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AN ANALYSIS OF NONVERBAL BEHAVIOR IN TWO MODES OF VOICE TRANSCRIPTION AND OPERATOR PRODUCTIVITY

The Ohio State University

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An Analysis of Nonverbal Behavior in Two Modes of Voice Transcription and Operator Productivity

Dissertation

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

By

Walter M. Sharp, B.A., M.A.

The Ohio State University
1984

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CHAPTER I

Introduction

The word processing industry has shown a phenomenal growth in the past few years. According to *Business Week* and other sources the word processing market is increasing fifteen to thirty percent per year, depending upon the particular item of equipment examined. Word processing is truly a growth industry (Foster, 1983).

This growth can be directly attributed to the same electronic technology that landed Neil Armstrong on the moon. An extension of this technology has created new "intelligent" typewriters and low-cost text processors in the business office! With all the excitement of change in the world of word processing, there is one machine new technology has ignored, the transcription machine.

The concept of stopping the recorded word to adjust the speaking rate to a slower speed was Alexander Graham Bell's in 1886. Thomas Edison, who had invented the phonograph earlier, incorporated Bell's concept with his own, and is credited with making dictation and transcription equipment a commercial success (Conot, 1979).

Since that time, in the late 1800's, various techniques have been applied to slow down the speaking rate of word originators to equal the secretaries' typing rate. The foot pedal, the first successful method, has yet to be replaced.
The most recent commercial attempt started in 1978. A technology called word compression and expansion was marketed by Sony as Variable Speech Control (VSC). The system electronically duplicates the sounds within a word, thus expanding the vocal duration of the word, in turn reducing the speaking rate. To increase the speaking rate, sounds are extracted from a word electronically, making the vocal duration shorter, thus, increasing the speaking rate. The application of the procedure for increasing the speaking rate is tremendous for persons who need rapid listening of quantities of recorded material. However, when VSC is used to slow down the speaking rate; the words are distorted and could be distracting to the secretary trying to type what is heard.

This writer took a different approach to VSC by developing a micro-mini computer to control the speaking rate. (See Appendix A). The major problem was to duplicate electronically what secretaries have been doing mechanically since Bell and Edison came up with the idea. This problem was solved by programming the computer to stop the transcriber after short normal phrases and to provide enough time for the secretary to type the phrase just heard. Secretaries can then set the speaking rate equal to their own typing rate.

The merits of the device are easily perceived by potential users. However, quantification of actual production improvement in a control-test group environment has not been achieved, primarily because of the multiplicity of activity in office environments. A test of this equipment was attempted by Dr. William D. Haueisen. However, frequent turnover, lack of rationalized procedures, poor supervision, and untrained "word originators" resulted in data that were not reliable.
Dr. Haueisen, in reference to his study, states:

"Actual scientific measurement is all but impossible in the field setting. I firmly believe such quantification can be done, but it will likely need to be done in a laboratory experiment. By imposing the control which is needed to quantify the results, we would assure success." (Haueisen, 1977).

Purpose of the Study

The purpose of this study was to provide scientific information about word production rates of voice transcription and periods of non-production by transcriptionists. With this information, decisions could be made by businesses interested in future equipment development. If production rates are improved and non-production time is reduced, some day a computerized word-rate control system may be a standard feature on most transcription machines. If there is no improvement in the production rates or a reduction in non-productive periods, the foot pedal should continue to be a viable method used to control the speech rate of transcription machines. The information would also help prospective purchasers of equipment make a decision. If production rates are increased by the use of computerized word-rate control systems and that is the sole criterion, then a request for the system could be made by the purchaser. If production rates are not improved, then the system should not be requested. However, if the study should show a reduction in non-productive time among operators of a computerized system, then another factor may enter the decision making process. By investigating both production rates and non-production periods decisions might be easier to make in the future.
Another purpose of the study was to provide information about computerized control of the variations in speaking rates from a single master tape. If operators can program the speaking rate without distortion, teachers of word processing could use one master tape per student to teach voice transcription at any speed from 1 to 100 words a minute. If the speaking rates can be reduced without distortion, students of foreign languages could listen to recordings of persons speaking at slow rates without losing the natural inflection to the voice.

Statement of the Problem

The problem of this study was to determine the relationships between two types of voice transcription equipment (manual and automated) and transcription production. Treatment group one used the manually controlled transcription machines; and treatment group two used the automated transcription machines. A related problem was to determine the relationship of a manually controlled transcription machine (treatment group one) and an automated transcription machine (treatment group two) upon the nonverbal activities of the operator. The contribution to the achievement and performance in using either a manually controlled or an automated transcription machine was assessed for each of the following factors:

1. Mailable letters typed
2. Gross words typed
3. Typographical errors made
4. Word omissions or additions
The above factors were used as the independent variables to compare the two groups.

**Hypotheses**

The major hypothesis addressed in the study was:

\[ H_{01} : u_1 - u_2 = 0 \]
\[ p. < = .05 \]

The number of mailable letters typed by treatment group one will be the same as the number of mailable letters typed by treatment group two following participation in a voice transcription training program.

The study also addressed the following sub-hypotheses:

\[ H_{02} : u_1 - u_2 = 0 \]
\[ p. < = .05 \]

The gross number of words typed by treatment group one will be the same as the gross number of words typed by treatment group two following participation in a voice transcription training program.
The number of typographical errors made by treatment group one will be the same as the number of typographical errors made by treatment group two following participation in a voice transcription training program.

\[ H_{03} : u_1 - u_2 = 0 \]
\[ p. < .05 \]

The number of word omissions or additions made by treatment group one will be the same as the number of word omissions or additions made by treatment group two following participation in a voice transcription training program.

\[ H_{04} : u_1 - u_2 = 0 \]
\[ p. < .05 \]

The number of interruptions of production typing by treatment group one will be the same as the number of interruptions of production typing by treatment group two following participation in a voice transcription training program.

\[ H_{05} : u_1 - u_2 = 0 \]
\[ p. < .05 \]

The number of minutes of non-production by treatment group one will be the same as the
number of minutes of non-production by
treatment group two following participation in
a voice transcription training program.

\[ H_{07} : u_1 - u_2 = 0 \]
\[ p. < = .05 \]

The number of minutes of production typing by
treatment group one will be the same as the
number of minutes of production typing by
treatment group two following participation in
a voice transcription training program.

**Delimitations**

The population of this study consisted of five groups of students
enrolled in typing classes in five Columbus, Ohio, public schools who
volunteered to participate in the study and who could type a minimum of
twenty words a minute or more for five minutes. There were no
restrictions made on the age of the students involved in the training
program.

The study did not attempt to create unusual circumstances or
learning situations in the transcription process. The researcher
obtained permission to use the first 24 business letters dictated for
(Appendix E). The material had a syllabic intensity of 1.5. Three
accepted variables which are related to and affect copy difficulty and
thus production are (SI) syllabic intensity, (AWL) average word length,
and (HFW) high frequency words (Robinson, 1965). Robinson concluded
that controlling for one factor is tantamount to no control at all! This would be a concern in this study if the variable examined in the study were growth in production rate over a period of time. However, this study did not examine growth in production but rather current production rate as related to two modes of transcription. Thus controlling the variable syllabic intensity to assure that all material contained words with an average of 1.5 syllables was determined to be the appropriate control criteria. There were only two word originators recorded on the tapes, one male and one female.

The study did not attempt to gather production data beyond three hours of instruction. Likewise, it did not consider on-going instruction parallel to the time of the training session.

Limitations

The limitations of this study include those factors mentioned above. In addition, it is limited in its generalizability to the unique population of students who participated in the study.

Definitions of Terms

Terms that are unique to this study are defined as follows:

Author: A person who dictates material into a recording device.

