slow
3.	23	Low	Slow	2.06	Slow
4.	23	Low	Slow	2.06	Slow
5.	23	Low	Slow	2.06	Slow
6.	6	Low average	Average	4.00	Average
7.	12	Average	Average	3.93	Average
8.	7	High average	Average	4.00	Average
9.	22	Average	Average	4.04	Average
10.	29	Low average	Average	4.15	Average
11.	16	High	Fast	5.56	Fast
12.	16	High	Fast	5.56	Fast
13.	16	High	Fast	5.56	Fast
14.	16	High	Fast	5.56	Fast
15.	16	High	Fast	5.56	Fast

5. Pitch Level

6. Pitch Variation

The measurements on pitch level, pitch variation, loudness variation, and rate variation were secured by having a group of three judges rate the recorded voices of the subjects on a seven-point scale. Appendix F shows the instructions given. Each variable was rated by a different group of three judges. Fifty randomly-chosen subjects were rerated to determine the reliability of the judgments. As shown in Table X, all coefficients of correlation exceeded the one per cent level of confidence. The apparatus and arrangement shown in Figure 4 (page 15) were used in the rating sessions.

TABLE X. RATE-RERATE RELIABILITY OF RATINGS BY
THREE JUDGES ON 50 RANDOMLY-CHOSEN SUBJECTS

VOCAL CHARACTERISTIC	N	r*
Pitch Level	50	+ .796
Pitch Variation	50	+ .696
Loudness Variation	50	+ .712
Rate Variation	50	+ .571

*An r of .361 is significant at the 1% level of confidence.

Measurements on rate level and sound pressure level were taken with a power level recorder (Sound Apparatus Co.) as shown in Figure 6, page 19.

The voices of the subjects were classified on the basis of the judges' ratings and measurements yielded by the power level recorder.

The rating which a subject received on those variables evaluated by the three judges was the sum of the three ratings. All such measurements on each variable were arranged in a continuum, and the voices of the subjects were classified as follows:

1. Classifications as to RATE VARIATION:

The 20 subjects with the largest sums of ratings and with the least spread or with no unreasonable spread of ratings by the judges were classified as having MUCH rate variation and were used in that column in the analysis of variance for treating the experimental data. Unreasonable spread of ratings was defined as that covering five or more intervals on the seven-point scale.

The 20 subjects whose sums of ratings fell nearest the mean of the continuum and who had the least spread or no unreasonable spread were classified as having AVERAGE rate variation and were listed in that column in the analysis.

The 20 subjects with the smallest sums of ratings and with the least spread or with no unreasonable spread of ratings were classified

as having LITTLE rate variation and were listed in that column in the analysis.

2. Classification as to LOUDNESS VARIATION:

The 20 subjects with the largest sums of ratings and with the least spread or with no unreasonable spread were classified as having MUCH loudness variation and were listed in that column in the analysis.

The 20 subjects whose sums of ratings fell nearest the mean of the continuum and who had the least spread or no unreasonable spread of ratings were classified as having AVERAGE loudness variation and were listed in that column in the analysis.

The 20 subjects with the smallest sums of ratings and with the least spread or no unreasonable spread were classified as having LITTLE loudness variation and were listed in that column in the analysis of variance.

3. Classification as to PITCH LEVEL:

The 20 subjects with the largest sums of ratings and with the least spread or with no unreasonable spread were classified as LOW in pitch level and were listed in that column in the analysis.

TABLE XI. ARRANGEMENT OF ITEMS IN THE STIMULUS TEST; VARIABLES REPRESENTED; VOICES SPEAKING THE ITEMS; AND PHRASES USED IN THE ITEMS

ITEM NO.	VARIABLE REPRESENTED	IDENTIFICATION NO. OF STIMULUS READER SPEAKING THE ITEM	IDENTIFICATION NO. OF PHRASE USED IN THE ITEM*
1.	Much Loudness Level	3	5
2.	Much Pitch Variation	16	25 a, b
3.	Average Rate Variation	11	23 a, b
4.	Much Pitch Variation	8	27 a, b
5.	Little Loudness Level	12	4
6.	Slow Rate Level	23	1
7.	Low Pitch Level	14	9
8.	Much Rate Variation	10	18 a, b
9.	Average Pitch Variation	29	32 a, b
10.	Little Pitch Variation	28	10
11.	Average Rate Variation	18	15 a, b
12.	High Pitch Level	16	9
13.	Average Rate Level	22	1
14.	Average Loudness Variation	11	7 a, b
15.	Average Pitch Level	4	9
16.	Much Loudness Variation	21	6 a, b
17.	Much Rate Variation	10	18 a, b
18.	Little Rate Variation	2	20 a, b
19.	Little Loudness Variation	12	7 a, b
20.	Little Rate Variation	19	2
21.	Little Loudness Variation	24	8
22.	Fast Rate Level	16	1
23.	Average Pitch Variation	7	27 a, b
24.	Slow Rate Level	23	1
25.	Average Rate Level	29	1
26.	Much Rate Variation	10	18 a, b
27.	Average Loudness Level	13	3
28.	Average Loudness Variation	9	8
29.	Little Loudness Variation	2	7 a, b
30.	Much Loudness Variation	4	6 a, b
31.	Average Loudness Level	22	3
32.	High Pitch Level	16	9
33.	Average Rate Level	6	1
34.	Average Loudness Level	11	4
35.	Little Rate Variation	19	2
36.	Average Pitch Level	20	9
37.	High Pitch Level	30	9
38.	Low Pitch Level	27	9
39.	Little Pitch Variation	4	31 a, b
40.	Little Loudness Level	7	3
41.	Fast Rate Level	16	1
42.	Average Pitch Level	12	9
43.	Slow Rate Level	23	1
44.	Average Loudness Level	19	4
45.	Much Rate Variation	10	18 a, b

*Phrases with the same identification number are not identical unless spoken by the same stimulus reader.

TABLE XI (Continued). ARRANGEMENT OF ITEMS IN THE STIMULUS TEST; VARIABLES REPRESENTED; VOICES SPEAKING THE ITEMS; AND PHRASES USED IN THE ITEMS

ITEM NO.	VARIABLE REPRESENTED	IDENTIFICATION NO. OF STIMULUS READER SPEAKING THE ITEM	IDENTIFICATION NO. OF PHRASE USED IN THE ITEM*
46.	Much Loudness Level	29	3
47.	Much Loudness Variation	21	6 a, b
48.	Much Pitch Variation	16	25 a, b
49.	Average Pitch Level	13	9
50.	Average Loudness Level	25	3
51.	Little Rate Variation	2	20 a, b
52.	Low Pitch Level	28	9
53.	High Pitch Level	30	9
54.	Average Pitch Variation	9	28 a, b
55.	Fast Rate Level	16	1
56.	Low Pitch Level	18	9
57.	Much Loudness Variation	4	6 a, b
58.	Average Rate Variation	6	22 a, b
59.	Much Pitch Variation	8	27 a, b
60.	Average Rate Variation	7	22 a, b
61.	Little Pitch Variation	21	10
62.	Much Loudness Level	20	3
63.	Much Pitch Variation	16	25 a, b
64.	Little Loudness Level	2	4
65.	Slow Rate Level	23	1
66.	Average Loudness Variation	9	8
67.	Little Loudness Level	17	4
68.	Much Rate Variation	10	18 a, b
69.	Average Pitch Variation	27	28 a, b
70.	Little Pitch Variation	22	10
71.	Average Rate Variation	29	16 a, b
72.	Fast Rate Level	16	1
73.	Average Pitch Level	19	9
74.	Little Rate Variation	2	20 a, b
75.	Low Pitch Level	23	9
76.	Average Loudness Variation	5	7 a, b
77.	Average Pitch Variation	14	30 a, b
78.	Much Loudness Variation	21	6 a, b
79.	Average Rate Level	12	1
80.	Average Loudness Variation	11	7 a, b
81.	Little Loudness Level	6	3
82.	High Pitch Level	16	9
83.	Average Rate Level	7	1
84.	Little Pitch Variation	28	10
85.	Much Loudness Level	10	5
86.	Little Loudness Variation	13	8
87.	Much Loudness Level	8	4
88.	Little Loudness Variation	25	7 a, b
89.	Slow Rate Level	23	1
90.	Fast Rate Level	16	1

*Phrases with the same identification number are not identical unless spoken by the same stimulus reader.

The 20 subjects whose sums of ratings fell nearest the mean of the continuum and who had the least spread or no unreasonable spread were classified as having AVERAGE pitch level and were listed in that column in the analysis.

The 20 subjects with the smallest sums of ratings and with the least or no unreasonable spread were classified as having HIGH pitch level and were listed in that column in the analysis.

