ABSTRACT

"VOCAL" COMMUNICATION: THE EFFECTS OF RATE (SPEED) AND INTENSITY (LOUDNESS) ON RESPONSE TO SPOKEN MESSAGES

By

Alfred Esimatemi Opubor

People respond not only to the referential content (or the what) of spoken messages, but also to the non-lexical or "vocal" content, (the how). This study investigated the effects of two "vocal" speech variables, rate (speed) and intensity (loudness) on response to messages spoken in a language unfamiliar to listeners.

Each message had been mechanically manipulated to combine one of three levels of rate with one of three levels of intensity. Nine combinations were obtained: Loud + Fast, Loud + Normal, Loud + Slow; Medium + Fast, Medium + Normal, Medium + Slow; Soft + Fast, Soft + Normal, Soft + Slow. The basic or "control" message combined Medium intensity and Normal rate. The recordings were in Marathi, a language of western India.

Four hundred forty-five English-speaking high school students were randomly assigned to nine groups, one control and eight experimental. Each group listened over headphones to a recording of the basic message and one

appropriate experimental message. They responded to each message on rating forms containing semantic-differential-type scales, representing three dimension of effect, namely, evaluation, strength and activity. Mean differences between group responses to the basic and experimental messages were calculated for each effect dimension.

Analyses of variance and t-tests involving these means were used to test six main effects hypotheses, four alternative main effects hypotheses and three interaction hypotheses.

The results indicate that in general slower and softer messages are more favorably evaluated and are considered more "forceful" than any other combinations, but that slower and medium intensity messages are considered most "dynamic" by listeners.

The implications of these results for a strategy of message preparation, as well as the possibilities and necessity for cross-cultural investigation of various "vocal" phenomena were discussed.

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CHAPTER I

THE PROBLEM AREA

Introduction

The study of messages is an inevitable aspect of the study of "the process of communication." Indeed, the process of communication can be profitably looked upon as "the process of message manipulation." Sources encode and transmit messages; receivers decode and are affected by messages.

Messages come in different forms; they are produced and apprehended through many different mechanisms. In communication research, the division of messages into verbal and nonverbal is fairly widely accepted. So also is the subdivision of nonverbal messages into such modality-dependent types as kinesics, "the systematic study of the visually sensible aspects of nonverbal interpersonal communication" (Birdwhistell, 1952) and proxemics, the study of the use of space in communication (Hall, 1959).

"Vocal" vs. Verbal Communication

In the literature it has been mentioned with increasing frequency that verbal messages--at least in their primary spoken form--are a composite of two largely independent

systems. The observations that led to this view are common-place enough. Speakers of most languages seem to recognize the phenomenon reflected by the statement: "it is not what he said, but how he said it." Or again, if we consider the situation of mediated communication e.g., via the telephone, or a loudspeaker system, we find that people are generally capable of making fairly accurate guesses about certain demographic and even psychological attributes of their interlocutor regardless of what he is talking about.

Soskin first formalized these impressions in communication terms by suggesting that speech comprises two channels of communication--the vocal,and the verbal or lexical. According to Starkweather "the verbal component is the pattern of sound which results in words and phrases, and other linguistic units making up the content of speech. The vocal components are all the remaining characteristics of sound which may be called tonal variation or voice quality" (1956, p. 394).

The verbal or linguistic channel carries the potential referential information, while the vocal or non-linguistic channel is the repository of potential affective information. Spoken messages without the verbal component may be said to be "content free." A typescript of content-free speech would be almost impossible to achieve.

The term "content-free" as used by Starkweather and his associates describes specially produced and treated recordings of speech. Generally, by passing magnetic tapes of speech through mechanical filters, they remove the high frequency components of the speech signals. Since much of the verbal component of speech--the vowels and consonants--is carried by the higher frequencies, much of this kind of information is alleged to be lost in the filtering process. However, the lower frequencies which contain the vocal components of speech remain intact.

The major concern of Starkweather and others who are similarly inclined, is to remove, from the effect of a given message, the contribution of semantic information. In this way, they hope to be able to specify more accurately what the vocal channel contributes to speech communication. The vocal channel has different components, among them the following:

Intensity	Rhythm
Pitch	Rate
Quality	

Together these include what have been variously referred to at different times, and by different authors, as paralinguistic, prosodic, non-lexical, extralinguistic, supra- and sub-segmental phenomena (Trager 1958; Crystal and Quirk, 1964; Mahl and Schulze, 1964; Pike, 1967).

Electronic filtering devices are only one method of producing "content-free" messages. Older attempts have included the use of:

a. "Meaningless" content such as numerals and letters of the alphabet. In a number of experiments summarized by Kramer (1962) speakers were asked to portray certain emotions by recording only numerals or letters of the alphabet. Listener recognition of the portrayed emotions were better than chance (Skinner, 1953; Knower, 1941; Pfaff, 1954; Davitz and Davitz, 1959).

b. Constant content. The rationale for this method is that if the words are held constant, and if they do not contain emotional content, their contribution to differences between utterances is negligible. Through the use of actors, different emotions are portrayed and are identified by listeners (Fairbanks, 1940; Fairbanks and Hoaglin, 1941).

c. Ignoring content. Verbal content is "ignored" through the measurement of non-verbal properties of speech such as speech rate, breathing rate, duration of pauses, the nature and duration of non-fluencies. These properties of speech are regarded as largely independent of content

thus they can be used to differentiate different emotions (Goldman-Eisler, 1955, 1956; Mahl, 1959; Dittman and Wynne, 1961).

d. Use of foreign language. The verbal content of a message in a foreign language conveys virtually no meaning to someone who does not know the language. Using this rationale, Kramer asked native Japanese actors to portray different emotions using Japanese utterances. American college students who knew no Japanese were then asked to identify the emotions portrayed and did so better than chance expectations (Kramer, 1962).

The Problem

The present study focuses on two vocal message variables--intensity and rate of speech.

We are interested in these two variables for two reasons. Firstly, previous research has operationalized them in ways that leave something to be desired. Secondly, the relationship of the intensity and rate of a message to its effect has not been well studied; perhaps because, as Mahl and Schulze suggest, prior work in this area has not been interested in the response of the listener (1964).

The research question we are asking in this study is: what is the effect on a listener of differences in the loudness and speed of a spoken message?

Review of Relevant Literature

Interest in psychological aspects of language goes back a long time; long before the term "psycholinguistics" came to be applied to particular conceptual approaches to the study of human language. Certainly psychologists have enaged in speculation, though few have actually conducted research, on questions related to the interests of this study.

One of these questions concerns the kinds of inferences that can be made from a person's voice about his personality. In his 1960 review of voice and personality studies by psychologists, Diehl traces the history of the study of the voice-personality relationship through the preoccupation with rhetoric in 18th century England and nineteenth century America to the more "scientific" and technologically-assisted work beginning in the early 1930's and continuing to the present.

> During the last three decades approximately 80 publications have appeared in the area of voice and personality. Inquiries have taken four major directions:
>
> (a) Judgments of physical and psychological characteristics from the recorded or concealed voice;
> (b) Relation between effective public speaking and personality;
> (c) Specific vocal characteristics representing personality traits; and
> (d) Vocal characteristics of psychoneuroses and psychoses (Diehl 1960, pp. 179-180).

The first and third lines of inquiry above are closest to the one pursued in this study.