Computerized word rate control: A device that reduces the recorded speaking rate of an author by inserting pauses between words or phrases.

Dictation/transcription equipment: A device used for both dictating material and voice transcription.

Gross words: The total number of words typed during the training
session.

**Interruption:** Any break in the continuity of production typing.

**Mailable letter:** A block style letter with all typographical errors appreciably corrected with correction fluid and acceptable by the researcher as mailable.

**Production time:** The time used by the typist for inserting paper into the typewriter, listening to recorded material, typing, searching for words in a dictionary, making corrections, and removing the paper from the typewriter.

**Production rate:** The gross number of words typed and the number of mailable letters produced during the training period.

**Non-production time:** The time used by the typist for personal conversation, asking questions, asking for assistance, leaving the workstation, resting, or any other activity not directly related to production.

**Syllabic intensity:** One of the measures used for determining the difficulty of straight-copy material; a syllabic intensity of 1.5 is considered to represent copy of "average" difficulty (Robinson, 1979, p. 72).

**Typographical error:** A mistake in typing that has not been corrected according to the standards of mailable letters.

**Variable Speech Control (VSC):** A patented device that increases or decreases the rate of speech. The speaker's normal rate of delivery, around 150-words per minute, can be increased to 375 words per minute or decreased to 105 words per minute (Leslie, 1978).

**Voice transcription:** The process of making a typewritten copy while
listening to a recording of someone's voice dictating the words to be typed.

**Word addition:** A word that has been added to a typewritten letter.

**Word omission:** A dictated word that has been left out of the typewritten letter.

**Word processing:** "...the transformation of ideas and information into a readable form of communication through the management of procedures, equipment, and personnel" (Rosen and Fielden, 1977, p. 335).
Chapter II

Review of the Literature

This study was primarily concerned with the analyses of the relationships among two types of voice transcription equipment, transcription production, and nonverbal communication. The content of the voice transcription material was held constant to investigate the relationship of a manually controlled transcription machine (treatment group one) and an automated transcription machine (treatment group two) to production. A related problem was to investigate the relationship of a manually controlled transcription machine (treatment group one) and an automated transcription machine (treatment group two) upon the nonverbal activities of the operator.

The literature review addresses three topics determined to be relevant to the study:

1. The shift of the U.S. economy from a manufacturing to a service economy,
2. The standards for measuring word processing production, and
3. The nonverbal communication of operators of automated equipment.
Shifting From a Manufacturing to a Service Economy

One of the methods of measuring the economic strength of a country is to observe the growth rate of its Gross National Product (GNP). The ability to adjust to a changing economy is also a measurement of strength. Office automation appears to be one of the most active strengths in the U.S. economy today.

Production in the United States

In recent years the United States economy has experienced a rapidly decreasing rate of productivity, a rate well below the 3.2 (percent) "norm" (Battelle, 1983). During the same period other countries have enjoyed high growth rates, such as, Canada 4.0, Sweden 5.4, Germany 5.4, France 5.5, Italy 5.9, Belgium 6.9, the Netherlands 6.9, and Japan 8.2. Since 1978, American productivity has continued to decline, currently standing between .0 and 1.0 percent (Goddard, 1983).

A factor closely related to the decline in the rate of productivity is the shift from a manufacturing economy to a service economy. According to The Battelle Memorial Institute figures more than 50 percent of the American workforce is engaged in service activities. Goddard says approximately 25 percent of that workforce is engaged in office work. The International Data Corporation reports that the productivity of the factory workers has increased 80 percent over the past twenty years, while the office employee production rate has risen only 4 percent. In 1980 office productivity actually declined for the first time ever in the history of the United States (Foster, 1983). The problem is further perpetuated by office personnel utilizing only 50 to 60 percent of their available work time for production (Keeling, 1978).
When one considers the enormous quantities of paper generated by American office workers, 600 million pages of computer printouts, 234 million photocopies, and 76 million letters each day (Foster, 1983); one can see that a small percentage increase in the use of available work time would increase productivity tremendously. Letter production for example could be increased by 7.6 million letters a day by using 10 percent more of the available work time for production. It is no wonder that management is looking for new ways to improve productivity in the office as the economy continues to shift from manufacturing to service activities.

Office Automation and Productivity

Automation appears to be one way to help solve the problem of low productivity in the shifting economy. "What is office automation? Is it word processing? Is it data processing? Is it electronic mail or telecommunications? In fact, office automation is all of these and more. It is the application of a broad range of electronic technologies of office activities for the purpose of enhancing the productivity of the people performing those activities" (Battelle, 1983 p. 1). The automated transcription machine in this study is an enhancement of the manually controlled (foot pedal) transcriber. For this enhancement to contribute in a positive way, by increasing office productivity in a shifting economy, it must first show a possibility for improving the production rate of a transcriptionist.

Standards for Measuring Word Processing Production

The importance of increasing production through automation emphasizes the need for adequate methods to measure new technologies.
Several methods have been designed for word processing. Standards for detecting typographical errors, spelling, and grammar are equally important measurement devices.

**Purpose of Measurement Standards**

To measure the contribution a new technology makes to word processing production, one must utilize an acceptable measurement standard. Work measurement standards are described by Littlefield (1978) as a means used in industry to establish an equitable relationship between the man-hours used and the units of output produced. Office production, more specifically word processing production, may be measured by very simple figures with rough totals in small offices or by very fine-tuned measurements in large offices (Kleinschrod, 1980). One of the problems with word processing measurement is that there are very few widely accepted standards for gauging performance. Measurements such as lines, pages, documents, applied hours, turnaround, and other qualities of word processing are used, but there is no agreed upon measurement acceptable to the whole industry. Littlefield suggest word processing measurement standards should provide management with the following information:

1. Output or units of work to be produced—correspondence, reports, projects;

2. Costs per unit of output;

3. Standards of performance for each type of work and each employee—transcribing dictation, typing, etc;

4. The effectiveness of scheduling and controlling work flow—monitoring of work flow, records of individual assignments and performance;
5. Quality of work produced;

6. Records of equipment reliability and service; and

7. Overall system effectiveness particularly in terms of equipment and personnel needs and needs for training (p. 135).

**Techniques for Setting Standards**

There are many techniques for setting standards in word processing. According to Kleinschrod, Littlefield, and Keeling the basic techniques for measuring office operations are: (1) historical records, (2) time logs, (3) work sampling, (4) stopwatch time studies, and (5) predetermined time systems.

Historical record studies, the simplest form of work measurement, accumulate information about time and output. With this method various office activities such as transcribing, typing, filing, and billing are studied to measure what was produced in the past. Keeling gives the following examples of measurements that may be used for measuring the output in a word processing center:

1. **By the page, letter, belt, disk, or cassette.** Measurement according to this base is probably the simplest plan to use. However, simply counting the number of pages, letters, belts, cassettes, etc., is too inaccurate to be of much value, for letters vary in length, and belts, disks, and cassettes hold varying amounts of dictated matter.

2. **By standard lines.** Some companies count the number of standard typewritten lines produced. A standard line is usually 60 spaces—15.24 cm (6 inches) for pica type and 12.7 cm (5 inches for elite type. The number of lines may be counted either by hand or by use of a line counter, which is a cardboard or plastic scale graduated for pica and elite type. Such a base cannot easily be used for tabulated or statistical
The standard-line basis is particularly useful, however, where workers are compensated on a piece-rate basis.

3. **By square centimeters or square inches.** Some companies use the square-centimeter or square-inch base in place of the standard-line base. In these firms the production of typist is measured by use of transparent celluloid sheets blocked off in square centimeters or inches. When a sheet is placed over a letter or a report, the number of square centimeters or inches of typewritten material may be read at a glance. This base is especially satisfactory in the measurement of tabulated material.