4. Classifications as to PITCH VARIATION:

The 20 subjects with the largest sums of ratings and with the least spread or no unreasonable spread were classified as having MUCH pitch variation. They were listed in that column in the analysis.

The 20 subjects whose sums of ratings fell nearest the mean of the continuum and who had the least spread or no unreasonable spread were classified as having AVERAGE pitch variation and were listed in that column in the analysis.

The 20 subjects with the smallest sums of ratings and with the least spread or no unreasonable spread were classified as having LITTLE pitch variation and were listed in that column in the analysis.

Classifications of the subjects' voices with respect to RATE LEVEL AND SOUND PRESSURE LEVEL were based on the measurements yielded by the power level recorder. The six statements (Appendix E) which the subjects recorded as a sample of their speech were transferred from the tape of the Magnicorder to the waxed tape of the power level recorder as shown in Figure 6 (page 19). A subject's rate level was determined by dividing the total number of millimeters of tape on the power level recorder required to record his six statements by the total number of syllables uttered in the six statements. Thus, a subject's rate was considered to be the number of syllables which he uttered in a given length of time. These measurements of rate level on all subjects were arranged in a continuum.

On the basis of the measurements of rate level and sound pressure level, the voices of the subjects were classified as follows:

1. Classification with respect to RATE LEVEL:

The 20 subjects with the fastest rates in the continuum were classified as FAST rate level and were listed in that column in the analysis of variance.

The 20 subjects whose rate levels fell nearest the mean of the continuum were classified as AVERAGE rate level and were listed in that column in the analysis.

The 20 subjects with the slowest rates in the continuum were classified as SLOW rate level and were listed in that column in the analysis.

2. Classification with respect to SOUND PRESSURE LEVEL:

The 20 subjects with the most sound pressure level in the continuum were classified as having MUCH sound pressure level and were listed in that column in the analysis.

The 20 subjects whose sound pressure levels fell nearest the mean of the continuum were classified as having AVERAGE sound pressure level and were listed in that column in the analysis.

The 20 subjects with the least sound pressure level in the continuum were classified as having LITTLE sound pressure level and were listed in that column in the analysis.

COLLECTING THE DATA

The experimental data were collected by having the subjects listen in groups of two or more to the stimulus test and rate each of the 90 items on a five-point scale, as shown on the Answer Sheet (Appendix D). The instrumentation and arrangement shown in Figure 4 (page 15) were used. The presentations were constant from group to group. At the beginning of the session, the subjects read the written instructions as shown on Appendix E. All resulting questions were answered. The terms as defined on the instruction sheet were explained to all groups.

After the subjects had rated the two practice items, their questions concerning the routine were answered. Once the rating

session started, it was not interrupted until the entire test had been rated.

A subject's rating of the stimulus test resulted in six separate scores, one for each of the vocal characteristics of pitch level, pitch variation, loudness level, loudness variation, rate level, and rate variation. Each score consisted of the sum of the ratings given by the subject for the 15 items relative to the particular vocal attribute.

ANALYSIS OF DATA

The experimental data were treated by analysis of variance. Thus, there were six analyses of variance in the study, one for each of the six vocal characteristics. In each analysis there were three columns of scores. (See Appendix G.) Each column represented one of the three degrees of the particular vocal attribute and contained the scores of the 20 subjects whose voices had been classified by the judges as exhibiting that particular degree of the characteristic. The scores, for example, on the stimulus test of the 20 subjects whose voices had been classified as high pitch level were entered in the column representing the high degree of the characteristic. The scores of the 20 classified as average pitch level were entered in the corresponding column; and the scores of the 20 classified as low pitch level were entered in the column representing the low degree of the vocal attribute. The purpose of the analysis of pitch level, for example, was to reveal whether or not there was a significant

difference in the mean ratings that the men of the three groups (high, average, low) assigned judgmentally to the pitch level of the voices of the men whom they heard in the stimulus test.

CHAPTER IV

SUMMARY, RESULTS, AND DISCUSSION

SUMMARY

The purpose of this study was to investigate the relationship between men's vocal characteristics and their ratings of vocal characteristics in other men. Women were not included.

Six vocal factors were investigated. These were pitch level, pitch variation, loudness level, loudness variation, rate level, and rate variation.

Six null hypotheses were formulated, one relating to each of the six vocal characteristics as follows: (1) When male speakers are grouped according to their natural pitch level of voice (high, average, low), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the pitch level of voice of men whom they hear. (2) When male speakers are grouped according to their natural pitch variation of voice (little, average, much), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the pitch variation of voice of men whom they hear. (3) When male speakers are grouped according to their natural sound pressure level of voice (much, average, little), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the loudness level of voice of men whom they hear. (4) When male speakers are grouped according to their natural loudness

variation of voice (much, average, little), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the loudness variation of voice of men whom they hear. (5) When male speakers are grouped according to their natural rate level of speaking (fast, average, slow), there is no significant difference in the mean ratings that the individuals of the three groups assign judgmentally to the rate level of speaking of men whom they hear. (6) When male speakers are grouped according to their natural rate variation of speaking (much, average, little), there is no significant difference in the mean ratings which the individuals of the three groups assign judgmentally to the rate variation of speaking of men whom they hear.

To test the six hypotheses a stimulus test was composed which contained 90 items recorded on magnetic tape for aural presentation to the subjects. An answer sheet on which the subjects rated each item on a five-point scale immediately after hearing it accompanied the test.

The five-syllable phrases by Black (3) were selected as the stimulus material from which the test was constructed. All phrases were of similar intensity and no two contained the same wording.

The material was organized into 13 separate forms. Each contained two types of items: free-reading and copy-reading. The free-reading phrases were those which the stimulus readers read with their natural pitch, rate, and loudness but with as little variation as possible. The copy-reading items were those first recorded by the experimenter and later recorded by the stimulus

readers. They heard the items through an earphone-playback system and repeated them in the same manner as they were read on the recording.

Thirty male stimulus readers of normal voices and articulation were secured and their responses to the free-reading and copy-reading items recorded on discs. They constituted an approximately equal number of high, average, low; and fast, average, and slow voices as judged by the experimenter.

The classification of the voices of the stimulus readers was accomplished through ratings by 15 judges composed of teachers and graduate students in speech. A seven-point scale was used for rating each stimulus reader on rate level and pitch level of voice. Based on the medians of the ratings, the voices were classified as high, average, and low in pitch level; and fast, average, and slow in rate. Those voices whose medians fell within the intermediate positions on the seven-point scale, namely, within 2.50 to 3.49, inclusive, and 4.50 to 5.49, inclusive, were not used in the stimulus test as examples of pitch levels or rate levels. The ratings were highly reliable. Each coefficient of correlation exceeded the one per cent level of confidence, with r ranging upward to .97.

Employing the material recorded by the stimulus readers, the investigator constructed several examples from which the final items would be selected. Twice as many were composed as would be needed in the stimulus test.

All example items were presented to 16 male judges for ratings of reliability. Each item was rated on a seven-point scale. Those

whose medians fell within the intermediate positions on the scale, namely, within 2.50 to 3.49, inclusive, and 4.50 to 5.49, inclusive, were not used in the stimulus test. As a result of this method, all items selected were of high reliability exceeding the one per cent level of confidence, with r ranging upward to .92.

The items were so chosen and spaced within the stimulus test as to have five phrases representing each of the 18 variables.

Three hundred and thirty-five male subjects, all college students, were used. The age spread was 16-43 years; the median, 18.3 years. All had normal hearing and speech as determined by screening tests. Normal was defined as having no defects of voice or articulation severe enough to warrant clinical treatment. Because the experimental design called for subjects who were comparatively naive and untrained with regards to established terminology, methods, and practices of voice training, speech majors and minors were excluded.

A sample of the speech of each subject was recorded on magnetic tape. He was instructed to read and talk naturally. Recording conditions were constant from subject to subject. The recording material consisted of three parts. In part one the subject read two factual five-syllable phrases. In part two he completed from memory two familiar sayings. In part three the subject spoke two short spontaneous statements about a house which was pictured on the instruction sheet. This method was employed because such a procedure would tend to give a more valid example of the subject's natural speech.

The classification of the subjects' voices was accomplished through ratings by judges and through measurements taken with a power level recorder (Sound Apparatus Co.). Using a seven-point scale, three judges rated each subject with respect to pitch level, pitch variation, loudness variation, and rate variation. Measurements of rate level and sound pressure level were taken on the power level recorder. Fifty randomly-chosen subjects were rerated to determine the reliability of the judgments. All coefficients of correlation exceeded the one per cent level of confidence, with r ranging upward to .79.

All measurements on each of the vocal characteristics rated by the judges were arranged in a continuum. The 20 subjects out of the 335 who fell nearest each end of the continuum and the 20 nearest the mean, and who had the least spread or no unreasonable spread in ratings by the judges, were selected for the classification of the particular vocal characteristic.