Diehl cites research to show tendencies in the relationship between certain voice characteristics such as pitch, force, quality,speech melody, horaseness, etc., and various psychological characteristics such as happiness and other emotions, social adjustment, intelligence, extroversion-introversion, emotional stability, etc. His summary of existing research is that;

> . . . although developments in voice science have provided more objective ways to study relationships between voice and personality, a large portion of the work still remains to be done. There seems to be sufficient theory based on empirical evidence; however, the paucity of experimental data at the present time makes it difficult, if not impossible, to apply in a systematic way any of the relationships which may be suspected (Diehl, 1960, pp. 194-195).

A more extensive and more recent survey of relevant research from a psychological perspective is by Mahl and Schulze (1964). Their review covers what they call the "extralinguistic area," which is broader than Diehl's voice-personality area. It subsumes Trager's paralanguage and includes "the functional relationships between the extralinguistic phenomena and the non-linguistic states and processes in the speaker and listener interacting in the communication situation" (Mahl and Schulze, 1964, p. 52). But the extralinguistic area is itself included within psycholinguistics. The relationships may be reduced to the following diagram:

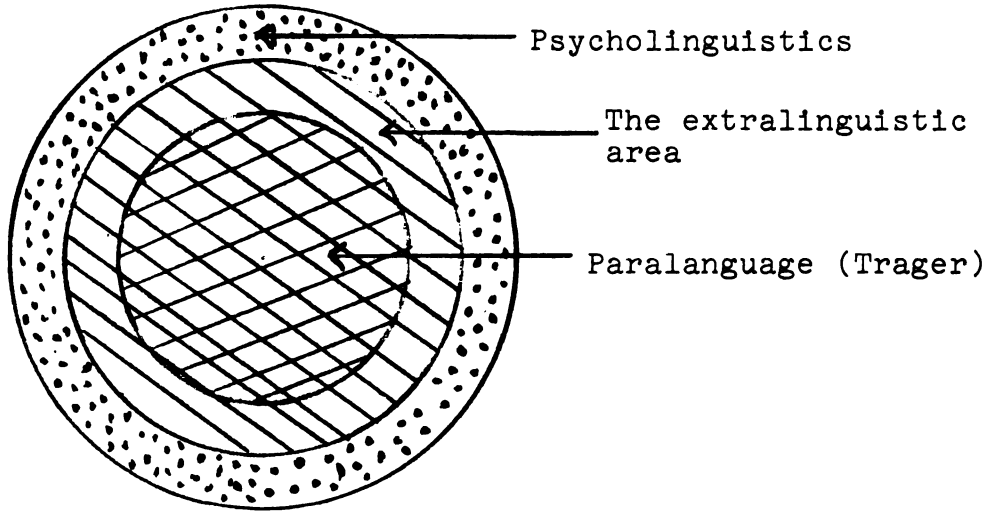

FIGURE 1.--The relationship between psycholinguistic, extralinguistic and paralinguistic studies (as deduced from the discussion in Mahl and Schulze, 1964).

Psycholinguistics is the broadest and most inclusive of the three areas depicted. An early working definition by Osgood and Sebeok states that psycholinguistics "is concerned in the broadest sense with relations between messages and the characteristics of human individuals who select and interpret them" (Osgood and Sebeok, 1965, p. 4). Trager's work is the first major attempt to systematize the study of nonlinguistic properties of speech, by first delimiting the area and then providing a taxonomy and methodology. His pioneering effort has had obvious influence on subsequent work in the field. He subdivides paralanguage into two components: voice qualities and vocalizations, each of which is further subdivided thus:

Voice Qualities	Vocalizations
Pitch range	Vocal characteristics
Vocalic control Glottis control Pitch control	Vocal qualifiers
Articulation control Rhythm control Resonance Tempo	Vocal segregates

Trager then provides verbal descriptions of how these features are manifested in speech, how they can be described. But his work does not go beyond describing the message code to consider the characteristics of either receiver or sender as Mahl and Schulze do.

Mahl and Schulze divide former systems for classifying extralinguistic phenomena according to two dimensions: Behavioral-Paralinguistic, depending on the methods of analysis which were employed in these systems. This

> . . . distinction between Behavioral and Paralinguistic methods does not imply that . . . different classes of phenomena or different levels of discourse are involved. The basis for making a distinction . . . seems . . . largely a matter of emphasis. Those investigators who use Paralinguistic methods of analysis usually are more concerned with individual--that is, discretely identified--instances of certain features of utterances, including deviations from characteristic patterns. Usually an exhaustive analysis is made, in which scores attempt to identify all instances of all phenomena included in the entire classification system of paralanguage (1964, p. 53).

In the second section of their survey, Mahl and Schulze look at "systematic studies of extralinguistic phenomena." They conclude from the work examined in this section that:

> One of the most striking revelations of the survey is the absence of systematic study of how the extra-linguistic phenomena affect the listener's spontaneous, communicative behavior of his underlying psychological states and processes (p. 78).

This statement is closely related to the reasons why the present study is being undertaken, and reveals the tangential nature of previous source-oriented research findings to our goals here. But such studies can provide a basis of hypothesizing certain receiver responses to given values of intensity and rate.

Mahl and Schulze make the following summary of available research with regard to rate (speed) of speech.

> Most of the investigations of Speech Rate support the hypotheses of Kanfer and Miller, that Speech Rate is positively related to anxiety. However, since Speech Rate has been shown to be largely determined by duration and frequency of pauses, the many discrepancies found among investigations of Silent Pauses suggest that the generality of findings obtained from Speech Rate studies may also be limited. So far, very little work has been done with Articulation Rate, even though it has been shown more sensitive to certain physiological changes than Speech Rate (1964, p. 98).

As for Loudness, the one study reported in this section is in the "Paralinguistic methods of analysis" subsection:

> Eldred and Price . . . studied 15 psychotherapy interviews of one patient. They did not find any evidence of a relationship between anxiety ratings and Pitch, Rate, or Loudness (p. 101).

Waskow, in her study of the effect of drugs on speech behavior, was interested in the changes in affect which occur as a result of the administration of drugs

such as LSD to subjects. She surmised that vocal aspects of speech would be sensitive to changes in affect. She therefore obtained a sample of speech from subjects who had received doses of drugs known to have different somatic effects, subjected these speech samples to a mechanical filtering device, thus rendering them "content free," and had the resultant vocal samples rated on forty semantic-differential rating scales.

Since her ultimate purpose was to determine some of "the dimensions along with listeners respond to the voice,"

> . . . the mean ratings (of five raters) on the forty scales were intercorrelated and a principal components factor analysis was performed. . . . . After study of the factors that emerged, fifteen scales were selected as looking particularly promising, and these were then used in the first application of the scales. . . .

She found that the fifteen scales grouped themselves in "3 clusters of 3 scales each, and 6 additional scales." The results she presents are for one of the three-scale clusters, consisting of the scales "annoyed--pleased," "tense--relaxed" and "complaining--content." She then correlated the scores on this factor with three of the six factors on the Clyde Mood Scale. She found that "scales which, a priori, would seem to be related to vocal tension were correlated with the vocal scores." In other words, then, listeners were able to identify the emotional state of speakers by listening to vocal messages produced by these speakers (Waskow, 1967).