4. **By key strokes.** A commonly used base is the number of key strokes made on the typewriter. By means of one type of electronic counter attached to typewriters, up to 5,000 key strokes can be accurately and automatically recorded each minute (pp. 659-60).

Time logs are maintained by each employee to record the time spent performing each task and the number of units produced. Littlefield points out the primary advantage of this technique is its simplicity.

Work sampling is based on a theory of probability. A random sample of work is drawn from a group to set the standards for the entire group (Littlefield). Kleinschrod also states that manuals are available to obtain work measurement values and that work sampling is limited to gross observations.

Stopwatch time studies are the oldest and best known scientific techniques of work measurement. Careful observations, using a stopwatch, set the time for each of the elements of word processing production. It is Kleinschrod's belief that the main disadvantages of time study methods are the inconsistent standards, omissions of methods analysis, and high cost.

Predetermined time systems are a set of clerical work tasks which
can be applied to the measurement of approximately 95 percent of office work (Kleinschrod). Keeling describes predetermined time as "... based on the assumption that if the same motions are used in all work activities and under the same conditions, the time values are constant and may be used to reduce subjective judgment ... The total time for all motions involved in performing the element plus the addition of a time allowance for conditions such as delay, fatigue, and personal needs becomes the time standard for the job (p. 667)."

Kleinschrod believes an important factor in determining word processing work standards is the final copy output. Final copy output being the net usable copy produced divided by the time spent in producing it. This includes the time spent in stroking the keys, work positioning, machine setup, paper collation, etc., and the time spent rectifying keyboarding errors. Considering all the factors of letter production, Littlefield indicates the average secretary using an electric typewriter transcribing from a transcription machine produces letters at a typing rate of 20 words a minute.

**Typographical Error Standards**

The standards for detecting typographical errors, and for word omissions or additions in the word processing field were not found by the researcher. It may be, since keyboarding is generally taught in secondary and post secondary schools, many of the old International Typewriting Contest rules that set the standards for schools are used in the field of word processing. A partial list of the rules (Clem, 1955), that seem most appropriate for word processing, is as follows:
1. **Spaces and Punctuation Marks.** An error in spacing or in punctuation is considered an error in the preceding word unless that word has already been penalized.

2. **Spacing After Punctuation.** Except as noted below, space once after all punctuation marks within sentences or within word groups not forming sentences, and space twice after all punctuation marks that close sentences or groups of words not forming sentences.

   There is good authority for following the above rule when spacing after the colon, but there is equally good authority for always spacing twice after a colon. Charge an error for every failure to space consistently according to one of these rules.

   It is better form to omit the space in small-letter abbreviations, such as a.m., f.o.b., etc. Many authorities prefer no space in capital-letter abbreviations (except initials of personal names), such as O.K., P.M., Ph.D., etc.; but a space after the period following each letter in all abbreviations is acceptable in all schoolwork. Failure to be consistent in a given piece of work constitutes an error.

3. **Incorrectly Divided Words.** A word divided incorrectly at the end of a line constitutes an error. A word hyphenated at the end of a line in the printed copy may or may not need the hyphen if it occurs medially in the line. Follow any standard dictionary for the authority on correct division.

4. **Transposition.** One error is charged for each transposition either of letters or of words. Errors within transposed words must be marked as additional errors.

5. **Rewritten Matter.** Charge one error for the rewriting and an additional error for each mistake in both the first and the second writing.

6. **Omitted Words.** Charge one error for each place
where words are omitted and deduct the strokes in
the omitted part from the total strokes at the end
of the text.

7. Left-Hand Margin. All characters at the begin­
ning of lines, except at paragraph indentions, must
be struck at the same point on the scale or an
error must be charged for each violation.

8. One error per Word. Not more than one error may
be charged in any one word.

9. Gross Words. Obtain the total number of strokes
typed by using the stroke count given at the end of
each line in the printed copy. Deduct strokes for
omitted words and add strokes for rewritten words.
Divide this total by 5 (a word is defined as 5
strokes) to find the number of gross words typed.
Drop one or two [characters] left over when dividing
by 5 and add as a whole word three or four [charac­
ters] left over. Use no decimals or fractions of
words. Take credit for every stroke typed (p. 259).

Spelling and Grammar Standards

The keyboarding errors made while typing from a printed text are
usually caused by deficiencies in typing technique. Kleinschrod (1980)
points out that word processing adds a new dimension to typing,
"Reasoning ability and skills in spelling and grammar count for more
than typing speed, for they move the work forward thoughtfully,
accurately, and unhampered by decision error (p. 160)."

Fried (1978) conducted a study to determine which skills
contributed most to the machine transcription ability of magnetic
keyboard operators. Spelling ability was found to be a major variable
in predicting transcription accuracy, accounting for nearly 66 percent
of the criterion variance, implying that accurate spellers tend to be
more accurate transcriptionist. The study recommended that "(1) more
emphasis should be placed on the development of spelling skills of words
commonly found in business vocabulary, (2) less emphasis should be
placed on straight-copy typing rate and more on the cognitive tasks associated with transcription, and (3) proofreading skills should be taught to include not only identification of general typographical errors but should also require attention to punctuation errors (p. 3)."

Nonverbal Communication with Automated Equipment

Nonverbal communication between individuals has been studied for several years. Studies concerning nonverbal communication as it may relate to automation was not found in the literature by this researcher. However, a variety of basic concepts of communication and relationships were found.

Nonverbal Communication

Galloway (1984) points out that researchers cannot agree on simple definitions of what is meant by "nonverbal" whether the issue is communicative, informative, subliminal, psychological, anthropological, or universal in definition and meaning. Wolfgang (1977) defines nonverbal behavior as behavior that transcends written or spoken words. Wolfgang says the study of nonverbal behavior is divided into three areas:

1. Proxemics a word coined by Hall (1969), refers to how individuals use space in relation to one another or to objects in the environment. How close individuals stand in relation to one another or arrange objects in the environment has been shown by Hall (1969) and others (Baxter, 1971; Aiello and Jones, 1971) to be culturally determined (p. 146).

2. Kinesics a term coined by Birdwhistell
(1970) refers to patterns of body movement. The popular term for kinesics is “body language” which includes such behaviors as facial expressions, gestures, posture, head nods, etc. (p. 146).

3. Paralinguistics ... refers to the extra-verbal elements that are associated with speech i.e., tone of voice, pauses, hesitations, errors in speech, rate of speech, etc. (p. 147).

All three areas of nonverbal study indicated by Wolfgang are concerned with the communication between people. Neil Frude (1983), a psychologist, suggests that there is a social interaction between people and machines. People tend to respond to machines in much the same way they respond to other people. This implies communication between machines and people.

Elements of Communication

Murphy (1984) defines communication as a process of transmitting a message so that the recipient understands it. She further states that communication is a two way process of exchanging ideas or information between human beings and is considered effective when it achieves the desired reaction or response from the recipient.

Murphy divides the process of communication into five elements:

1. Sender/encoder—the sender of the message is also the encoder choosing symbols to correctly express a message.

2. Message—the message consists of both verbal symbols and nonverbal symbols.

3. Channel/medium—the method of sending the message, whether it be written, through a medium of sound, etc.

4. Receiver(s)/decoder(s)—the receiver of the message is also the decoder and is ultimately the one who reacts.

5. Feedback—the reaction to the message may be "yes" or "no," a request for further clarification, an undesirable
decision, or a detailed, helpful report. If the receiver incorrectly perceived (decoded) the message, there has been miscommunication. The success or failure of the communication is indicated by the feedback.