The voices of the subjects were classified with respect to loudness level and rate level by measurements taken with the power level recorder. These measurements were arranged in a continuum and the subjects' voices classified according to the upper, middle, and lower 20.

The experimental data were collected by having the subjects listen in groups of two or more to the stimulus test and rate each of the 90 items on a five-point scale. Presentation conditions of instrumentation and environment were constant from group to group. A subject's score (Appendix G) was the total of his ratings of the 15

items in the stimulus test pertaining to the particular vocal characteristic. Thus, each subject had six different scores, one for each of pitch level, pitch variation, loudness level, loudness variation, rate level, and rate variation.

The data were treated by six analyses of variance, one for each of the six vocal characteristics. In each analysis there were three groups of scores. Each group contained the scores of the twenty subjects selected for the particular grouping. The purpose of each analysis was to determine if there was a significant difference in the mean ratings which the men of the three groups assigned judgmentally to the vocal characteristic in the stimulus test corresponding to the one being treated in the analysis.

RESULTS AND DISCUSSION

Table XII shows the mean sums of ratings for the three groups of subject raters selected for the analysis of variance on the pitch level items in the stimulus test. Subjects were grouped according to the classification of their voices with respect to pitch level (high, average, low) by the judges.

TABLE XII. MEAN SUMS OF RATINGS ON THE 15 PITCH LEVEL ITEMS IN THE STIMULUS TEST

	SUBJECT RATERS		
	HIGH	AVERAGE	LOW
Mean Sum	48.65	48.55	48.80

Table XIII shows the summary of the analysis of variance of pitch level. The subjects were grouped according to the classification of their voices as to pitch level (low, average, high) by the judges.

TABLE XIII. ANALYSIS OF VARIANCE ON THE SCORES OF THE SUBJECTS
FOR THE PITCH LEVEL ITEMS IN THE STIMULUS TEST

SOURCE OF VARIANCE	SUMS OF SQUARES	DEGREES OF FREEDOM	VARIANCE	F-RATIO
Between Groups	0.63	2	0.31	----
Within Groups	<u>1,218.70</u>	<u>57</u>	21.38	
Total	1,219.36	59		

The F-ratio in Table XIII is not significant. As can be seen, the variance within groups is larger than between groups. This error variance significantly exceeds the variance of principal interest. The raters in the three groups apparently did not make categorically different judgments.

Table XIV shows the mean sums of ratings for the three groups of subject raters, selected for the analysis of variance on the pitch variation items in the stimulus test. Subjects were grouped according to the classification of their voices with respect to pitch variation (much, average, little) by the judges.

TABLE XIV. MEAN SUMS OF RATINGS ON THE 15 PITCH VARIATION
ITEMS IN THE STIMULUS TEST

	MUCH	SUBJECT RATERS AVERAGE	LITTLE
Mean Sum	47.60	48.10	47.20

Table XV shows the summary of the analysis of variance on pitch variation. The subjects were grouped according to the classification of their voices with respect to pitch variation (much, average, little) by the judges.

TABLE XV. ANALYSIS OF VARIANCE ON THE SCORES OF THE SUBJECTS FOR THE PITCH VARIATION ITEMS IN THE STIMULUS TEST

SOURCE OF VARIANCE	SUMS OF SQUARES	DEGREES OF FREEDOM	VARIANCE	F-RATIO
Between Groups	8.13	2	4.06	----
Within Groups	<u>1,413.80</u>	<u>57</u>	24.80	
Total	1,421.96	59		

The F-ratio in Table XV is not significant. The variance within groups is larger than between groups. The raters in the three groups apparently did not make categorically different judgments.

Table XVI shows the mean sums of ratings for the three groups of subject raters selected for the analysis of variance on the loudness level items in the stimulus test. Subjects were grouped according to the classification of their voices with respect to loudness level (much, average, little) by the judges.

TABLE XVI. MEAN SUMS OF RATINGS ON THE 15 LOUDNESS LEVEL ITEMS IN THE STIMULUS TEST

	SUBJECT RATERS		
	MUCH	AVERAGE	LITTLE
Mean Sum	48.50	49.80	48.65

Table XVII shows the summary of the analysis of variance on loudness level. The subjects were grouped according to the classification of their voices with respect to loudness level (much, average, little) by the judges.

TABLE XVII. ANALYSIS OF VARIANCE ON THE SCORES OF THE SUBJECTS FOR THE LOUDNESS LEVEL ITEMS IN THE STIMULUS TEST

SOURCE OF VARIANCE	SUMS OF SQUARES	DEGREES OF FREEDOM	VARIANCE	F-RATIO
Between Groups	20.23	2	10.11	1.29*
Within Groups	<u>446.75</u>	<u>57</u>	7.84	
Total	466.99	59		

*Not significant at the 5% level of confidence.

As shown by the F-ratio in Table XVII there was no significant difference (significant at the 5% level of confidence) in the mean ratings that the men of the three groups (much, average, little) assigned judgmentally to the loudness level items in the stimulus test.

Table XVIII shows the mean sums of ratings for the three groups of subject raters selected for the analysis of variance on the loudness variation items in the stimulus test. Subjects were grouped according to the classification of their voices with respect to loudness variation (much, average, little) by the judges.

TABLE XVIII. MEAN SUMS OF RATINGS ON THE 15 LOUDNESS VARIATION ITEMS IN THE STIMULUS TEST

	SUBJECT RATERS		
	MUCH	AVERAGE	LITTLE
Mean Sum	51.00	51.20	51.10

Table XIX shows the summary of the analysis of variance on loudness variation. The subjects were grouped according to the classifications of their voices with respect to rate level (much, average, little) by the judges.

TABLE XIX. ANALYSIS OF VARIANCE ON THE SCORES OF THE SUBJECTS FOR THE LOUDNESS VARIATION ITEMS IN THE STIMULUS TEST

SOURCE OF VARIANCE	SUMS OF SQUARES	DEGREES OF FREEDOM	VARIANCE	F-RATIO
Between Groups	45.40	2	22.70	----
Within Groups	<u>1,314.00</u>	<u>57</u>	23.05	
Total	1,359.43	59		

The F-ratio in Table XIX is not significant. The raters in the three groups apparently did not make categorically different judgments.

Table XX shows the mean sums of ratings for the three groups of subject raters selected for the analysis of variance on the rate level items in the stimulus test. Subjects were grouped according to the classification of their voices with respect to rate level (fast, average, slow) by the judges.

TABLE XX. MEAN SUMS OF RATINGS ON THE 15 RATE LEVEL ITEMS IN THE STIMULUS TEST

	SUBJECT RATERS		
	FAST	AVERAGE	SLOW
Mean Sum	46.20	45.25	44.35

Table XXI shows the summary of the analysis of variance on rate level. The subjects were grouped according to the classifications of their voices as to rate level (fast, average, slow) by the judges.

TABLE XXI. ANALYSIS OF VARIANCE ON THE SCORES OF THE SUBJECTS FOR THE RATE LEVEL ITEMS IN THE STIMULUS TEST

SOURCE OF VARIANCE	SUMS OF SQUARES	DEGREES OF FREEDOM	VARIANCE	F-RATIO
Between Groups	34.23	2	17.12	1.26*
Within Groups	<u>777.50</u>	<u>57</u>	13.64	
Total	811.75	59		

*Not significant at the 5% level of confidence.

As shown by the F-ratio in Table XXI there was no significant difference (significant at the 5% level of confidence) in the mean ratings that the men of the three groups (fast, average, slow) assigned judgmentally to the rate level items in the stimulus test.

Table XXII shows the mean sums of ratings for the three groups of subject raters selected for the analysis of variance on the rate variation items in the stimulus test. Subjects were grouped according to the classification of their voices with respect to rate variation (much, average, little) by the judges.

TABLE XXII. MEAN SUMS OF RATINGS ON THE 15 RATE VARIATION ITEMS IN THE STIMULUS TEST

	SUBJECT RATERS		
	MUCH	AVERAGE	LITTLE
Mean Sum	45.20	46.45	41.65

Table XXIII shows the summary of the analysis of variance on rate variation. The subjects were grouped according to the classifications of their voices as to rate variation (much, average, little) by the judges.

TABLE XXIII. ANALYSIS OF VARIANCE ON THE SCORES OF THE SUBJECTS FOR THE RATE VARIATION ITEMS IN THE STIMULUS TEST

SOURCE OF VARIATION	SUMS OF SQUARES	DEGREES OF FREEDOM	VARIANCE	F-RATIO
Between Groups	248.04	2	124.02	3.01*
Within Groups	<u>2,348.70</u>	<u>57</u>	41.21	
Total	2,596.79	59		

*Not significant at the 5% level of confidence.