Perhaps the most directly relevant study for our purposes is that by Davitz (1964). For that reason we will discuss and quote from this study at some length to indicate where our practices differ from his and demonstrate the need for this study. Davitz was primarily interested in

> . . . some of the auditory cues associated with vocal expressions of emotional meaning. To investigate this problem, two sets of variables were selected, one set concerned with dimensions of emotional meaning, and a second concerned with auditory characteristics of speech. The variables of emotional meaning were based on Osgood, Suci, and Tannenbaum's research, which suggested three aspects of emotional meaning: (1) Valence, (2) Strength, and (3) Activity. Selection of speech variables was based on the characteristics of sound commonly considered in psychophysical studies of audition: (1) loudness, (2) pitch, (3) timbre, and (4) rate of speech. The research considered the relation between each of the three variables of emotional meaning, valence, strength, and activity, and each of the four speech variables of loudness, pitch, timbre and rate (p. 101).

What Davitz refers to here as "Valence" is more commonly known as "Evaluation" or the "Evaluative" dimension. We will use these more common labels throughout this study.

Davitz asked seven speakers to read two sentences in fourteen different contexts so that fourteen different emotions were expressed. Each speaker also read the sentences in a "non emotional" context.

> These readings were tape recorded, and then the readings of the two sentences identical in content for all paragraphs were taken out of context and spliced so as to provide a recording of different emotional expressions with standard content (1964, p. 102).

> The recordings of all seven speakers were judged by 20 persons who were given the list of 14 feelings and asked to identify the feeling expressed by each reading of the two standard sentences after hearing the non emotional 'normal conversation' reading by each speaker. . . . The final tape used for ratings of vocal characteristics consisted of the reading of each feeling identified most frequently for male speakers and for female speakers, plus the non emotional "normal conversation" reading by each speaker (1964, p. 103).
>
> The final tape was played to a second set of 20 judges who were asked to rate each expression on four seven-point scales dealing with (1) loudness (loud to soft); (2) pitch (high to low); (3) timbre (blaring to resonant); and (4) rate of speech (fast to slow). A speaker's expression of a given feeling was played twice, each time followed by a recording of that apeaker's non emotional, "normal conversation," which served as a baseline against which the motional expression was rated (1964, p. 104).

Davitz's results revealed that "activity was positively and linearly related to the speech variables, but both valence and strength appeared to be related curvilinearly, if at all, to the speech variables." He therefore generalized as follows: "In the vocal communication of emotional meanings, auditory cues of loudness, pitch, timbre, and rate are a function of the subjectively rated activity level of the feeling communicated (p. 108). He further states that "Presumably, valence and strength are communicated by other, perhaps more subtle and complex, auditory cues" (p. 122).

Many aspects of the Davitz study invite comment. First, the number of judges on whose ratings his results are based--twenty--is extremely small. Davitz himself

admits that this limits the extent to which his findings may be generalized. He also considers as a drawback "the relatively simple vocal characteristics considered . . ." and "the specificity of the categories of emotion." Furthermore, each emotion is a composite of different values on each vocal variable, and changes in the context of communication could lead to changes in the particular value of each variable called into play. Thus anger may be accompanied by excessive loudness in one instance, and by a general tautness and quiteness in another (1964, p. 106).

Davitz used the "content standard" method to eliminate bias introduced through the verbal channel, but it is possible to raise questions about this method. How suitable are the two embedded sentences to the expression of each of the emotions elicited? For if the verbal content of a message is more appropriate to the expression of one emotion than another, we cannot correctly argue that such content is "neutral." In fact, we might have considerable interaction effects between verbal and vocal variables in such circumstances.

The Davitz study is the most ambitious attempt to investigate the relationship of vocal variables to aspects of connotative or emotional meaning. However, it raises fundamental reservations in terms of the

operationalization of vocal variables and the interaction between verbal and vocal channels. The present study is an attempt to remedy some of the more obvious limitations of the Davitz study, and thus provide a sounder basis for the investigation of the dynamics of communication through the vocal channel.

Theoretic Hypotheses

To recapitulate, the research question we are asking is: what is the effect on a listener of differences in the rate (speed) and intensity (loudness) of a spoken message? The hypotheses are based on the assumption that we can match message variables with response variables; that given certain message variables, we can predict their effect in terms of receiver response. Specifically, we hypothesize as follows:

H-1. Rate of speech is positively related to the perceived potency of a message, i.e., the faster a message is, the more "potent" it will be rated by a listener.

H-2. Rate of speech is positively related to the perceived activity of a message, i.e., the faster a message is, the more "active" it will be rated by a listener.

H-3. Rate of speech is positively related to the evaluation of a message, i.e., the faster a message is, the more favorably it will be rated by a listener.

H-4. Intensity of speech is positively related to the perceived potency of a message, i.e., the louder a message, is, the more "potent" it will be rated by a listener.

H-5. Intensity of speech is positively related to the perceived activity of a message.

H-6. Intensity of speech is positively related to the evaluation of a message.

These hypotheses presuppose linear relationships between message variables and response variables. That this may not be the case has been suggested by Davitz who found non significant correlation ratios between his four message variables and two of his response variables, evaluation and strength. He states, however, that "Although the correlation ratios obtained indicate curvilinear relations between valence and strength and the four speech variables, the magnitude of the ratios do not permit generalization beyond the present data" (1964, p. 106). Assuming that what Davitz found holds true for other data, we will propose the following alternative hypotheses:

AH-1. Rate of speech is curvilinearly and positively related to the perceived potency of a message.

AH-2. Rate of speech is curvilinearly and positively related to the evaluation of a message.

AH-3. Intensity of speech is curvilinearly and positively related to the perceived potency of a message.

AH-4. Intensity of speech is curvilinearly and positively related to the evaluation of a message.

There are no alternative hypotheses regarding message effects on activity as Davitz's findings agree with the relationship which we have hypothesized here.

The foregoing hypotheses and alternative hypotheses refer to main effects. However, as we are dealing with two message variables, both co-present in all messages,

we must take their possible joint effects into account. There is not much suggestion in the literature about what the interaction effects of these two variables would be.

In view of this situation, we will invoke some intuitive reactions to the nature of the message elements involved, as well as the reasoning which led to our main effects hypotheses, and suggest the following interaction hypotheses:

Interaction Hypotheses

H-7. In combinations of rate and intensity, the perceived activity of the message will be positively and linearly related to rate of speech, and positively curvilinearly related to the intensity of speech.

H-8. In combinations of rate and intensity, the perceived strength of the message will be positively curvilinearly related to the intensity of the message and negatively related to the rate of the message.

H-9. In combinations of rate and intensity the evaluation of the message will be curvilinearly and positively related to the rate of speech and curvilinearly and negatively related to the intensity of speech.

To test these hypotheses, a study was conducted in which subjects were required to respond on scales to three different levels of the two vocal variables--rate and intensity--and combinations thereof. Intact groups of subjects were randomly assigned to one of nine treatment groups--eight experimental and one control. Each group was then exposed to one of the experimental messages and

the control message, the exposures being separated by a time interval. The procedure adopted is more fully described in the next chapter.

CHAPTER II

METHOD AND PROCEDURES

This chapter describes the construction of messages, the operationalization of the independent and dependent variables, the sample, the experimental design and techniques of analysis.