The five elements of communication imply a dialogue between two people, where the dialogue may be initiated by either party. A person to machine dialogue is readily seen when a person operates a computer. An operator sends a message through a keyboard to a central processing unit, the information is processed and fed back to the sender through a monitor. All of the elements of communication have been met. The question becomes, "Can the computer (machine) initiate communication with the person?" To meet the definition of communication the computer (sender) would have to make the operator (receiver) act or respond.

Nonverbal Behavior and Context

Galloway (1984) states in his paper that human behavior cannot be fully understood and predicted until a knowledge of setting, context, and role is placed alongside the acting and communicating person. Barker (1968) discovered that much of peoples behavior is situation-dependent, or under the control of the environmental setting. Context is more complicated. Hall (1977) separates context messages into high context and low context. A high-context (HC) communication or message is one in which most of the information is either in the physical context or internalized in the person, while very little is in the coded, explicit, transmitted part of the message. A low-context (LC) communication is just the opposite; i.e., the mass of the information is vested in the explicit code. Hall gives this example, "Twins who have grown up together can and do communicate more economically (HC) than two lawyers in a courtroom during a trail (LC), a
mathematician programming a computer, two politicians drafting legislation, two administrators writing a regulation, or a child trying to explain to his mother why he got into a fight (p. 91)." High-context communication, which is both verbal and nonverbal, is economical, fast, efficient, and satisfying when contrasted with low context communication; however, time must be devoted to programming. If programming for high-context communication does not take place, the communication is incomplete. Hall (1976) implies time is a nonverbal when he states that time is "one of the most basic organizing systems of life, for all situational behavior has a temporal and a spatial (proxemic) dimension (p. 136)." Most of Hall's (1974) research contributions have been in the area of proxemics, which is the study of man's transactions as he perceives and uses intimate personal, social, and public space. There was no mention in his proxemic studies of the relevance of time and space, the door was left open for the study of the time dimension. This leads the writer to believe that machine communication with a person would occur after a person became a proficient operator, and all the behavior, verbal and nonverbal, would be high-context and relevant to time. Knowing the role to be played by the person is equally important. Galloway (1984) adds to this a new dimension, the notion that nonverbal communication is multi-messaged and multi-leveled. "Occurring simultaneously at all ... levels, performances of energies, rhythms, and nonverbal expressions are also played out. These nonverbals of expression, rhythm, and energy contribute significantly to the creation of context and its potential meaning (p.}
Anthropomorphism

Anthropomorphism tendencies may indicate the desire of people to communicate with machines. The Encyclopedia Americana (1980) defines anthropomorphism as "the attribution of human qualities to beings that are not human or to objects of phenomena in nature (p. 53)." Jung (1976) writes of anthropomorphism in ancient Greek mythology when "man saw the sun as the great Father of heaven and earth, and the moon as the fruitful Mother. Everything had its demon, was animated like a human being, or like his brothers the animals. Everything was conceived anthropomorphically or theriomorphically, in the likeness of man or beast. Even the sun's disc was given wings or little feet to illustrate its motion. Thus there arose a picture of the universe which was completely removed from reality, but which corresponded to man's subjective fantasies. It needs no very elaborate proof to show that children think in much the same way. They too animate their dolls and toys, and with imaginative children it is easy to see that they inhabit a world of marvels (p. 21)." We adults sometimes speak of "wise old owls", "furious storms," or "dancing flowers," as proof of an unforgettable childlike imagination.

Hackers

"Hacking" may be a more direct indicator that machines do communicate with people. Frude (1983) defines hackers as people who have a compulsive desire to use computers.

Frude says that "in certain circumstances people will respond to an
inanimate object as if it were living. Given special cues, they will establish relationships with machines ... and will react as if they were encountering another human being (p. 104)."

According to Frude, hackers were discovered about fifteen years ago by computer scientist Joseph Weizenbaum. They are compulsive programmers, and behave in a way very similar to an addiction. They are fanatical, singleminded, and devoted to the computer. They spend hours and hours coaxing the computer to perform extravagant tasks. They can hardly bear to be out of physical contact with the machine, and when they are away from the machines they carry their printouts around with them. They will describe time at the computer as if it ceases to exist and that hours pass by unnoticed. Psychologists have called this phenomenon "Flow" and have studied some of the conditions under which it occurs. There is no doubt that flow is pleasurable. Hackers recognize it and enjoy it. Frude believes that the existence of hackers illustrates the fact that human-machine relations are by no means free of emotional implications.

Implications of the Literature

The new technologies creating automation in the office will play a vital role in improving the U.S. economy as it shifts from manufacturing to service industries. The success or failure of a new technology will depend upon the standards used to measure its effect upon production. Equally important is how people will relate to this new technology.
CHAPTER III

Methods and Procedures

This study examined the production rates of students who participated in a training program using two types of voice transcription equipment: one a manually controlled transcriber (group one) and the other an automated transcriber (group two). The content of the voice transcription material was held constant to investigate production rates as determined by the number of mailable letters produced and a word count of the type written material completed. In addition to this, non-production time was examined by determining the number of minutes used for personal conversation, asking questions, asking for assistance, leaving the work station, rest periods, and any other activity not directly related to production.

Population

The population of this study consisted of 53 students from typing classes in each of five schools in the Columbus metropolitan area who volunteered to be part of the study and who demonstrated a typing speed of at least 20 words a minute. The students represented a four-year college, an inner-city comprehensive high school, an inner-city vocational high school, a suburban comprehensive high school, and a suburban vocational high school. None of the students had used
transcription equipment prior to the study. The students were randomly assigned to the two treatment groups. The sample size for each group was 28 for treatment group one and 25 for treatment group two.

**Pilot Tests**

Two pilot tests were conducted, one at a suburban vocational school and the other at a university. The tests were used to ascertain the appropriateness of the procedures for conducting the study.

The first pilot test, consisting of six students, was conducted in a suburban vocational high school. The second pilot test, consisting of ten students, was conducted at a university. Both schools were located in the Columbus metropolitan area and volunteered to participate in the test. The students were randomly assigned to the treatment groups. The typing test and spelling test were administered to determine their appropriateness as a pretest, and the training program was used to determine if the dictation letters would measure productivity; in addition to this a personal evaluation was made by each student (Appendix B). As a result of the pilot tests, a few minor changes were made, such as obtaining comfortable head sets. The major change was the addition of two observers in addition to the video taping.

**Instrumentation**

A pretest was administered to the students in treatment group one and treatment group two prior to the beginning of the training session to assure equality. The test consisted of two parts, typing and spelling. The typing test was for five minutes; the material contained a syllabic intensity of 1.5. The typing test was from *College
Typewriting, Complete Course-Tenth Edition, 1980, 151d Building Straight-copy Typing Skill, page 262, Southwestern Publishing Co. (Appendix C). The spelling test was the beginning corresponding secretaries test developed by Dr. Nancy Elizabeth Fried (Appendix D). The Kuder-Richardson Formula 21 and an item analysis were conducted on the test to insure its stability. The resulting reliability was .935; the discrimination distribution ranged between .478 and .929; and the difficulty distribution ranged between 18 per cent and 55 percent (Fried, 1978, pp. 17-19). Approval for using the tests may be found in Appendix E.

A word count of the mailable letters completed and a word count of the typewritten material at the onset of the study and at the conclusion of the training sessions were used to determine the production rate. Two observers recorded the time of production and non-production, and a video tape of each session was made to verify the observations. A visual observation of the completed production material was made by the researcher to determine typing errors and word omissions.

**Design**

The following is a pictorial graph of the quasi-experimental design which was used for the study.

\[ O_1 \quad T_1 \quad O_2 \quad - - - - - - - - - - - - - \\
O_3 \quad T_2 \quad O_4 \]

Where: \( O_{1-3} \) = The scores obtained from treatment group one and treatment group two on the pretest.
The number of words typed, the number of mailable letters typed, the number of minutes of production, and the number of minutes of non-production by treatment group one and treatment group two at the conclusion of the study.