As shown by the F-ratio in Table XXIII there was no significant difference (significant at the 5% level of confidence) in the mean ratings that the men of the three groups (much, average, little) assigned judgmentally to the rate variation items in the stimulus test.

The results of the analyses of variance summarized in Table XXIV (page 65) show none of the F-ratios to be significant at the 5% level of confidence.

The ratio for rate variation, however, closely approached significance at the 5% level; consequently, t tests were run. No significant differences were found between the means.

Thus, the six null hypotheses of this study were not rejected because no significant difference was found in the mean ratings of the three groups for any of the six vocal characteristics.

TABLE XXIV. SUMMARY OF ANALYSES OF VARIANCE ON THE SCORES OF THE
SUBJECTS FOR THE SIX VOCAL CHARACTERISTICS INVESTIGATED

CHARACTERISTIC	F-RATIO	SIGNIFICANCE
Pitch Level	----	
Pitch Variation	----	
Loudness Level	1.29	Not Significant at the 5% Level of Confidence
Loudness Variation	----	
Rate Level	1.26	Not Significant at the 5% Level of Confidence
Rate Variation	3.01	Not Significant at the 5% Level of Confidence*

*An F-ratio of 3.15 is significant at the 5% level of confidence.

Some general observations on the data are possibly worth noting.

As seen in the summary of the mean ratings, Table XXV, the ratings assigned by the average category of subjects are numerically higher than those of the higher and lower groups in four out of six instances.

TABLE XXV. SUMMARY OF MEAN SUMS OF RATINGS OF THE ITEMS ON THE SIX
VOCAL CHARACTERISTICS IN THE STIMULUS TEST

	SUBJECT RATERS		
	HIGH SCORE GROUP	AVERAGE SCORE GROUP	LOW SCORE GROUP
Mean Sum Pitch Level	48.65	48.55	48.80
Mean Sum Pitch Variation	47.60	48.10	47.20
Mean Sum Loudness Level	48.50	49.80	48.65
Mean Sum Loudness Variation	51.00	51.20	51.10
Mean Sum Rate Level	46.20	45.25	44.35
Mean Sum Rate Variation	45.20	46.45	41.65

Table XXVI shows the ranks of the mean ratings and illustrates the assigning of higher ratings by the average category of subjects.

TABLE XXVI. RANKS OF MEAN SUMS OF RATINGS OF THE ITEMS ON THE SIX VOCAL CHARACTERISTICS IN THE STIMULUS TEST

	SUBJECT RATERS		
	HIGH SCORE GROUP	AVERAGE SCORE GROUP	LOW SCORE GROUP
Mean Sum Pitch Level	1	2	3
Mean Sum Pitch Variation	2	3	1
Mean Sum Loudness Level	1	3	2
Mean Sum Loudness Variation	1	3	2
Mean Sum Rate Level	3	2	1
Mean Sum Rate Variation	2	3	1

Friedman's Chi-square $r(9)$ was used in an analysis of the rankings in Table XXVI and was found to be non-significant at the 5% level.

This observed tendency for the average category of subjects to assign higher ratings to the items on the stimulus test might warrant a carefully designed study to determine the basis of such judgments.

An inspection of the raw data (Appendix G) shows little variation within the three groups of each of the six sets of scores. Generally, the discrepancies are small and in some cases very little. Consequently, there is little reason to question the interpretation given to the analyses of variance. However, as a further test of homogeneity, Bartlett's test, as discussed by Edwards (5), was run on each of the six sets of scores. The Chi-square obtained on the pitch level items is significant at the 2% level. This casts some doubt

concerning the homogeneity of variance of the three groups of scores; however, the Chi-square obtained is not quite large enough to indicate a positive presumption of heterogeneity. Therefore, the application of the analysis of variance is not ruled out.

The Chi-squares obtained on the remaining five sets of scores are so small and have such high probability (ranging upward from .10 to .50) of occurrence by chance, that no significance can be attached to them. There are no significant differences of homogeneity of the groups within each set of scores. Therefore, there is no doubt concerning the applicability of the analysis of variance.

Table XXVII reveals some interesting differences in the magnitudes of the variances of the six sets of scores.

TABLE XXVII. SUMMARY OF VARIANCES OF RATINGS OF THE ITEMS ON THE SIX VOCAL CHARACTERISTICS IN THE STIMULUS TEST

	High Score Group	SUBJECT RATERS Average Score Group	Low Score Group	Sum of Variances by Rows
Pitch Level	10.66	39.21	14.27	64.14
Pitch Variation	34.91	26.67	13.83	74.41
Loudness Level	8.26	10.48	4.77	23.51
Loudness Variation	28.68	15.64	24.83	69.15
Rate Level	7.12	14.93	18.87	40.92
Rate Variation	<u>36.06</u>	<u>59.73</u>	<u>27.82</u>	123.61
Sum of Variances by Columns	125.69	165.66	104.39	

As shown in the Table XXVII, the average group apparently tends not only to rate the test items higher, as shown by the mean sums of ratings in Table XXV, but to be more variable in the ratings assigned

to the test items. This may indicate that the average group tended to be less reliable in their ratings than were the high score and low score groups.

In the average group the only marked difference between the level and variation items is found in the items pertaining to rate. The rate variation items show greatest variance, which apparently tends to support the observation by several subjects that these items were the most difficult to rate. (Note summation of variances by rows.)

Apparently, as shown by the summation of rows, there is a greater variance for all groups in the variation items than in the level items.

The least variance is in the loudness level and rate level items. It is interesting to note that the subjects for these groups were classified on the basis of measurements yielded by the power level recorder. Apparently these subjects gave more homogeneous ratings than did the remaining subjects, who were classified on the basis of ratings by judges.

The low score group shows the least sum of variance of the three. They also exhibit less variance in four out of the six sets of scores.

The observations of the data discussed above reveal nothing which would indicate that the subjects performed in keeping with a rejection of the null hypotheses. However, it should be noted at this point that some of the judges of the voices of the stimulus readers were observed to perform in keeping with a rejection of the null hypotheses of this experiment. As these judges were not experimental subjects, no data were gathered on them. A subjective

basis of judgment might have been influencing their objective ratings. If such were the case, it seems to give some support to the hypothesis that raters familiar with terminology and methods of voice evaluation and improvement might possess attitudes on voice which would influence their ratings. Subjects similar to these judges might have produced different results in the present experiment. This observation and the findings of the studies reviewed in Chapter I have prompted the investigator to make some of the suggestions for further research listed on pages 73-74.

Although the findings of this study are negative, they are, in the opinion of the investigator, significant.

As designed and conducted, the experiment has made four possible contributions. The first is that of formulating a new concept of how voice might possibly be measured and evaluated indirectly. This concept suggests that the vocal characteristics of individuals on the average can possibly be measured by evaluating their ratings, on a "pencil and paper" test, of the vocal attributes of others. The thought was prompted by the procedures employed in the projective techniques used in appraising dynamic personality factors. The method of the present study, however, is not a projective technique.

Another contribution of this study is that of indicating a possible method of measuring and evaluating voice indirectly by employing terms in the rating scale of the test which would indicate social values associated with attributes of voice. As seen in the related studies reviewed in Chapter I, certain judgments of raters are

influenced by their own physical characteristics. The rating scale in all of these investigations contained social value terms. Marks (12) used the terms "darkness" and "lightness" in his study dealing with the skin color of negro college students. He found that the darker judges tended to rate a given subject as being lighter than did the lighter judges. Marks interpreted this as evidence that the judges were, in their striving to be average, displacing their own position toward the lighter end of the scale.

Hinckley and Rethlingshafer (11) used the social value terms "short" and "tall" in their study concerning the height of men. They point out that the meaning of these terms to the individual judge is in part determined by the height of the judge. The shorter judges tended to judge the height of men in the United States as being shorter than did the taller judges.

The influence of terms relating to age was evident in the investigation by Rettie (14). He found that women judged ages of women in terms of their own age. Older women judged ages as being younger than did younger judges.

In each of these experiments the meanings of the social value terms employed had a definite relationship to the physical characteristics of the judges and a consequent effect upon their judgments. The present study points to the possibility that an investigation similar to the present one but employing social value terms in the rating scale might make a positive contribution toward finding an indirect method of measuring and rating voice. Such terms as pleasant,

unpleasant; educated, uneducated; distinct, indistinct; lazy, and energetic might be employed.

One of the values of an indirect method of measuring and evaluating voice would be that of saving a great deal of time in administering screening tests in educational orientation programs. Instead of the large staff employed for giving such tests, comparatively few workers familiar with the mechanics of conducting indirect tests recorded on discs or magnetic tape would be sufficient. The trained personnel could be used more efficiently in the rechecking program for those individuals found to be in need of further testing.

Another possible contribution of the present study is that of presenting a method and technique which might be adapted to other experiments.