Message Construction

As was stated earlier (p. 4), many methods for isolating the vocal channel have been attempted in previous studies. The method adopted here is the use of a foreign language--i.e., a language unfamiliar to the receivers. The rationale behind this method is that the verbal content of a message in a foreign language is completely inaccessible to the receiver; but this is not necessarily the case for the nonlexical features of the message. Studies by Miron (1961) and Kramer (1962) among others suggest that insofar as recognition of portrayed emotion is concerned, receivers are able to respond with better than chance accuracy to vocal features. In effect then, certain vocal characteristics seem to operate as communication cues regardless of the language in which they occur.

A male speaker of Marathi, a language of western India, translated the following passage from English into Marathi: "There is no other answer. You've asked me that before. My reply has always been the same, and it will always be the same." This passage is the same as that used in the study by Kramer, and is a modified version of that used in the work of Fairbanks and his associates. A version of it was also used by Davitz.

The Marathi speaker recorded this passage in his language in a sound-proofed studio. He was instructed to read it with "as little emotion as possible" at a moderate speed. This version 10 seconds long was retained as the "basic" message insofar as rate was concerned.

The tape of this basic message was then sent to the Gotham Audio Corporation in New York City for expansion and compression, on their "Electro Information Rate Changer." This is a device which can compress a message up to nearly half (53%) of its original length, or expand it up to twice (200%) its original length with very little distortion.

We asked Gotham to compress the Marathi tape to 75 per cent of the original and expand it 150 per cent. These two versions operationalized the "fast" and "slow" levels of message rate, while the original tape was retained as the "normal" level.

We decided to manipulate intensity also in objective terms. The three "rate" versions described above were put on one tape. This tape was then dubbed on equipment diagrammed in Figure 2, at the Michigan State University Audiology and Speech Sciences Laboratory.

The dubbing produced three tapes with different levels of intensity--40 decibels, 60 decibels and 80 decibels. These levels operationally define "soft," "medium," and "loud" intensity as used in this study.

At the end of this manipulation, we emerged with three sets of recordings each with three versions of the original message. The levels of the two variables are as follows:

Intensity	Rate
Loud (80 db)	Fast (150%)
Medium (60 db)	Normal (100%)
Soft (40 db)	Slow (75%)

The combinations which these levels produce are as follows:

Loud + Fast	Medium + Fast	Soft + Fast
Loud + Normal	Medium + Normal	Soft + Normal
Loud + Slow	Medium + Slow	Soft + Slow

The dependent variable in this study is message Effect, which has three dimensions, viz:

A. Evaluation represented by the scales:

Good - Bad

Pleasant - Unpleasant

Beautiful - Ugly

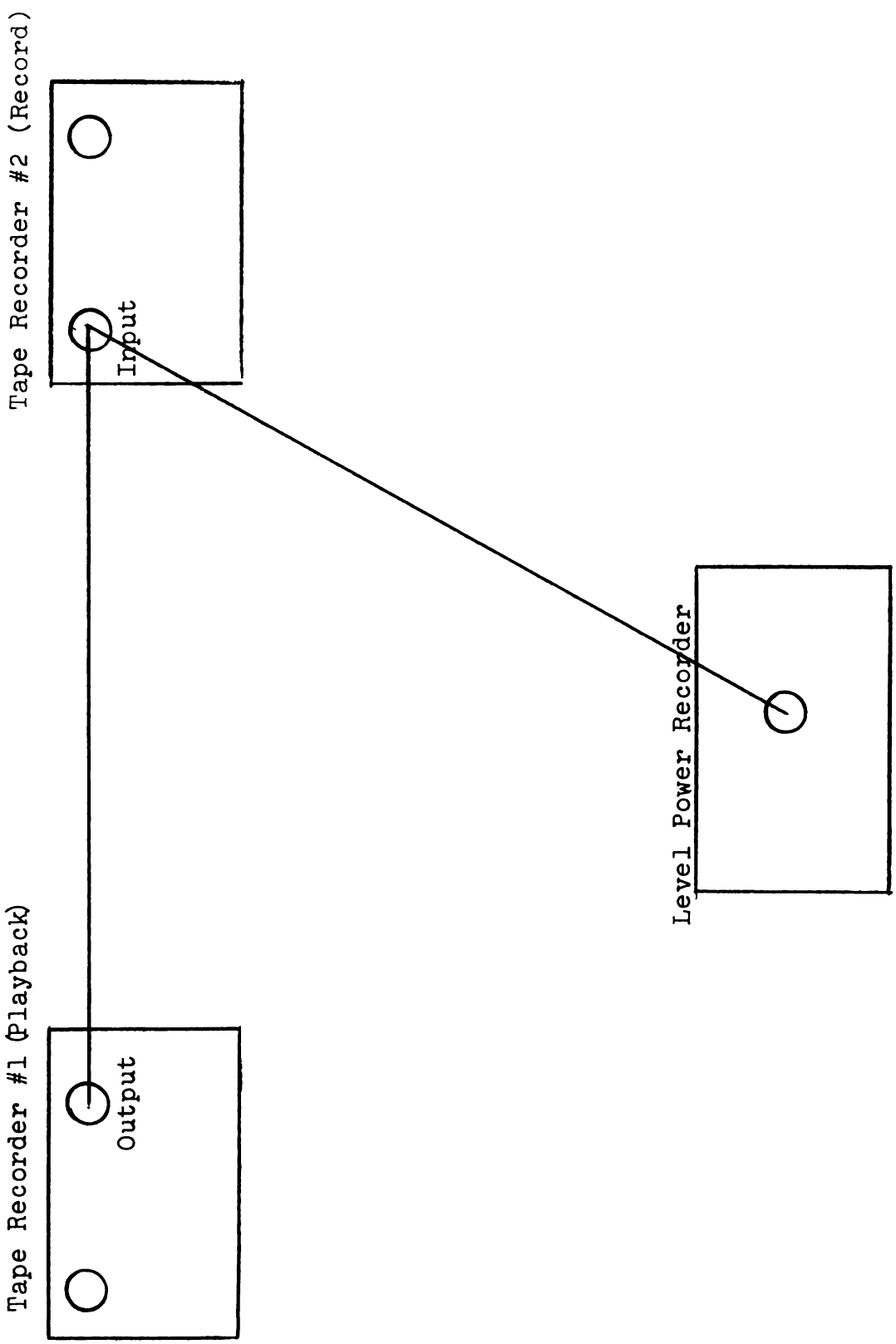

FIGURE 2.--Set up for "intensity" recording.

B. Strength represented by the scales:

Strong - Weak

Large - Small

Thick - Thin

Heavy - Light

C. Activity represented by the scales:

Active - Passive

Fast - Slow

Shrill - Mellow

Sharp - Dull

For each group of subjects, scores for the scales representing each facet are summed and the mean score is obtained. The difference between the group mean score for the "basic" message and the group mean score for the experimental message is the effect of the experimental message for the particular dimension under consideration.