$T_1$ = The treatment administered to treatment group one. The group used the manually controlled transcription machines.

$T_2$ = The treatment administered to treatment group two. The group used the automated transcription machines.

**Step by Step Procedure**

Prior to the time of the training sessions teachers from each of the five participating schools were asked to have the following completed (Appendix F):

1. To obtain written permission from the student if he/she was an adult or from the student's parent or guardian if the student was a minor (Appendix G)

2. To administer the five minute timed writing and the spelling test unobtrusively during regular class periods.

Five days were set aside for the training sessions in the laboratories of the Business Education Department at The Ohio State University. Each day a different school participated in the training. There were six training stations for teaching voice transcription, three
stations for the manually controlled transcribers (group one) and three stations for the automated transcribers (group two). The students were divided into two groups labeled "A" and "B" and were randomly selected to be placed in a training station. Each day a random order list of twelve numbers was prepared by selecting numbers from a statistical table (*A Million Random Digits with 10,000 Normal Deviates*). The first six numbers represented group "A"; the second six represented group "B". Numbers A1, A2, A3, A4, A5, and A6 represented the manually controlled transcriber stations, while numbers B1, B2, B3, B4, B5, and B6 represented the automated transcriber stations. The students were assigned to the list of numbers based upon the order of the pretests as they were handed the researcher when the teacher entered the laboratory with the students. Each of the students had three hours of voice transcription training (Appendix H). To facilitate the scheduling of the voice transcription training among twelve students, three hours of instruction were given on microcomputers. The hours of training were divided into a series of one and one-half hour sessions. The following schedule was arranged so that one group worked on voice transcription while the other group worked on the microcomputers:

<table>
<thead>
<tr>
<th>TIME</th>
<th>GROUP</th>
<th>TRAINING SESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:15 - 8:30</td>
<td></td>
<td>Orientation and Assignments</td>
</tr>
<tr>
<td>8:30 - 10:00</td>
<td>A</td>
<td>Voice Transcription</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Microcomputers</td>
</tr>
<tr>
<td>10:00 - 10:15</td>
<td></td>
<td>BREAK</td>
</tr>
</tbody>
</table>
Two trained observers observed and recorded the minutes of production and non-production of each student during the training sessions. (A check of reliability indicated no difference between the observers, and a perfect correlation between the non-production variables minutes of production and the number of interruptions for personal conversations by the observers.) The non-production time was identified according to the type of interruptions: personal conversations, asking questions, asking for assistance, leaving the work station, periods of rest, and any other type of activity not directly related to production (Appendix I). The observers were placed on a rotation plan so that each student was observed an equal amount of time by each observer (Appendix J). All sessions were video taped.

Analysis of the Data

The data collected in this study were obtained from treatment group one and treatment group two. The pretest, the number of mailable letters, the word count of typewritten material, and the recorded
observations of the time for production and non-production were used for analyses. The data were analyzed using various descriptive and correlational statistics. More specifically: the mean, and standard deviation were determined. The t-test was used to test the difference between the means of the two groups. Correlations were run to determine relationships among variables.
Chapter IV

Analysis of Data

This chapter presents analyses of the data collected in this study.

Introduction

The primary purpose of this study was to analyze the relationship between two types of voice transcription equipment and production as measured in terms of mailable letters. The content of the voice transcription material was held constant to investigate the relationship of a manually controlled transcription machine (treatment group one) and an automated transcription machine (treatment group two) to production. A related problem was to investigate the relationship of a manually controlled transcription machine (treatment group one) and an automated transcription machine (treatment group two) upon the the nonverbal activities of the operator.

Treatment group one used the manually controlled transcription machines, each operator used a foot pedal to control the word rate of the dictation. By depressing the foot pedal the operator could hear the words to be typed then could release the foot pedal at will and take as long as desired to type the words. Treatment group two used the automated transcription machines, each operator programmed the machine for a specific word rate (speed) of dictation. By pressing a play key once and releasing, the automated machine controlled the number of words
the operator heard and the amount of time the operator could use to type
the words. The major difference between the two machines was the shift
of the power to control the word rate from the operator to the
transcription machine.

Hypothesis Testing

To investigate the problem of this study, the following seven
hypotheses were formulated:

1. The number of mailable letters typed by treatment group one
   will be the same as the number of mailable letters typed by treatment
group two following participation in a voice transcription training
program.

2. The gross number of words typed by treatment group one will be
   the same as the gross number of words typed by treatment group two
   following participation in a voice transcription training program.

3. The number of typographical errors made by treatment group one
   will be the same as the number of typographical errors made by treatment
group two following participation in a voice transcription training
program.

4. The number of word omissions or additions by treatment group
   one will be the same as the number of word omissions or additions made
   by treatment group two following participation in a voice transcription
   training program.

5. The number of interruptions of production typing by treatment
group one will be the same as the number of interruptions of production
typing by treatment group two following participation in a voice
transcription training program.
6. The number of minutes of non-production by treatment group one will be the same as the number of minutes of non-production by treatment group two following participation in a voice transcription training program.

7. The number of minutes of production typing by treatment group one will be the same as the number of minutes of production typing by treatment group two following participation in a voice transcription training program.

All data were transferred to key punch cards, and various descriptive and correlational computer programs from the Statistical Analysis System (SAS) at The Ohio State University were used for data analyses. The analyses related to each of the hypotheses are reported in this chapter.

**Description of the Population**

The population of this study consisted of 53 business students from the Columbus, Ohio, area. The students represent a four year college, an inner-city comprehensive high school, an inner-city vocational high school, a suburban comprehensive high school, and a suburban vocational high school. The prerequisites for participation in the study were that students had to demonstrate the ability to type a minimum of 20 words a minute on a five minute typing timed writing and that they had no previous experience using transcription equipment.

**Equate Observers of the Treatment Groups**

Two trained observers observed and recorded the variables minutes of production and non-production for each student during the training sessions. The observers also identified the variables number of minutes
used for training and the number of interruptions for personal conversation, asking questions or for assistance, leaving the workstation, periods of rest, and any other type of activity not directly related to production. To verify the reliability of the observers after being trained, a fifteen minute video sample was shown to the observers. Three five minute segments of video tape containing at least one representation (except for training and rest) of the variables to be observed were edited from the first pilot test and used for the sample. The observation scores were analyzed using a t-test to determine if the scores of the two observers were significantly different for any of the variables. The value of \( t = .676 \) was obtained when the minutes of production were compared, a perfect \( t \) value was obtained when the number of interruptions for personal conversation were compared. None of these values was significant at the .01 or .05 level supporting that differences between the two observers were no greater than that expected to be due to chance.

Pearson Product Moment Correlations were calculated to determine the linear relationship of the variables minutes of production and the number of interruptions for personal conversation as recorded by each of the two observers. There was a perfect correlation \( (r = 1.00, p < .01) \) for both variables.

**EQUATING TREATMENT GROUPS**

The students were randomly selected to be in treatment group one or treatment group two. A pretest was administered prior to the treatments as an additional assurance of equality and to secure data used in analyses. The pretest measured spelling, gross words typed, and
typographical errors. The mean of the spelling pretest (Table 1) for treatment group one was 19.750, and the mean for treatment group two was 20.600. The mean gross words a minute typed (Table 2) by treatment group one was 48.071, and the mean for treatment group two was 48.600. The mean number of typographical errors (Table 3) for treatment group one was 11.857, and the mean for treatment group two was 12.680.