The last contribution is that of failing to produce evidence, based on the approach used in this study, which would indicate that men's vocal characteristics have an influence upon their ratings of vocal attributes in other men. This is true only when the descriptive terms of the rating scale and other aspects of the rating process are similar to those used in this experiment. These findings might possibly contribute to our understanding of past, present, and future studies relative to the reliability of tests of vocal characteristics.

CHAPTER V

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

The purpose of this study might well be stated again: to investigate the relationship between the vocal characteristics of men and their ratings of the vocal characteristics of other men. Women were not included in the study.

The experiment was prompted by the need in the field of speech, and elsewhere, for more rapid and efficient methods of screening voices. An indirect means of doing such would be most helpful in that it would eliminate the necessity for examiners to test each individual separately. This study was designed and pursued in hopes that it might produce evidence which would aid in our understanding of how such an indirect method might be achieved eventually.

The line of thinking which produced the experimental design was initiated by a consideration of the procedures used in some of the projective techniques for appraising dynamic personality factors. The investigator does not, however, consider the method used in this study to be a projective technique.

The vocal characteristics investigated were six in number, namely, pitch level, pitch variation, loudness level, loudness variation, rate level, and rate variation. Six null hypotheses were formulated, one for each of the vocal characteristics. The hypotheses were tested by employing a ninety-item test presented aurally to the subjects. The answer sheet, containing a five-point scale and

written instructions for each item, has been referred to in this study as a "paper and pencil" test because of the procedure, on the part of the subject, of reading the instructions, listening to the item, and marking the scale.

The experimental data were treated by six analyses of variance, one for each of the null hypotheses. The results showed no significant difference in the mean ratings assigned by the men in the three groups of any of the six vocal characteristics investigated. Thus, the six null hypotheses were not rejected.

It is the opinion of the experimenter, based on the findings of this study and those of the studies reviewed, that further research for answers to the following questions would contribute to the future realization of an indirect method of measuring and evaluating voice:

1. What are some social value terms relating to characteristics of voice which are understood by subjects naive and untrained in established terminology, methods, and practices of voice training? How could these be used in a rating scale to measure the subjects' attitudes toward voice? Would there be a significant relationship between the ratings which these subjects would give on such a scale and their own vocal characteristics?
2. What are the social value terms relating to characteristics of voice which are understood by subjects who are well informed and trained in established terminology, methods, and practices of voice training? How could these terms be used in a rating scale? Would there be a significant relationship between the

ratings which these subjects would give on such a scale and their own vocal characteristics?

3. By using subjects well informed and trained in established terminology, methods, and practices in voice training, would the present experiment produce other results?

4. Would the present study produce other results if female subjects only were used? Would there be a difference between the results obtained from trained and untrained female subjects?

5. Do subjects of average classification with respect to vocal characteristics demonstrate less ability in making discriminations of these attributes than do subjects classified as above or below average?

BIBLIOGRAPHY

BIBLIOGRAPHY

1. American Standards Association, Inc., Acoustical Terminology. New York, (1951) pp. 11-12.
2. Black, John W., "The Relation Between Message Type and Vocal Rate and Intensity," Speech Monog., 16, 2, 1949, pp. 3-6.
3. Black, John W., "Timed Phrases," ONR Technical Report, SDC-411-1-5, 1949, 9 pp.
4. Darley, F. L., "A Normative Study of Oral Reading Rate," Unpublished M.A. Thesis, State University of Iowa, 1940.
5. Edwards, A. L., Experimental Design in Psychological Research, (New York: Rinehart and Co., Inc., 1950), pp. 195-197.
6. Fairbanks, Grant, Voice and Articulation Drillbook, (New York: Harper and Brothers, 1940), pp. 140-200.
7. Fairbanks, G. and Pronovost, W., "An Experimental Study of the Pitch Characteristics of the Voice during the Expression of Emotion," Speech Monog., 6, 1939, pp. 87-104.
8. Franke, P., "A Preliminary Study Validating the Measurement of Oral Reading Rate in Words per Minute," M.A. Thesis, State University of Iowa, 1939.
9. Friedman, Milton, "Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance," J. Amer. Statist. Ass., 32, 1937, pp. 675-701.
10. Harrimon, P. L., The New Dictionary of Psychology, (New York: The Philosophical Library, Inc., 1947), p. 345.
11. Hinckley, E. D. and Rethlingshafter, D., "Value Judgments of Height of Men by College Students," J. of Psychol., 31, 1951, pp. 257-262.
12. Marks, E. S., "Skin Color Judgments of Negro College Students," J. of Abnorm. and Soc. Psychol., 38, 1943, pp. 370-376.
13. Pronovost, W., "An Experimental Study of the Habitual and Natural Pitch Levels of Superior Speakers," Ph.D. Dissertation, State University of Iowa, 1939.

14. Rettie, George, Jr., "Value Judgments of Age in Women," Unpublished Master's Thesis, University of Florida, Gainesville, Florida, 1952, 34 pp.
15. Snidecor, J. C., "Experimental Studies of the Pitch and Duration Characteristics of Superior Speech," Ph.D. Dissertation, State University of Iowa, 1940.
16. Walker, C. and Black, J. W., "The Intrinsic Intensity of Oral Phrases," U. S. Naval School of Aviation Medicine, Joint Report No. 2, Bureau Medical Research.

APPENDIX A

EXPERIMENTER'S COPY OF FORM NO. ONE, Page 1.

Category No. One: Free Reading Items

Stimulus Readers Nos. 1, 14, 25.

Instructions to the Stimulus Readers:

Read the following phrases in your natural loudness, rate, and pitch but with as little variation as possible. Read all phrases alike. Read each phrase or word immediately following the light signal which the operator will give you. Do not read the number of the phrase or word.

Be sure to "light" the decibeloscope at the desired level (cause the second from the top but not the top lamp to glow) when you read each word or phrase.

Practice the entire group once. When you are ready to record give the operator a spoken signal. Notice that you start the recording by giving your full name. The operator will give you the light signal to begin.

<u>Phrase or Word:</u>	<u>To be Used in the Stimulus Test as</u> <u>Is, or when Spliced Together, as</u> <u>Shown by Converging Lines in Nos.</u> <u>6-7B, as Examples of:</u>	<u>Loudness Level to be Used</u> <u>for Rerecording the Loud-</u> <u>ness Level and Loudness</u> <u>Variation Items:</u>
1. THE SAFEST AND BEST	Natural Rate	
2. DISTANCE FROM THE FIELD	Little Rate Variation	
3. THE SPEED OF THE PLANE	Little Loudness Level	Little
4. SEEM TO BE SKIDDING	Average Loudness Level	Average
5. WE CIRCLE THE FIELD	Much Loudness Level	Much
6. THE		Little
6A. TRAFFIC	Much Loudness Variation	Average
6B. PATTERN	When Spliced Together in this Order	Much
7. CLOSER		Much
7A. TO	Average Loudness Variation	Average
7B. THE FIELD	When Spliced Together in This Order	Much
8. MAKE THE SECOND ONE	Little Loudness Variation	
9. THE CONTROLS ARE USED	Natural Pitch	
10. THAT THE STUDENT SEES	Little Pitch Variation	

APPENDIX A (Continued)

EXPERIMENTER'S COPY OF FORM NO. ONE (Continued), Page 2.

Category No. Two: Copy Reading Items

Stimulus Readers Nos. 1, 14, 25.

Instructions to the Stimulus Readers:

Read each of these words or phrases in the same manner as you will hear them read on the recording over the earphone. Follow the pattern very carefully. Immediately after a word or phrase is read by the voice over the earphone you read it in like manner. You will notice that the words and phrases are printed in order on your sheet of paper. Give the operator a spoken signal when you are ready.

<u>Phrase or Word:</u>	<u>Rate Level to be Used by the</u> <u>Experimenter in Making the</u> <u>Recording</u>	<u>To be used in the stimulus test as</u> <u>is or when spliced together as shown</u> <u>by converging lines, As Examples Of:</u>
Type One: <u>Rate Level:</u>		
11. WHEN WE'RE IN THE AIR	Slow	Slow Rate Level
12. ENTRY TO THE SPIN	Average	Average Rate Level
13. WE EASE BACK THE STICK	Fast	Fast Rate Level

Type Two: Much Rate Variation:

14. TO LAND	Slow	} _____ Much Rate Variation
14A. ON	Average	
14B. THE FIELD	Fast	
15. IN	Average	} _____ Much Rate Variation
15A. ORDER	Fast	
15B. TO KEEP	Slow	
16. BACK	Fast	} _____ Much Rate Variation
16A. INTO	Slow	
16B. THE FIELD	Average	

APPENDIX A (Continued)

EXPERIMENTER'S COPY OF FORM NO. ONE (Continued), Page 3.

Category No. Two: Copy Reading Items (Continued)

Stimulus Readers Nos. 1, 14, 25.