Subjects

The subjects for this study were 445 students at Everett High School in Lansing. Since the mechanics of administering the messages required language laboratory facilities, most of the subjects were enrolled in modern language courses studying Spanish, French and German. About one-sixth of the subjects were, however, not enrolled in these language classes, but participated in the experiment in their English and American literature classes. All exposure to the messages was nevertheless

in the language laboratory, during periods regularly scheduled for classes. The breakdown of the population according to demographic variables is as follows:

Age	
$\bar{x}$	15.9
s.d.	1.6

Sex	
Male =	172
Female =	270
No report =	3
	445

Year in School	
Sophomores	223
Juniors	153
Seniors	66
No report	3
	445

Language Studied	
French	130
Spanish	67
German	78
English & American Literature	169
No report	1
	445

Experimental Design

The independent variables were: (1) slow versus normal versus fast message rate, and (2) soft versus medium versus loud message intensity. The dependent variable is message effect in terms of perceived valence, strength and activity.

Basically, we have a two variable 3 x 3 factorial design, as demonstrated in Figure 3. The groups were randomized to the different treatment conditions.

These nine combinations represent all possible combinations of our two independent variables--INTENSITY and RATE.

Each group received two messages--the basic or "control" message, and one of the experimental messages--

		RATE		
		FAST	NORMAL	SLOW
INTENSITY	LOUD	Group #1	Group #2	Group #3
	MEDIUM	Group #4	Group #5 Basic or "Control" Message	Group #6
	SOFT	Group #7	Group #8	Group #9

FIGURE 3.--Message treatment groups.

except the control group (#5) who received the basic message twice. Because of the logistics, both messages were administered about half an hour apart. For example subjects in Group #1 received the basic or control message first; then they engaged in activity related to their school work--the teacher made some announcements in French and answered questions. Then the subjects received the "Loud+ Fast" message.

The experiment was conducted on two separate days. On the first day, all subjects used the language laboratory equipment, and heard the messages through earphones. It was discovered, on this occasion, that the "soft" level on the intensity variable was extremely difficult for subjects to hear as the ambient noise of the laboratory

machines was about 35 db. The groups affected were numbers 7, 8 and 9, especially the last two. During the second session, the messages were therefore played over loud speakers. In our sample, all the subjects in Groups number 8 and 9 and most of Group 7 heard the messages only over loud speakers. We were therefore interested in the possibility of differences in equipment--between earphones and loudspeakers--introducing bias into our results. To check on the effect, if any, of these differences, we randomly assigned subjects on the second (i.e., the loudspeaker) day to Groups 1-7. In our analysis, we will compare the response of those subjects in Groups 1-7 who heard the message over loudspeakers with the response of those who heard it through earphones.

Data Analysis

Responses to both control and experimental messages were matched on the basis of name, so that we could compare a subject's response to the experimental message with his response to the control message.

All the theoretic hypotheses and their alternatives require that we relate each of the message variables--rate and intensity--with each of the facets of the effect variable--evaluation, strength and activity. We have hypothesized the following relationships:

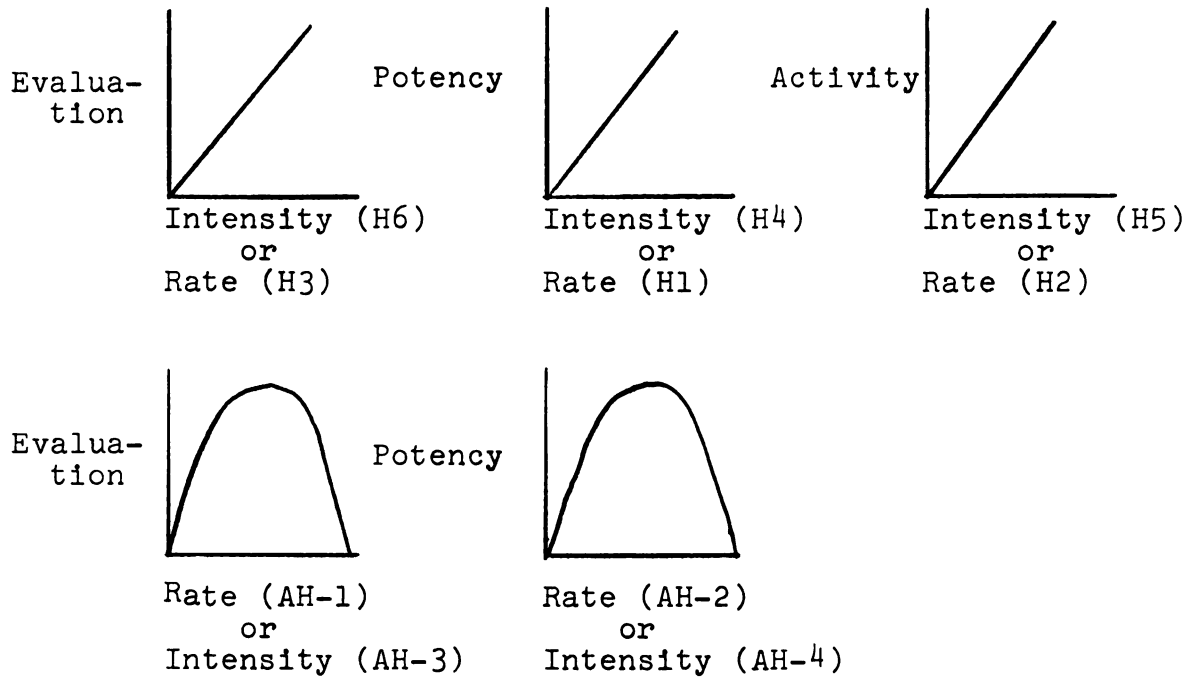

FIGURE 4.--Graphic representation of hypotheses.

Furthermore, H-1 through H-6 are tested through various t-tests and analyses of variance comparing differences in mean effect scores among the various treatment groups.

Experimental Procedures

At both sessions, the following procedures were followed in sequence:

1. Subjects entered the language laboratory and sat in their regular places (in the case of modern language students) or in any available booth (in the case of the English and American literature students). The classroom teacher then introduced the experimenter who explained

that he was involved in a study of "Language Behavior" under the auspices of the Department of Communication at Michigan State University, and sought the cooperation of the subjects.

2. Subjects were then asked to read the first page of materials placed in the booths prior to their arrival. This page explained the kinds of situations in which the study was interested (see Appendix I, p. 55).
3. Subjects were informed that they would hear some tapes in a language they did not know, and would be asked to react to what they had heard. They were urged to listen carefully as the taped segments were quite brief.
4. Subjects then read the second page of materials which explained the use of semantic differential-type scales. The experimenter answered all questions and directed subject's attention to the rating forms on which their responses would be recorded.
5. According to which subgroup they were assigned to (randomly by seating arrangement, e.g., first two rows versus the rest or first two columns versus the other three) subjects then listened to a recorded message and rated it on the forms provided.

6. Each message was played twice. If any subjects so requested, the message was played a third time. Usually, there were no requests for a fourth playing.
7. When all subjects had completed the rating, all the forms were collected, and the class teacher conducted part of her lesson or made announcements about classwork.
8. The experimenter than administered a second message to the subjects, who again rated it in the same way as before.

CHAPTER III

RESULTS

The main findings of the study are reported in this chapter. As was indicated in the previous chapter (p. 25) one of the major difficulties of the experimental situation arose out of the level of ambient noise in the laboratory machines. It therefore became necessary to use loudspeakers rather than headphones for administering the messages. In groups 1, 3, 5, and 7, some subjects received the messages over loudspeakers while some received them over headphones. A test of differences between these two subsets of subjects within each group, revealed no significant differences on the criterion variables. We can assume therefore that the kind of equipment used for administering the messages did not affect the results obtained.