### Table 1

**Means of Treatment Group Pretests**

**Spelling**

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum Score</th>
<th>Maximum Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>19.750</td>
<td>5.309</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>20.600</td>
<td>4.778</td>
<td>7</td>
<td>25</td>
</tr>
</tbody>
</table>

### Table 2

**Means of Treatment Group Pretests**

**Gross Words Typed**

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum Score</th>
<th>Maximum Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>48.071</td>
<td>14.519</td>
<td>24</td>
<td>75</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>48.600</td>
<td>13.385</td>
<td>26</td>
<td>70</td>
</tr>
</tbody>
</table>
Table 3
Means of Treatment Group Pretests

Typographical Errors

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum Score</th>
<th>Maximum Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>11.857</td>
<td>8.222</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>12.680</td>
<td>8.143</td>
<td>3</td>
<td>32</td>
</tr>
</tbody>
</table>

The pretest scores were analyzed using a t-test to determine if the scores of the two groups were significantly different for the variables (spelling, gross words typed, and errors). A value of \( t = .544 \) was obtained when the spelling tests of the treatment groups were compared, a value of \( t = .890 \) was obtained when the gross words typed by the treatment groups were compared, and a value of \( t = .716 \) was obtained when the typographical errors of the treatment groups were compared. None of these values was significant at the .05 level supporting that differences between the two groups were no greater than that expected to be due to chance.

Analyses of Data

Analyses of Hypothesis One

Hypothesis one was:

The number of mailable letters typed by treatment group one will be the same as the number of mailable letters typed by treatment group two
following participation in a voice transcription training program.

At the conclusion of the study, the mean number of mailable letters typed by treatment group one was 3.750; the mean number of mailable letters typed by treatment group two was 5.880. A t-test was performed to test whether the two groups were significantly different with reference to the total mailable letters typed. As shown in Table 4, there was a significant difference between the total number of mailable letters typed by group one and group two. On the basis of this finding from an analysis of the t-test statistics the researcher fails to accept hypothesis one.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>3.750</td>
<td>3.157</td>
<td>51.0</td>
<td>.039*</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>5.880</td>
<td>4.166</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05

Group two typed 40 percent more mailable letters than group one.

Additional Findings Related to Hypothesis One

This investigation was conducted to determine the extent to which each of the following variables was related to one another:

1. the number of typographical errors not corrected in the
letters typed,
2. the number of words omitted or added to letters,
3. the number of mailable letters completed,
4. the number of personal conversations conducted during the
treatment,
5. the number of questions asked or requests for assistance asked
during the treatment,
6. the number of times the student left the work station,
7. the number of times the student stopped voice transcription to
rest,
8. the number of times the student interrupted voice
transcription for reasons other than those mentioned in items
4-7 above,
10. the total number of interruptions to voice transcription
production,
11. the number of minutes used for voice transcription production
typing,
12. the number of minutes used for training in use of the
equipment, and
13. the number of minutes used for interruptions.

Pearson Product Moment Correlations were calculated to determine
the linear relationship of the total number of mailable letters typed by
treatment group one and the independent variables. A number of
significant correlations were found (Table 5).
Table 5
Correlation Coefficients for Treatment Group One

Mailable Letters

<table>
<thead>
<tr>
<th>Mailable Letters</th>
<th>Pretest Spelling</th>
<th>Pretest Gross Words</th>
<th>Gross Words</th>
<th>Typo. Errors</th>
<th>Words Omitted or Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailable Letters</td>
<td>r 1.000</td>
<td>0.667</td>
<td>0.547</td>
<td>-0.625</td>
<td>-0.452</td>
</tr>
<tr>
<td>P</td>
<td>.000</td>
<td>.01**</td>
<td>.01**</td>
<td>.01**</td>
<td>.05*</td>
</tr>
</tbody>
</table>

*P < .05
**P < .01

The total mailable letters typed by treatment group one had a substantial positive relationship (Table 6) with pretest spelling (r = .67, P < .01), pretest gross words a minute typed (r = .55, P < .01), and gross word a minute typed during the treatment (r = .55, P < .01). The total mailable letters typed had a substantial negative relationship with typographical errors (r = -.63, P < .01), and a moderate negative relationship with the number of words omitted or added to the letters typed (r = -.45, P < .05).
Table 6
Verbal Interpretation of the Relationships

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.70 or higher</td>
<td>very strong relationship</td>
</tr>
<tr>
<td>.50 to .69</td>
<td>substantial relationship</td>
</tr>
<tr>
<td>.30 to .49</td>
<td>moderate relationship</td>
</tr>
<tr>
<td>.10 to .29</td>
<td>low relationship</td>
</tr>
<tr>
<td>.01 to .09</td>
<td>negligible relationship</td>
</tr>
</tbody>
</table>

Source: Davis, *Elementary Survey Analysis*, 1971

Correlations were calculated to determine the linear relationship of the total number of mailable letters typed by treatment group two and the independent variables. A number of significant correlations were found (Table 7).
The total mailable letters typed by treatment group two had a substantial positive relationship with the variables pretest spelling \((r = .59, p < .01)\), and pretest gross words a minute \((r = .51, p < .01)\). Total mailable letters had a moderate positive relationship with the gross words typed during the treatment \((r = .42, p < .05)\). The total mailable letters had a very strong negative relationship with the number of typographical errors \((r = -.71, p < .01)\). The total mailable letters typed had a moderate negative relationship with the number of words omitted or added to the letters \((r = -.47, p < .05)\).

A comparison of the correlations of treatment group one (Table 5) and treatment group two (Table 7) indicated that the variables pretest spelling and pretest gross words a minute had a substantial positive relationship for both treatment groups. Treatment group one had a
substantial positive relationship between the total number of mailable letters typed and the gross word typed; while treatment group two had a moderate positive relationship between the number of mailable letters and the gross words typed. Just the reverse was indicated for the variable typographical errors. Treatment group two had a very strong negative relationship between the total number of mailable letters and typographical errors; while treatment group one had a substantial negative relationship between the total number of mailable letters and typographical errors. A possible explanation for the difference is a shift in concentration on the part of treatment group two from typing speed (gross words) to accuracy (typographical errors). Both treatment groups had a moderate negative relationship between the total number of mailable letters and the number of words omitted or added to the letters.

Analyses of Hypothesis Two

Hypothesis two was:

The gross number of words typed by treatment group one will be the same as the gross number of words typed by treatment group two following participation in a voice transcription training program.

At the conclusion of the study, the mean gross words typed by treatment group one was 1282.482; the mean gross words typed by treatment group two was 1303.760. A t-test was performed to test whether the two groups were significantly different with reference to the total gross words typed. As shown in Table 8, there was no significant difference between the total gross number of words typed by
group one and group two. On the basis of this finding from an analysis of the t-test statistics the researcher accepts hypothesis two.

Even though there was no significant difference between the groups, treatment group two did type 9 percent fewer words than group one.

Table 8
T-test of Group Total Gross Words Typed Means

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>1282.428</td>
<td>519.373</td>
<td>51.0</td>
<td>.866</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>1303.760</td>
<td>380.078</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Findings Related to Hypothesis Two

Pearson Product Moment Correlations were calculated to determine the linear relationship of the total gross number of words typed by treatment group one and the independent variables. A number of significant correlations were found (Table 9).
Table 9
Correlation Coefficients for Treatment Group One

Gross Words

<table>
<thead>
<tr>
<th>Gross Words</th>
<th>Pretest Spelling</th>
<th>Pretest Words</th>
<th>Mailable Letters</th>
<th>Interruption Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>1.000</td>
<td>0.496</td>
<td>0.566</td>
<td>0.547</td>
</tr>
<tr>
<td>p</td>
<td>.000</td>
<td>.01**</td>
<td>.01**</td>
<td>.01**</td>
</tr>
</tbody>
</table>

The total gross words typed by treatment group one had a substantial positive relationship with pretest gross words a minute (r = 0.57, p < .01), mailable letters (r = 0.55, p < .01), and pretest spelling (r = 0.50, p < .01). The total gross words had a moderate negative relationship with the total number of interruption minutes (r = -0.39, p < .05).