<u>Phrase or Word:</u>	<u>Rate Level to be Used by the</u> <u>Experimenter in Making the</u> <u>Recording:</u>	<u>To be Used in the Stimulus Test as</u> <u>Is or when Spliced Together as Shown</u> <u>by Converging Lines, as Examples of:</u>
Type Two: <u>Much Rate Variation:</u> (Continued)		

17. WE	Fast	} _____ Much Rate Variation
17A. BEGIN	Average	
17B. A TURN	Slow	
18. THE SAME	Average	} _____ Much Rate Variation
18A. AS	Slow	
18B. THE ONE	Fast	
19. THE CLIMB	Slow	} _____ Much Rate Variation
19A. IS	Fast	
19B. TOO STEEP	Average	

Type Three: Average Rate Variation

20. ABOUT	Slow	} _____ Average Rate Variation
20A. THIS	Average	
20B. DISTANCE	Slow	
21. IT'S	Fast	} _____ Average Rate Variation
21A. A CLIMBING	Average	
21B. TURN	Fast	
22. TO	Average	} _____ Average Rate Variation
22A. A FULL	Slow	
22B. LANDING	Average	
23. THE FIRST	Average	} _____ Average Rate Variation
23A. SPIN	Fast	
23B. TO YOU	Average	

APPENDIX A (Continued)

EXPERIMENTER'S COPY OF FORM NO. ONE (Continued), Page 4.

Category No. Two: Copy Reading Items (Continued)

Stimulus Readers Nos. 1, 14, 25.

<u>Phrase or Word:</u>	<u>Pitch Level and Inflectional Pattern of Pitch Change to be Used by the Experimenter in Making the Recording</u>	<u>To be Used in the Stimulus Test when Spliced Together as Shown by Converging Lines, As Examples of:</u>
Type Four: <u>Much Pitch Variation:</u>		
24. THE BRAKES	High—	Much Pitch Variation
24A. CAN	Average—	
24B. BE USED	Low—	
25. A SPIN	Average—	Much Pitch Variation
25A. TO	Low—	
25B. THE RIGHT	High—	
26. IF	Low—	Much Pitch Variation
26A. THE ENGINE	High—	
26B. FAILS	Average—	
27. ADVANCE	Low—	Much Pitch Variation
27A. THE	Average—	
27B. THROTTLE	High—	
28. KEEP	Average—	Much Pitch Variation
28A. A CONSTANT	High—	
28B. BANK	Low—	
29. YOU'LL	High—	Much Pitch Variation
29A. START	Low—	
29B. THE LANDING	Average—	

APPENDIX A (Continued)

EXPERIMENTER'S COPY OF FORM NO. ONE (Continued), Page 5.

Category No. Two: Copy Reading Items (Continued)

Stimulus Readers Nos. 1, 14, 25.

<u>Phrase or Word:</u>	<u>Pitch Level and Inflectional Pattern of Pitch Change to be Used by the Experimenter in Making the Recording</u>	<u>To Be Used in the Stimulus Test when Spliced Together as Shown by Converging Lines, As Examples of:</u>
Type Five: <u>Average Pitch Variation</u>		
30. THE STICK	High ↗	Average Pitch Variation
30A. AND	Average —	
30B. RUDDER	High ↗	Average Pitch Variation
31. ADJUST	Low ↘	
31A. THE	Average —	Average Pitch Variation
31B. THROTTLE	Low ↘	
32. ALONE	Average —	Average Pitch Variation
32A. TO	High ↗	
32B. THE FIELD	Average —	Average Pitch Variation
33. RELEASE	Average —	
33A. THE	Low ↘	Average Pitch Variation
33B. PRESSURE	Average —	

APPENDIX A (Continued)

STIMULUS READERS' COPY OF FORM NO. ONE, Page 1

Category No. One: Free Reading Items

Stimulus Readers Nos. 1, 14, 25.

Instructions to the Stimulus Readers:

Read the following phrases in your natural loudness, rate, and pitch but with as little variation as possible. Read all phrases exactly alike. Read each phrase or word immediately following the light signal which the operator will give you. Do not read the number of the phrase or word.

Be sure to "light" the decibeloscope at the desired level (cause the second light from the top but not the top lamp to glow) when you read each word or phrase.

Practice the entire group once. When you are ready to record give the operator a spoken signal. Notice that you start the recording by giving your full name. The operator will give you the light signal to begin.

1. THE SAFEST AND BEST (watch for light signal)
2. DISTANCE FROM THE FIELD (watch for light signal)
3. THE SPEED OF THE PLANE (watch for light signal)
4. SEEM TO BE SKIDDING (watch for light signal)
5. WE CIRCLE THE FIELD (watch for light signal)
6. THE (watch for light signal)
- 6A. TRAFFIC (watch for light signal)
- 6B. PATTERN (watch for light signal)
7. CLOSER (watch for light signal)
- 7A. TO (watch for light signal)
- 7B. THE FIELD (watch for light signal)
8. MAKE THE SECOND ONE (watch for light signal)
9. THE CONTROLS ARE USED (watch for light signal)
10. THAT THE STUDENT SEES (watch for light signal)

APPENDIX A (Continued)

STIMULUS READERS' COPY OF FORM NO. ONE, Page 2
Category No. Two: Copy Reading Items

Stimulus Readers Nos. 1, 14, 25.

Instructions to the Stimulus Readers:

Read each of these words or phrases in the same manner as you will hear them read on the recording over the earphone. Follow the pattern very carefully. Immediately after a word or phrase is read by the voice over the earphone you read it in like manner. You will notice that the words and phrases are printed in order on your sheet of paper. Give the operator a spoken signal when you are ready. Be sure to "light" the second from the top, but not the top lamp on the decibeloscope as you read each word or phrase.

- 11. WHEN WE'RE IN THE AIR
- 12. ENTRY TO THE SPIN
- 13. WE EASE BACK THE STICK

(WAIT FOR THE RECORDING TO BE CHANGED HERE)

- 14. TO LAND
- 14A. ON
- 14B. THE FIELD
- 15. IN
- 15A. ORDER
- 15B. TO KEEP
- 16. BACK
- 16A. INTO
- 16B. THE FIELD
- 17. WE
- 17A. BEGIN
- 17B. A TURN
- 18. THE SAME
- 18A. AS
- 18B. THE ONE

APPENDIX A (Continued)

STIMULUS READERS' COPY OF FORM NO. ONE, Page 3
Category No. Two: Copy Reading Items (Continued)

Stimulus Readers Nos. 1, 14, 25.

- 19. THE CLIMB
- 19A. IS
- 19B. TOO STEEP
- 20. ABOUT
- 20A. THIS
- 20B. DISTANCE
- 21. IT'S
- 21A. A CLIMBING
- 21B. TURN
- 22. TO
- 22A. A FULL
- 22B. LANDING
- 23. THE FIRST
- 23A. SPIN
- 23B. TO YOU

(WAIT FOR THE RECORDING TO BE CHANGED HERE.)

- 24. THE BRAKES
- 24A. CAN
- 24B. BE USED
- 25. A SPIN
- 25A. TO
- 25B. THE RIGHT
- 26. IF
- 26A. THE ENGINE
- 26B. FAILS
- 27. ADVANCE
- 27A. THE
- 27B. THROTTLE

APPENDIX A (Continued)

STIMULUS READERS' COPY OF FORM NO. ONE, Page 4
Category No. Two: Copy Reading Items (Continued)

Stimulus Readers Nos. 1, 14, 25.

- 28. KEEP
- 28A. A CONSTANT
- 28B. BANK
- 29. YOU'LL
- 29A. START
- 29B. THE LANDING
- 30. THE STICK
- 30A. AND
- 30B. RUDDER
- 31. ADJUST
- 31A. THE
- 31B. THROTTLE
- 32. ALONE
- 32A. TO
- 32B. THE FIELD
- 33. RELEASE
- 33A. THE
- 33B. PRESSURE

APPENDIX B

Instructions to the Judges of the Voices of the Stimulus Readers

You are to rate each voice with respect to its average pitch and rate on the seven-point scale. The name of the reader will not be given. His identification number will be spoken by the experimenter immediately preceding the playing of his recording.

The reader will read three five-syllable phrases. Please wait until he has read all three before marking the scales.

Are there any questions?

APPENDIX C
Number 1

Instructions to the Judges of the Example Items
Pertaining to RATE VARIATION

In the recording you will hear several short, five-syllable phrases. Each phrase will be read by a different voice and repeated three times in succession to give you sufficient time to form your judgment. Immediately after forming your judgment you are to rate the phrase on the scale according to your estimate of the amount of RATE VARIATION in the production of the words in the phrase. Do not consider any of pauses even though they are shorter in some phrases than in others. You will have ten seconds between phrases for marking your rating and reading the instructions concerning the next item.