Similarly, because we wished to check on the effects due to the order in which scales were presented on the rating sheets, two versions (Form I and Form II in Appendix I, pp. 58-59) were used. The scores on each criterion variable showed a correlation of .80 or above between

the two versions; leading to the conclusion that the order of presentation of the scales did not affect the obtained results.

Another possible source of bias was the language studied by subjects. Again there were no significant differences between languages on the criterion variables. Of course the use of a foreign language unknown to any of the subjects may have been largely responsible for the absence of significant differences.

All these checks seem to support the assumption that any differences obtained on the criterion variables between or among groups is likely to be due to the different message treatments administered to the nine groups.

Test of the Main Hypotheses

The instrument on which the data for analysis are based, consists of semantic-differential-type scales. Each criterion variable is expressed as a mean score, derived from the sum of relevant scales. The data analyzed are the mean difference or "effect" scores between responses to the basic or "control" message, and those to each experimental message.

The data analysis involved 3 x 3 analyses of variance. The results of these analysis are provided in the following tables.

TABLE 1.--Mean evaluation "effect" scores for all nine groups.

Intensity	Rate			
	Fast	Normal	Slow	Overall
Loud	1.13	0.24	1.30	0.923
Medium	0.22	-0.10	0.31	0.143
Soft	0.67	-0.12	0.46	0.337
Overall	0.673	0.006	0.523	0.434

TABLE 2.--Analysis of variance among evaluation "effect" means.

Source	df	Ms	F	p
Rate	2	16.46	14.49	0.0005
Intensity	2	18.86	16.49	0.0005
Rate x Intensity	4	4.57	4.02	0.003
Error	436	1.14		

Although both main rate and intensity effects are significant, we also have a significant interaction effect. This significant interaction effect "suggests that the differences among the simple effects of the treatments in one classification may be different for each treatment (in the other classification) with which they may be combined" (Lindquist, 1953, p. 211). In our case this means that

the differences in means among the different levels of rate are not distributed in the same manner as are the differences in means among the intensity levels. In other words, although differences in either the rate or intensity of a message lead to differences in the evaluation of the message, we cannot say that an increment in rate or intensity is linked with an increment in evaluation. An inspection of the cell means show that in general, the lowest mean occurs in cells in the middle of each axis of the table, i.e., the extremes of rate and intensity have higher means than the middle level. What we have then is a curvilinear relationship. For overall rate, the curvilinearity shows a somewhat positive trend; for overall intensity, it shows a somewhat negative trend.

All this evidence together supports Hypotheses 6, 9 and Alternative Hypothesis 2. Hypothesis 3 is not supported.

TABLE 3.--Mean potency "effect" scores for all nine groups.

Intensity	Rate			
	Fast	Normal	Slow	Overall
Loud	-0.49	-0.018	-0.206	-0.26
Medium	0.247	0.450	0.166	0.069
Soft	0.229	0.876	0.857	0.615
Overall	-0.19	0.40	0.24	0.315

TABLE 4.--Analysis of variance using above means (potency).

Source of Variance	df	ms	F	p
Rate	2	14.79	11.88	0.0005
Intensity	2	27.61	22.19	0.0005
Rate x Intensity	4	0.534	0.43	n.s.
Error	436	1.24		

Both rate and intensity yield significant F-ratios, with no significant interaction effects. The means show that for rate, there is a negative, curvilinear trend. And for intensity a negative linear trend. The results for the rate effects support Alternate Hypothesis 1, but fail to support Hypothesis 1, whereas those for the intensity effects fail to support either Hypothesis 4 or Alternate Hypothesis 3. The results also fail to support Hypothesis 8.

TABLE 5.--Mean activity "effect" scores for all nine groups.

Intensity	Rate			
	Fast	Normal	Slow	Overall
Loud	-1.061	0.494	0.534	-0.09
Medium	-0.209	1.13	1.13	0.42
Soft	-0.745	0.817	1.54	0.36
Overall	-0.720	0.766	1.02	

TABLE 6.--Analysis of variance using mean activity "effect" scores (above).

Source of Variance	df	ms	F	p
Rate	2	130.69	135.56	0.0005
Intensity	2	11.65	12.09	0.0005
Rate x Intensity	4	4.47	4.64	0.001
Error	436	0.964		

While both main effects are significant, so is the interaction. The simple effects show a negative linear trend for rate; and the same, though less marked for intensity. The marginals for intensity show something of a negative curvilinear trend, but this is not pronounced at all.

The rate results fail to support Hypothesis 2. The intensity results do not support Hypothesis 5. Hypothesis 7 is also not supported.

Summary and Discussion

The hypotheses investigated in this study are concerned with whether or not differences in certain "vocal" variables make a difference when a listener reacts to spoken messages. Hypotheses 1, 2, and 3 suggest that the speed at which a message is spoken would make a difference. Specifically they state that the faster a message is, the

better, more powerful and more dynamic a listener would perceive it to be.

The results obtained from the analysis of our data do not provide support for any of these hypotheses. Rather they indicate (in support of Alternative Hypothesis 1) that if a message is either fast or slow, it will be regarded as "stronger" or more powerful than if it is neither fast nor slow. The results also indicate (in support of Alternative Hypothesis 2) that a fast or slow message is considered "better" than a message which is neither fast nor slow. But when a listener judges the dynamism ("active-ness") of a message, he tends to favor slower messages over faster ones. This finding is surprising, and counter-intuitive. We expect "dynamic" speakers to speak rather faster than slower.

Hypotheses 4, 5, and 6 were concerned with the effect of the loudness of a message on a listener's response to it. They stated that the louder a message the "better," more forceful more dynamic it would be considered to be. The results of this study do not altogether support these statements. Our findings indicate that while the louder a message, the more favorably it is evaluated, the reverse is true when the "potency" or "forcefulness" of the message is being judged, so that the softer a message is spoken, the more potent it is considered. But a soft or medium loud message is considered more "active" or

"dynamic" than a loud message, with the medium loud message being the most highly rated.

In Hypotheses 7, 8, and 9, we looked at the combined effects of both the loudness and speed of a message on the way it is received. Here again, we stated in Hypothesis 9 that if a message was either fast or slow as well as soft, it would be more favorably received than if it was otherwise. This hypothesis was supported by the results. But Hypothesis 8 which stated that the louder and slower a message, the more "forceful" it would be rated, was not supported; the results in fact lead to the opposite conclusion. While these results are consistent with those obtained for the isolated effect of message loudness by itself, they are slightly different from those obtained for the isolated effect of message speed. The fact that we do not have a significant interaction effect here is interesting. It is intuitively reasonable that when we combine extremes of loudness and speed, the most effective combination for conveying "strength" or "potency" should be one which contains the highest level of one variable with the lowest level of the other; but it is not easy to predict which of the two possible combinations "fast" + "soft" or "slow" + loud" would achieve this effect.

These results raise certain questions and suggest certain practical applications which will be considered in the next chapter.

CHAPTER IV

CONCLUSIONS AND FURTHER RESEARCH

It is clear from our results that how fast or how loud one speaks affects a listener's response. What is not so clear is the pattern of relationships between loudness or speed or both of them together, and how people react to messages.