Correlations were calculated to determine the linear relationship of the total gross number of words typed by treatment group two and the independent variables. A number of significant correlations were found (Table 10).
Table 10
Correlation Coefficients for Treatment Group Two

<table>
<thead>
<tr>
<th>Gross Words</th>
<th>Pretest Spelling</th>
<th>Pretest Words</th>
<th>Mailable Letters</th>
<th>Minutes Non-prod.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Words</td>
<td>1.000</td>
<td>0.466</td>
<td>0.457</td>
<td>0.418</td>
</tr>
<tr>
<td></td>
<td>.000</td>
<td>.05*</td>
<td>.05*</td>
<td>.05*</td>
</tr>
</tbody>
</table>

*p < .05

The total gross words typed by treatment group two had a moderate positive relationship with three variables, pretest spelling (r = .47, p < .05), pretest gross words a minute (r = .46, p < .05), and mailable letters (r = .42, p < .05). Total gross words typed had a negative relationship with the number of minutes used for non-production (r = - .41, p < .05).

A comparison of the correlations of treatment group one (Table 9) and treatment group two (Table 10) indicated spelling for both groups was significantly related to the gross number of words typed. However, there were some differences, treatment group two showed a lower level of relationship than treatment group one on the variable gross words typed and the variables pretest gross words a minute and mailable letters. The difference suggested that something other than gross words typed was related to the transcription of mailable letters. The minutes of
non-production time variable represented the total minutes of two variables, the minutes for training and the minutes used for interruptions; the variable had a negative relationship to the gross words typed for treatment group two, but only the time used for interruptions by treatment group one had a negative relationship to the gross words typed. One possible explanation for this difference is the intentional use of interruption time by treatment group one.

Analysis of Hypothesis Three

Hypothesis three was:

The number of typographical errors made by treatment group one will be the same as the number of typographical errors made by treatment group two following participation in a voice transcription training program.

At the conclusion of the study, the mean number of typographical errors made by treatment group one was 30.392; the mean number of typographical errors made by treatment group two was 21.000. A t-test was performed to test whether the two groups were significantly different with reference to the total number of typographical errors. As shown in Table 11, there was no significant difference in the total number of typographical errors made by group one or group two. On the basis of this finding from an analysis of the t-test statistics the researcher accepts hypothesis three.
Table 11

T-test of Group Total Number of Typographical Errors

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>30.392</td>
<td>28.686</td>
<td>51.0</td>
<td>0.203</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>21.000</td>
<td>23.811</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Even though there was no significant difference between the groups, treatment group two did make 38 percent fewer errors when compared with treatment group one.

Additional Findings Related to Hypothesis Three

Pearson Product Moment Correlations were calculated to determine the linear relationship of the total number of typographical errors made by treatment group one and the independent variables. A number of significant correlations were found (Table 12).
Table 12
Correlation Coefficients for Treatment Group One

Typographical Errors

<table>
<thead>
<tr>
<th>Typo. Errors</th>
<th>Pretest Spelling</th>
<th>Words Omitted or Added</th>
<th>Mailable Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typo. Errors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>1.000</td>
<td>-0.484</td>
<td>0.617</td>
</tr>
<tr>
<td>p</td>
<td>.000</td>
<td>.01**</td>
<td>.01**</td>
</tr>
</tbody>
</table>

***p < .01

The total typographical errors made by treatment group one had a substantial positive relationship with the number of words omitted or added to letters (r = .62, p < .01), and a substantial negative relationship with mailable letters (r = -.63, p < .01). The total typographical errors made had a moderate negative relationship with the variable pretest spelling (r = -.48, p < .01).

Correlations were calculated to determine the linear relationship of the total number of typographical errors made by treatment group two and the independent variables. A number of significant correlations were found (Table 13).
Table 13
Correlation Coefficients for Treatment Group Two

Typographical Errors

<table>
<thead>
<tr>
<th>Typo. Errors</th>
<th>Pretest Spelling</th>
<th>Pretest No. Errors</th>
<th>Words Omitted or Added</th>
<th>Mailable Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>-0.498</td>
<td>0.580</td>
<td>0.468</td>
<td>-0.711</td>
</tr>
<tr>
<td>p</td>
<td>0.000</td>
<td>0.05*</td>
<td>0.01**</td>
<td>0.05*</td>
</tr>
</tbody>
</table>

* p < .05
** p < .01

The total typographical errors made by treatment group two had a very strong negative relationship with the number of mailable letters typed (r = -.71, p < .01). The total typographical errors made had a substantial positive relationship with the number of errors made on the pretest (r = .58, p < .01), and a substantial negative relationship with the spelling pretest (r = -.50, p < .05). The total number of errors made had a moderate positive relationship with the number of words omitted or added to the letters typed (r = .47, p < .05).

A comparison of the correlations of treatment group one (Table 12) and treatment group two (Table 13) indicated spelling for both groups was significantly related to the number of typographical errors made in the typing of letters. Word omissions and additions had a higher level of positive relationship to the number of typographical errors for
treatment group one than for treatment group two. Treatment group two had a very strong negative relationship between typographical errors and the number of mailable letters while treatment group one had a substantial negative relationship. There was a substantial positive relationship between the total number of typographical errors made in typing letters and the number of errors made on the pretest for treatment group two; however, there was no significant relationship between the two variables for treatment group one. With the exception of the variable pretest spelling, there were differences in the level of relationship among the variables for treatment group one and treatment group two. These findings indicate that an operational difference exists in the process of voice transcription between the two groups.

**Analyses of Hypothesis Four**

Hypothesis four was:

The number of word omissions or additions made by treatment group one will be the same as the number of word omissions or additions made by treatment group two following participation in a voice transcription training program.

At the conclusion of the study, the mean number of word omissions or additions by treatment group one was 3.750; the mean number of word omissions or additions by treatment group two was 0.720. A t-test was performed to test whether the two groups were significantly different with reference to the total number of word omissions or additions. As shown in Table 14, there was a significant difference between the total number of word additions or omissions made by group one and group two.
On the basis of this finding from an analysis of the t-test statistical data the researcher fails to accept hypothesis four.

Table 14

T-test of Group Total Number of Word Omissions or Additions Means

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>3.750</td>
<td>5.000</td>
<td>29.7</td>
<td>.003**</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>0.720</td>
<td>1.061</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**p < .01

Group two had 83 percent fewer word omissions or additions than group one.

Additional Finding Related to Hypothesis Four

Pearson Product Moment Correlations were calculated to determine the linear relationship of the total number of word omissions or additions made by treatment group one and the independent variables. Two significant correlations were found (Table 15).
Table 15
Correlation Coefficients for Treatment Group One

Number of Word Omissions or Additions

<table>
<thead>
<tr>
<th>Words Omitted or Added</th>
<th>Typo. Errors</th>
<th>Mailable Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Words Omitted or Added</td>
<td>r 1.000</td>
<td>0.617</td>
</tr>
<tr>
<td></td>
<td>P .000</td>
<td>.01**</td>
</tr>
</tbody>
</table>

*P < .05
**P < .01

The total number of words omitted or added had a substantial positive relationship with the number of typographical errors (r = .62, P < .01), and a moderate negative relationship with the number of mailable letters (r = -.45, P < .05).