The primary factor to be considered as a definition of RATE VARIATION is the amount of spread or range in change of rate, i.e. the spread between the extremes of fast and slow.

Be sure to base your rating only on the amount of RATE VARIATION which the average college male student would probably use in reading such a phrase in the "average" reading situation. Do not base your rating on the amount of variation which he "should" use or on the amount which you would prefer that he use. Do not be too cautious about the spread of your rating. In other words, give full expression to your impulse. If you feel that the phrase under consideration is read with very much or very little RATE VARIATION mark the rating scale accordingly. Furthermore, do not be confused if many of the phrases seem to be read with the same amount of RATE VARIATION.

There will be a practice session before the actual rating session starts so that you will know exactly what you are to listen for and how to mark your rating sheet.

Make certain that you sit in the same chair for the repeat rating session.

Remember to rate only the amount of RATE VARIATION with which the words are read.

APPENDIX C (Continued)
Number 2

Instructions to the Judges of the Example Items
Pertaining to PITCH VARIATION

In the recording you will hear several short, five-syllable phrases. Each phrase will be read by a different voice and repeated three times in succession to give you sufficient time to form your judgment. Immediately after forming your judgment you are to rate the phrase on the scale according to your estimate of the amount of PITCH VARIATION in the production of the words in the phrase. You will have ten seconds between phrases for marking your rating and reading the instructions concerning the next item.

The primary factor to be considered as a definition of PITCH VARIATION is the amount of spread or range in change of pitch, i.e., the spread between the extremes of high and low.

Be sure to base your rating only on the amount of PITCH VARIATION which the average college male student would probably use in reading such a phrase in the "average" reading situation. Do not base your rating on the amount of variation which he "should" use or on the amount which you would prefer that he use. Do not be too cautious about the spread of your rating. In other words, give full expression to your impulse. If you feel that the phrase under consideration is read with very much or very little PITCH VARIATION mark the rating scale accordingly. Furthermore, do not be confused if many of the phrases seem to be read with the same amount of PITCH VARIATION.

There will be a practice session before the actual rating session starts so that you will know exactly what you are to listen for and how to mark your rating sheet.

Make certain that you sit in the same chair for the repeat rating session.

Remember to rate only the amount of PITCH VARIATION with which the words are read.

APPENDIX C (Continued)
Number 3

Instructions to the Judges of the Example Items
Pertaining to LOUDNESS VARIATION

In the recording you will hear several short, five-syllable phrases. Each phrase will be read by a different voice and repeated three times in succession to give you sufficient time to form your judgment. Immediately after forming your judgment you are to rate the phrase on the scale according to your estimate of the amount of LOUDNESS VARIATION in the production of the words in the phrase. You will have ten seconds between phrases for marking your rating and reading the instructions concerning the next item.

The primary factor to be considered as a definition of LOUDNESS VARIATION is the amount of spread or range in change of loudness, i.e., the spread between the extremes of loud and soft.

Be sure to base your rating only on the amount of LOUDNESS VARIATION which the average college male student would probably use in reading such a phrase in the "average" reading situation. Do not base your rating on the amount of variation which he "should" use or on the amount which you would prefer that he use. Do not be too cautious about the spread of your rating. In other words, give full expression to your impulse. If you feel that the phrase under consideration is read with very much or very little LOUDNESS VARIATION mark the rating scale accordingly. Furthermore, do not be confused if many of the phrases seem to be read with the same amount of LOUDNESS VARIATION.

There will be a practice session before the actual rating session starts so that you will know exactly what you are to listen for and how to mark your rating sheet.

Make certain that you sit in the same chair for the repeat rating session.

Remember to rate only the amount of LOUDNESS VARIATION with which the words are read.

APPENDIX C (Continued)
Number 4

Instructions to the Judges of the Example Items
Pertaining to LOUDNESS LEVEL

In the recording you will hear several short, five-syllable phrases. Each phrase will be read by a different voice and repeated three times in succession to give you sufficient time to form your judgment. Immediately after forming your judgment you are to rate the phrase on the scale according to your estimate of the LOUDNESS LEVEL of the phrase. You will have ten seconds between phrases for marking your rating and reading the instructions concerning the next item.

Be sure to base your rating of the LOUDNESS LEVEL on that which the average college male student would probably use in reading such a phrase in the "average" reading situation. Do not base your rating of the LOUDNESS LEVEL on that which you would prefer that he use or on that which he "should" use. Do not be too cautious about the spread of your rating.

Make certain that you sit in the same chair for the repeat rating session.

There will be a practice session before the actual rating session starts.

Remember to rate only the LOUDNESS LEVEL at which the phrase is read.

APPENDIX D, Page One

Instructions to the Subjects and an Example Page of the
Answer Sheet to the Stimulus Test

NAME: _____ DATE _____
Last First Middle

In each question you will hear a short phrase read twice from the tape recording through the loud speaker. The two readings will be exactly alike. You are to check on the answer sheet the one answer which you judge to be the best description of the voice which reads the phrase. Put the check mark on the line provided to the left of the answer. Pay no attention to the meaning of the phrase. Concentrate only on the characteristics of the voice as indicated by the question.

It will be necessary that you understand the following terms:

1. RATE, which refers to the speed of the voice. Does it tend to be slow or fast?
2. PITCH, which means how high or low the voice tends to be in comparison with the musical scale.
3. LOUDNESS, which means how loud or soft in force the voice tends to be.
4. VARIATION IN RATE, which means the amount of change from fast to slow which the voice of the speaker shows.
5. VARIATION IN PITCH, which means the amount of change from high to low which the voice of the speaker shows.
6. VARIATION IN LOUDNESS, which means the amount of change from loud to soft which the voice of the speaker shows.

The number of the question will also be spoken through the loud speaker and followed immediately by the word "read." Following the word "read" there will be a seven-second silent period for the purpose of giving you time to read the question. Immediately following the seven-second silent period a voice will speak the two repetitions of the phrase. You are to listen carefully to the characteristics of the voice, as indicated by the question, and quickly check your answer. You will have three seconds in which to form your judgment and check the answer.

Be sure to sit as still as possible and in the same position throughout the test because moving your head will cause you to hear the phrases differently. Also remain perfectly quiet throughout the test because sound of any kind will hinder your hearing and the hearing of others in the group.

If you have any questions, the experimenter will be glad to answer them.

Listen now to the two examples and mark your answers accordingly.

APPENDIX D (Continued), Page Two

EXAMPLES

1. You describe the <u>LOUDNESS</u> of voice with which this phrase is read as: <u> </u> 1. Very soft <u>CHECK ONLY</u> <u> </u> 2. Soft <u>ONE ANSWER</u> <u> </u> 3. Average <u> </u> 4. Loud <u> </u> 5. Very loud	2. You describe the <u>VARIATION IN LOUDNESS</u> of voice with which this phrase is read as: <u> </u> 1. Very little variation <u>CHECK</u> <u> </u> 2. Little variation <u>ONLY</u> <u> </u> 3. Average variation <u>ONE</u> <u> </u> 4. Much variation <u>ANSWER</u> <u> </u> 5. Very much variation

Remember to pay no attention to the meaning of the phrase.
Concentrate only upon the characteristics of the voice as indicated by the question on the answer sheet.

THE TEST

1. You describe the <u>LOUDNESS</u> of voice with which this phrase is read as: <u> </u> 1. Very soft <u> </u> 2. Soft <u>CHECK ONLY</u> <u> </u> 3. Average <u>ONE ANSWER</u> <u> </u> 4. Loud <u> </u> 5. Very loud	3. You describe the <u>VARIATION IN RATE</u> of voice with which this phrase is read as: <u> </u> 1. Very little variation <u>CHECK</u> <u> </u> 2. Little variation <u>ONLY</u> <u> </u> 3. Average variation <u>ONE</u> <u> </u> 4. Much variation <u>ANSWER</u> <u> </u> 5. Very much variation
2. You describe the <u>VARIATION IN PITCH</u> of voice with which this phrase is read as: <u> </u> 1. Very little variation <u> </u> 2. Little variation <u>CHECK ONLY</u> <u> </u> 3. Average variation <u>ONE ANSWER</u> <u> </u> 4. Much variation <u> </u> 5. Very much variation	4. You describe the <u>VARIATION IN PITCH</u> of voice with which this phrase is read as: <u> </u> 1. Very little variation <u> </u> 2. Little variation <u>CHECK</u> <u> </u> 3. Average variation <u>ONLY</u> <u> </u> 4. Much variation <u>ONE</u> <u> </u> 5. Very much variation <u>ANSWER</u>

(There were 90 items in the test. The first four are given here as an example.)

APPENDIX E

Instructions to the Subjects and Statements Recorded by the Subjects

1.