This study has attempted to be "clinically pure" in its isolation of "vocal" variables from the spoken message. We have assumed, with reasonable justification, that the verbal or referential content of the message did not affect the results we obtained. But as soon as we move into any realistic situation, we will have to confront the verbal channel. The most interesting and most useful kinds of results will be those which deal with the interaction between <u>what</u> is said and <u>how</u> it is said. Obviously then, we have to work with languages which are understood by listeners.

The combination of verbal and "vocal" channels leads to complexity--but it is a ubiquitous complexity which human beings deal with constantly. One difficulty for

the communication researcher in such situations is specifying the what of the resultant messages. It is a notorious fact that communication research is weak in the analysis and categorization of messages. Linguists, whose chief concern is to describe the verbal code, have yet to achieve the kind of description and analysis which are relevant for communication research.

In the specification of the what of a message, to which we wish to relate a how, one approach is to categorize messages according to the situation in which they are produced. Thus we can distinguish the category "Inaugural Address," "After-dinner speech," "Sunday sermon," "Bull session." Hymes (1962, p. 24) refers to such categories as "Speech Events."

One kind of research then would be concerned with varying the how while keeping the speech event constant. For example, does it make a difference if a nursery rhyme is said fast or slow, loud or soft?

The mention of nursery rhymes leads to another possible method of classifying the verbal content of messages. Nursery rhymes, like cultural truisms, are marked by a large amount of redundancy; they are highly predictable at all levels. Thus if we were to use nursery rhymes in studies of the combination of the verbal and vocal channels, we would really be able to convey new information only through the vocal channel. The research

question here would be: How do differences in the redundancy of the verbal channel affect response to a spoken message?

Some prior researchers suggest that one of the factors which will interact with response to verbal channel redundancy is social class. This is because children, in their acquisition of language, tend to learn the value of vocal features much before they have achieved mastery of the verbal code. Their use of the vocal as well as the verbal channel in later life is therefore not arbitrary, but largely dependent on the environment into which they have been socialized. This is the central thesis of the work of Basil Bernstein, the British Sociolinguist. Bernstein approaches language behavior from a sociological perspective, and suggests that social structure and the position of the individual within it, is related to the possession of certain codes of communication. For British society, he identifies two coding procedures: elaborated and restricted. The pure or ideal form of restricted code, which has many variants, is characterized in general by this attribute: "the verbal component of the message, given the social context, is highly predictable," from the point of view of "an observer who knows the code." Bernstein then makes a distinction between

> . . . the verbal component of the message and the extraverbal components. The verbal channel . . .

> refers only to the transmission of words. The extraverbal channels include messages transmitted through the expressive associates of the words (intonation, etc.) and messages transmitted through gestures, physical set, and facial modification (1964, p. 58).

In other words, Bernstein distinguishes verbal from nonverbal message channels, and in the latter case, between what we have referred to as the "vocal" and gestural bands. The three variants of the restricted code are distinguished one from another in terms of the locus of message predictability in either the verbal or nonverbal channels. "The third variant refers to an order of communication where the verbal component approaches maximal redundancy but where the extraverbal channels permit messages of a relatively low order of prediction" (1964, p. 59). In other words, in the third variant, new information can be transmitted only through extraverbal channels.

Bernstein says that although all of the English children whom he studied possessed a restricted code, the working class ones, were largely limited to this code, whereas the middle class children also possessed an elaborated code. We would expect therefore, that working-class children in Bernstein's sample would make greater use of, and be more sensitive to, extraverbal channels. A possible study based on Bernstein's work would be to compare American school children from different ethnic and socio-economic backgrounds on the extent to which

they were able to create and respond to nonverbal messages. If Bernstein's findings are crossculturally applicable, one should find that social-structural differentiating variables correlate highly with ability in identifying and/or reacting to, emotion portrayed through vocal and visual channels.

In summary of the foregoing, then: the literature suggests that just as children master verbal skills with age, they learn to master the use of vocal and other non-verbal codes. Furthermore, since these codes have social importance, they are used differentially by different social groups.

A tantalizing extrapolation from one of Bernstein's findings is to attempt to relate the dialectic of physical violence in American society to the use of different codes. One may say for example that the incidence of physically violent and aggressive behavior in certain minority groups or socio-economic strata is related to the fact that in these areas of society, the verbal channel is not regarded as appropriate for communicating new information. The resort to the nonverbal channel is then seen as logical for expressing feelings of frustration and new self awareness--for saying something <u>new</u> to the rest of society.

If the use of vocal and verbal codes varies from subculture to subculture, would it not vary even more from language to language? Is there a cross-cultural "vocal" language?

Previous research findings are inconclusive about the extent to which vocal characteristics constitute universals of human communication. That they are part of the expression system cannot be denied; the physiology and acoustics of speech production and reception make some of the vocal features inevitable. What is not clear is how general are interpretations of differential exploitations of aspects of the vocal expression system.

A related and long standing research tradition, that involving "phonetic symbolism" has attempted to investigate the generality of symbolic connotations associated with speech sounds. Wicker (1968) summarizes the major results of this research:

> Speech sounds have been said to have symbolic connotations in themselves, beyond those imposed by the arbitrarily assigned meanings of the words they comprise. This doctrine of phonetic symbolism was given experimental support when Sapir (1929) discovered that CVC trigrams containing high vowels were judged to be more appropriate labels of small objects than trigrams containing low vowels. This effect seems easy to replicate (Newman, 1933), and there has been little disagreement among psychologists as to its validity.
>
> There has been, however, much disagreement regarding the generality of the phenomenon. It has been debated, for example, whether phonetic symbolism is universal: whether it is independent of the cultural and linguistic background of subjects (Taylor, 1963; Weiss, 1964). There has been disagreement on whether it is reflected only in subjective judgments about verbal materials (Newman, 1933) or whether it can also be seen in real languages (Johnson, 1967) (p. 175).

Miron's study of cross-linguistic phonetic symbolism attempted to broaden the cultural base of research in this area.

> Nonsense syllables, composed of phonemes which occur in both Japanese and American-English, were presented on tape recordings to Japanese and American subjects. The two groups both rated the syllables on the semantic differential . . . and marked common tendencies in their ratings were interpreted as evidence for the existence of cross-linguistic phonetic symbolism. Since the vocal expression of the phonetician who recorded the syllables may have been influenced by his own reaction to the syllables, it seems possible that non-verbal vocal cues may have been produced which were similarly interpreted in both American and Japanese (Kramer, 1962, p. 11).

Kramer's 1962 study was designed to see whether, among other things, "American listeners will be able to categorize the emotions being portrayed in Japanese by Japanese speakers with an accuracy significantly better than chance" (p. 11). Although Kramer found that American actors could in fact identify the emotions intended by Japanese actors in the recorded messages he noted that "not all emotions proved equally easy for American listeners to recognize in Japanese. Furthermore, some emotions may be portrayed in Japanese in more than one way, not all of which are recognizable to Americans" (p. 34).

Such studies demonstrate the universality of emotions and their expression through the vocal channel. They suggest that human beings can interpret vocal cues in largely similar ways regardless of their cultural background, but that the extent to which they do so is yet to be determined.

The present study carries the investigation one stage further. Instead of asking: What emotion is being portrayed, we ask: How do you react to what you have heard? This is a more general, more open-ended question even though our methodology requires a particular set of responses. A replication of this study with subjects of different language backgrounds will move research in "vocal" communication more firmly towards cross-cultural generalizability.