Give your last name followed by your first and middle name.
Give your number.
Read the phrases printed in large type below.
Talk naturally.
Wait for the flashlight signal before reading each phrase.

BACK INTO THE FIELD

BEFORE ANY SPIN

2.

Complete the phrases printed below.
Talk naturally.
Do not speak the part of the phrase which is printed.
Wait for the flashlight signal before completing each phrase.

TIME AND TIDE -----

OLE KING COLE -----

3.

Make two short statements about the house shown in the picture below.
Start each statement with "The house."
Talk naturally.
Wait for the flashlight signal before making each statement.

"THE HOUSE"-----

"THE HOUSE"-----

(A picture of a house was mounted here.)

APPENDIX F

Instructions to the Judges of the Voices of the Subjects

Remember that you are rating college students, the majority of whom are freshmen. Rate them on the basis of the average student. Do not compare them with professional readers or speakers. Do not let your opinion as to the vocal characteristics which they should have or which you would want them to have influence you.

Do not be too conservative with the spread of your rating.

Be sure to wait until the subject has spoken all phrases before rating him.

You will notice that the numbers assigned to the subjects are, for the most part, consecutive: however, some numbers have been omitted and a few have been duplicated. Write the subject's number as it is spoken by the subject.

1. To the Judges of Rate Variation in the Voices of the Subjects:
The primary factor to be considered is the amount of spread or range in change of rate, i.e., the spread between the extremes of fast and slow.
2. To the Judges of Pitch Variation in the Voices of the Subjects:
The primary factor to be considered is the amount of spread or range in change of pitch, i.e., the spread between the extremes of high and low.
3. To the Judges of Loudness Variation in the Voices of the Subjects:
The primary factor to be considered is the amount of spread of range in change of loudness, i.e., the spread between the extremes of loud and soft.
4. To the Judges of Loudness Level in the Voices of the Subjects:
Loudness Level refers to the average loudness of the voice.

You will have four examples. Rate them for practice.

APPENDIX G
Number 1

Raw Scores of Subjects Employed in Analysis of Variance on Pitch Level

<u>High</u>		<u>Average</u>		<u>Low</u>	
Subject No.	Score	Subject No.	Score	Subject No.	Score
791	48	749	56	841	52
524	53	754	43	622	48
664	52	760	52	801	55
578	44	762	49	790	46
682	46	766	50	846	47
537	52	777	60	836	50
735	46	588	53	690	44
819	54	614	47	646	55
840	50	810	44	620	52
509	46	685	45	787	46
534	48	631	47	858	50
567	47	651	53	856	49
625	54	656	55	727	48
647	49	502	51	684	43
703	46	696	47	677	45
868	44	515	42	675	50
871	51	699	44	663	49
519	47	701	55	623	47
525	51	704	46	803	44
573	45	705	32	742	56
Sum of X	973		971		976
Sum of X ²	47,539		47,887		47,900
(Sum of X) ²	946,729		942,841		952,576

APPENDIX G (Continued)
Number 2

Raw Scores of Subjects Employed in Analysis of Variance on
Pitch Variation

<u>Little</u>		<u>Average</u>		<u>Much</u>	
Subject No.	Score	Subject No.	Score	Subject No.	Score
511	59	502	48	630	44
667	43	776	47	816	50
849	44	748	43	735	54
606	49	771	60	699	52
868	48	659	41	578	52
669	43	594	51	740	43
725	55	713	52	765	44
648	39	518	43	719	45
772	46	679	51	775	48
608	38	584	49	726	49
805	47	652	40	705	49
870	54	628	52	572	49
675	48	738	51	797	44
859	41	710	45	524	45
746	51	542	45	509	43
605	47	697	51	530	43
660	40	521	54	567	54
657	45	602	44	583	51
789	50	582	43	573	47
757	<u>52</u>	743	<u>52</u>	702	<u>46</u>
Sum of X	944		962		952
Sum of X ²	45,220		46,760		45,578
(Sum of X) ²	891,136		925,444		906,304

APPENDIX G (Continued)
Number 3

Raw Scores of Subjects Employed in Analysis of Variance on
Loudness Level

<u>Little</u>		<u>Average</u>		<u>Much</u>	
Subject No.	Score	Subject No.	Score	Subject No.	Score
562	49	821	42	818	49
514A	51	711	45	845	51
528	50	774	50	689	48
514B	47	651	55	688	49
504	45	683	51	869	51
505	45	647	55	784	48
501	51	848	47	720	47
536	46	675	50	624	50
519	47	844	45	690	46
566	49	628	51	630	49
561	50	632	51	715	44
526	50	847	48	591	50
533	50	619	53	862	50
531	51	801	52	662	42
565	50	585	51	737	50
523	52	512	50	620	51
772	45	745	51	710	53
563	48	796	48	867	52
701	48	803	51	865	45
725	<u>49</u>	731	<u>50</u>	625	<u>45</u>
Sum of X	973		996		970
Sum of X ²	47,427		49,800		47,202
(Sum of X) ²	946,729		992,016		940,900

APPENDIX G (Continued)
Number 4

Raw Scores of Subjects Employed in Analysis of Variance on
Loudness Variation

<u>Little</u>		<u>Average</u>		<u>Much</u>	
Subject No.	Score	Subject No.	Score	Subject No.	Score
519	46	813	51	529	58
701	53	809	47	716	54
733	54	535	54	625	58
531	49	840	47	624	51
725	49	860	54	688	48
724	57	803	55	591	56
762	49	866	55	775	53
729	54	807	47	769	42
768	53	854	56	520	46
538	54	805	53	679	54
661	41	777	53	672	56
633	59	574	49	525	55
772	45	607	50	573	48
511	52	738	59	575	48
761	58	837	56	735	49
560	54	865	47	630	47
728	53	714	50	690	60
504	51	833	47	826	39
669	41	683	45	611	52
711	50	783	49	770	46
Sum of X	1,022		1,024		1,020
Sum of X ²	52,696		52,726		52,610
(Sum of X) ²	1,044,484		1,048,576		1,041,300

APPENDIX G (Continued)
Number 5

Raw Scores of Subjects Employed in Analysis of Variance on
Rate Level

<u>Slow</u>		<u>Average</u>		<u>Fast</u>	
Subject No.	Score	Subject No.	Score	Subject No.	Score
871	43	532	46	772	47
686	43	653	48	735	45
718	55	521	42	576	51
737	45	760	44	698	46
717	43	802	42	612	46
663	44	631	45	783	45
630	43	807	42	568	41
673	49	738	49	848	47
804	47	540	50	600	44
629	44	856	42	846	46
510	46	611	46	814	47
699	43	523	36	646	47
543	41	687	46	801	44
527	44	559	41	813	44
842	33	695	49	792	53
537	45	754	43	671	46
715	44	841	49	798	43
615	50	746	44	562	46
808	46	563	51	520	47
598	39	589	50	700	49
Sum of X	887		905		924
Sum of X^2	39,697		41,235		42,824
(Sum of X) ²	787,669		819,025		853,776

APPENDIX G (Continued)
Number 6

Raw Scores of Subjects Employed in Analysis of Variance on
Rate Variation

<u>Little</u>		<u>Average</u>		<u>Much</u>	
Subject No.	Score	Subject No.	Score	Subject No.	Score
532	38	715	46	797	52
571	45	503	42	617	41
511	42	604	46	852	32
538	45	509	52	862	38
534	31	588	44	867	57
689	41	566	36	809	46
590	45	805	37	816	46
592	37	652	66	576	41
782	32	738	56	577	46
664	35	721	52	857	47
517	50	653	39	662	40
505	45	691	51	861	47
513	45	594	46	522	48
561	38	704	43	717	60
730	46	661	38	656	45
648	44	823	48	804	41
634	38	739	40	670	51
610	49	780	45	869	48
593	45	527	43	580	43
675	<u>42</u>	587	<u>59</u>	796	<u>41</u>
Sum of X	833		929		904
Sum of X ²	35,223		44,287		41,546
(Sum of X) ²	693,889		863,041		817,216

AUTOBIOGRAPHY

I, Roy Edwards Tew, was born in Caroleen, North Carolina, July 16, 1913. I received my secondary school education in the public schools of the cities of Waynesville, North Carolina and Fort Myers, Florida. My undergraduate training was obtained at Stetson University and the University of Florida, from which I received the degree of Bachelor of Arts in Education in 1937. From Teachers College, Columbia University, I received the degree Master of Arts in 1942, while on leave of absence from the faculty of the Department of Speech, University of Florida. In 1947 I received an appointment to an assistantship in The Ohio State University, where I specialized in the Department of Speech. I held this position for three years while working on the degree Doctor of Philosophy. In 1950 I returned to my position as Assistant Professor of Speech, University of Florida. Here I completed the dissertation in partial fulfillment of the requirements for the degree Doctor of Philosophy.