It would be interesting to find out for example whether subjects whose languages consistently and systematically manipulate some of these vocal variables will differ in their response from other subjects. Speakers of tone languages where pitch variation is a feature of the syllable may conceivably react differently to vocal cues than speakers of English in whose language pitch variation (intonation) is spread over a longer linguistic stretch--the phrase or utterance. It is probably not accidental that it is speakers of tone languages who have developed drum, whistle and gong languages--surrogates of speech in which the vocal features of speech form the basis of communication. In fact, West African drum languages depend largely on the reproduction of tonal relationships (i.e., relative pitch differences) rather than vowels and consonants, for signalling messages. But the messages which they send are mostly referential and formulaic

(Herzog, 1947; Carrington, 1949; Stern, 1954; Opubor, 1969). It would be interesting to investigate the connotative possibilities of drum languages, to see what combinations of their codes are associated with what kinds of connotative meaning.

Another related question is the extent to which stereotypes of various languages are related to the realities of their "vocal" behavior. The French and the Italians are said to speak very rapidly; Southern Americans to speak slowly. Are these borne out by objective measurements of rate of speaking? Do homosexuals generally speak at higher frequencies than other males? Is a high pitched male voice necessarily associated with perjorative connotations across cultures?

Answers to such questions can lead to a more rational strategy of verbal communication across national boundaries. If we can determine which aspects of response to vocal cues are universal and which are language or culture specific, we can devise ways of ensuring that international communicators, both in face-to-face and mass media situations, maximize the effect they wish to achieve through skillful use of all communication channels, including the "vocal."

The results of this study suggest the following elements of such a strategy:

1. If a speaker wants an audience to react favorably to what he says, he must speak either more slowly, or speak faster, than his normal speed. He would be even more successful in achieving his goal if he also spoke softly. However should he wish to speak at his normal speed, he must speak louder than normal.
2. If a speaker wishes an audience to consider him "powerful" or "forceful," he must speak more softly and more slowly than normal.
3. If a speaker's goal is to be considered "dynamic" by his audience, he must speak more slowly than normal but keep the volume of his speech at about normal.

These are strategy conclusions from the results of this study, and indicate the kinds of practical applications to which such studies can be put. The accuracy and effectiveness of such strategies are limited by the constraints intrinsic to a study such as ours. We cannot generalize beyond the group of high school students used in the present study. We cannot say that the strategy outlined would hold if the speaker uses a language which his audience knows, or if the nationality of his audience will lead to different strategies. Our results indicate that the sex of his audience or the foreign languages which

they know should make no difference. But this is conceivably only an artifact of the particular circumstances of this study.

These and similar reservations can be obviated through the kinds of further research which we outlined earlier.

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APPENDICES

APPENDIX I

THE INSTRUMENT

THE INSTRUMENT

STUDIES IN LANGUAGE BEHAVIOR
Department of Communication
Michigan State University

General Instructions:

You are about to participate in a study of language behavior.

We are interested, in this study, in how people respond to the human voice and to speech. Imagine a situation like this:

> The telephone rings in your home or apartment or room. You pick it up and speak to the other person. You do not recognize the voice; the person at the other end of the line is a stranger.

In spite of the fact that the caller is a stranger, you would probably have no difficulty in making certain statements about them. You would usually be able to say whether they were male or female, young or old, happy or unhappy, sometimes even whether they were friendly or unfriendly. Most times your guesses would be correct.

In this study we will ask you to make judgments about voices on tape. Try to respond as carefully as you can in the way we have suggested on the questionnaire.

Thank you for your cooperation.

STUDIES IN LANGUAGE BEHAVIOR
Department of Communication
Michigan State University

NAME_____SCHOOL_____STUDENT NUMBER_____

AGE_____SEX: MALE___FEMALE___YEAR IN SCHOOL____MAJOR_____

INSTRUCTIONS:

On each page you will find a series of adjectives in pairs. Between each pair of adjectives there are five spaces, for example:

	++	+	0	-	--	
friendly	_____	_____	_____	_____	_____	unfriendly

You will hear a voice on tape. When the tape is stopped, you will be asked to judge what you have heard on the tape, using the adjective pairs. Make one judgment for each pair of adjectives.

If you feel that the voice on the tape sounds "very friendly," you would place a check in the first space, under the double plus (++) thus:

	++	+	0	-	--	
friendly	X	_____	_____	_____	_____	unfriendly

If the voice sounds "friendly" but not extremely so, place the check in the second space, below the single plus (+) thus:

	++	+	0	-	--	
friendly	_____	X	_____	_____	_____	unfriendly

If the voice sounds neither friendly nor unfriendly, or if you are uncertain, place the check in the middle space below the zero (0) thus:

	++	+	0	-	--	
friendly	_____	_____	X	_____	_____	unfriendly

Also if you do not think that the voice can be described in terms of "friendly" and "unfriendly," check the middle space.

If the voice sounds "not friendly," check the fourth space, under the single minus (-), thus:

	++	+	0	-	--	
friendly	_____	_____	_____	X	_____	unfriendly

If the voice sounds "very unfriendly," check the fifth space, under the double minus (--), thus:

	++	+	0	-	--	
friendly	_____	_____	_____	_____	X	unfriendly

THERE ARE NO WRONG OR RIGHT ANSWERS. The best response is what you feel is appropriate. We are interested in what the voices mean to you.

Rating Scales

Voice Sample #____

high ___ ___ ___ ___ ___ low

good ___ ___ ___ ___ ___ bad

tense ___ ___ ___ ___ ___ relaxed

active___ ___ ___ ___ ___ passive

shrill___ ___ ___ ___ ___ mellow

hard ___ ___ ___ ___ ___ soft

calm ___ ___ ___ ___ ___ excited

sick ___ ___ ___ ___ ___ healthy

ugly ___ ___ ___ ___ ___ beautiful

fast ___ ___ ___ ___ ___ slow

happy ___ ___ ___ ___ ___ sad

thick ___ ___ ___ ___ ___ thin

masculine___ ___ ___ ___ ___ feminine

slow ___ ___ ___ ___ ___ fast

weak ___ ___ ___ ___ ___ strong

normal ___ ___ ___ ___ ___ breathless

dull ___ ___ ___ ___ ___ sharp

pleasant ___ ___ ___ ___ ___ unpleasant

naive ___ ___ ___ ___ ___ sophisticated

large ___ ___ ___ ___ ___ small

Form I

Rating Scales

Voice Sample #_____

good	___	___	___	___	___	bad
large	___	___	___	___	___	small
relaxed	___	___	___	___	___	tense
naive	___	___	___	___	___	sophisticated
hard	___	___	___	___	___	soft
pleasant	___	___	___	___	___	unpleasant
sharp	___	___	___	___	___	dull
excited	___	___	___	___	___	calm
strong	___	___	___	___	___	weak
normal	___	___	___	___	___	breathless
fast	___	___	___	___	___	slow
passive	___	___	___	___	___	active
sharill	___	___	___	___	___	mellow
feminine	___	___	___	___	___	masculine
healthy	___	___	___	___	___	sick
ugly	___	___	___	___	___	beautiful
high	___	___	___	___	___	low
happy	___	___	___	___	___	sad
thin	___	___	___	___	___	thick
strong	___	___	___	___	___	weak

Form II