Correlations were calculated to determine the linear relationship of the total number of word omissions or additions made by treatment group two and the independent variables. A number of significant correlations were found (Table 16).
Table 16
Correlation Coefficients for Treatment Group Two

Number of Word Omissions or Additions

<table>
<thead>
<tr>
<th></th>
<th>Words Omitted or Added</th>
<th>Pretest Spelling</th>
<th>Typo. Errors</th>
<th>Mailable Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Words Omitted or Added</td>
<td>r</td>
<td>1.000</td>
<td>-0.409</td>
<td>0.468</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>.000</td>
<td>.05*</td>
<td>.05*</td>
</tr>
</tbody>
</table>

*p < .05

The total number of words omitted or added by treatment group two had a moderate positive relationship with the total number of typographical errors made (r = .47, p < .05). The total number of words omitted or added had a moderate negative relationship with the variables pretest spelling (r = -.41, p < .05), and the total number of mailable letters (r = -.47, p < .05).

A comparison of the correlations of treatment group one (Table 15) and Treatment group two (Table 16) indicated the typing of mailable letters for both groups was significantly related to the number of words omitted or added. However there were some differences; treatment group one showed a higher level of significant relationship than treatment group two on the variable typographical errors. Treatment group one had no significant relationship, while treatment group two had a moderate negative relationship, between the variables words omitted or added and
pretest spelling. One possible explanation for these differences is the operational differences of the two transcription machines. The manually controlled machines used by treatment group one required the operator to perform a start, stop, and reverse action that increased the possibility for word omissions or additions; while treatment group two used machines that had a continuous flow of words that reduced the possibility of word omissions or additions. The differences in the mechanical systems may have been enough to allow the different significant levels of the variables to occur.

Analyses of Hypothesis Five

Hypothesis five was:

The number of interruptions of production typing by treatment group one will be the same as the number of interruptions of production typing by treatment group two following participation in a voice transcription training program.

At the conclusion of the study, the mean number of interruptions of production typing by treatment group one was 3.500; the mean number of interruptions of production typing by treatment group two was 3.720. A t-test was performed to test whether the two groups were significantly different with reference to the total number of interruptions of production typing. As shown in Table 17, there was no significant difference between the total number of interruptions of production typing by group one and group two. On the basis of this finding from an analysis of the t-test statistics the researcher accepts hypothesis five.
Even though there was no significant difference between the groups, the means of the sub-variables (personal conversations, asking questions or for assistance, leaving the work station, rest, and other) that made up the total number of interruptions indicated a difference in the purpose for which the interruptions were used (Table 18). Treatment group one had more personal conversations (1.107), asked fewer questions or for assistance (1.678), left the work station less (0.285), rested at the work station more often (0.250), and had more other interruptions (0.178) than treatment group two. Treatment group two had fewer personal conversations (0.800), asked more questions or for assistance (2.400), left the work station more often (0.360), rested less at the work station (0.120), and had fewer other interruptions (0.040) than treatment group one. Treatment group two did average 5 percent fewer interruptions of production typing than group one.
### Table 18

Means of Group Sub-variable Interruptions of Production

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Personal Conversation</th>
<th>Ask Ques. or Assist.</th>
<th>Leaves Work Station</th>
<th>Rest</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>1.107</td>
<td>1.678</td>
<td>.085</td>
<td>.250</td>
<td>.178</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>.800</td>
<td>2.400</td>
<td>.360</td>
<td>.120</td>
<td>.040</td>
</tr>
</tbody>
</table>

**Additional Findings Related to Hypothesis Five**

Pearson Product Moment Correlations were calculated to determine the linear relationship of the total number of interruptions of production typing and the independent variables by treatment group one. A number of significant correlations were found (Table 19).
Table 19
Correlation Coefficients for Treatment Group One

<table>
<thead>
<tr>
<th>Interruptions</th>
<th>Personal Conversations</th>
<th>Ask Ques. or Assist.</th>
<th>Leaves Work Station</th>
<th>Rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interruptions</td>
<td>1.000</td>
<td>0.872</td>
<td>0.916</td>
<td>0.395</td>
</tr>
<tr>
<td>p</td>
<td>.000</td>
<td>.01**</td>
<td>.01**</td>
<td>.05*</td>
</tr>
</tbody>
</table>

*p < .05
**p < .01

The total number of interruptions by treatment group one had a very strong positive relationship with the variables personal conversations \( r = .87, p < .01 \), asking question or for assistance \( r = .92, p < .01 \), and rest \( r = .77, p < .01 \). The total number of interruptions had moderate positive relationship with the variable leaves the work station \( r = .40, p < .05 \).

Correlations were calculated to determine the linear relationship of the total number of interruptions and the independent variables by treatment group two. A number of significant correlations were found (Table 20).
Table 20
Correlation Coefficients for Treatment Group Two

<table>
<thead>
<tr>
<th>Interruptions</th>
<th>Personal Conversations</th>
<th>Ask Ques. or Assist.</th>
<th>Leaves Work Station</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interruptions r</td>
<td>1.000</td>
<td>0.831</td>
<td>0.951</td>
<td>0.564</td>
</tr>
<tr>
<td>p</td>
<td>.000</td>
<td>.01*</td>
<td>.01*</td>
<td>.01*</td>
</tr>
</tbody>
</table>

*p < .01

The total number of interruptions of production by treatment group two had a very strong positive relationship with the variables personal conversation (r = .83, p < .01), and asking questions or for assistance (r = .95, p < .01). The total interruptions of production had a substantial positive relationship with leaving the work station (r = .56, p < .01), and other (r = .53, p < .01).

A comparison of the correlations of treatment group one (Table 19) and treatment group two (Table 20) indicated both groups had a very strong positive significant relationship between the variable total number of interruptions of production and the variables personal conversations and asking questions or for assistance. The total number of interruptions of production had a moderate positive significant relationship with leaving the work station for treatment group one;
while for treatment group two there was a substantial positive significant relationship with the variable leaving the work station. The total number of interruptions of production had a very strong significant relationship with the variable rest for treatment group one, but no significant relationship for treatment group two. The total number of interruptions had no significant relationship with the variable other for treatment group one; while the total number of interruptions had a substantial positive significant relationship with the variable other for treatment group two. One possible explanation for the difference between the groups for the variable other is that all mechanical problems were recorded as other by the observers; the number of typewriter failures for treatment group two may have exceeded those of treatment group one. A possible explanation for the differences between the variables leaving the work station and rest was the operational differences of the two transcribers. For example, the manually controlled transcriber had no indication of the speed the operator should be typing; while the automated transcriber had the rate of speed, previously set by the operator, illuminated on the machine at all times.

Correlations were calculated to determine the linear relationship of each of the independent variables with one another for treatment group one. A number of significant correlations were found among the sub-variables that made up the total number of interruptions of production (Table 21).
Table 21
Correlation Coefficients for Treatment Group One
Sub-variable Interruptions of Production

<table>
<thead>
<tr>
<th></th>
<th>Personal Conversation</th>
<th>Ask Ques. Assist.</th>
<th>Leaves Work Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Conversation</td>
<td>r 1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p .000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ask Ques. or Assist.</td>
<td>r .684</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>p .01**</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Leaves Work Station</td>
<td>r .548</td>
<td>.723</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>p .01**</td>
<td>.01**</td>
<td>.000</td>
</tr>
<tr>
<td>Rest</td>
<td>r .01**</td>
<td>.01**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>p .05*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>r .374</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p .05*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P < .05
**P < .01

The variable personal conversations by treatment group one had a substantial positive relationship with the variables asking questions or for assistance (r = .68, P < .01) and rest (r = .55, P < .01). Asking questions or for assistance had a very strong positive relationship with the variable rest (r = .72, P < .01). Leaving the work station had a
moderate positive relationship with other activities ($r = .37, p < .05$).

Correlations were calculated to determine the linear relationship of the independent variables with one another for treatment group two. A number of significant correlations were found among the sub-variables that made up the total number of interruptions of production (Table 22).

<table>
<thead>
<tr>
<th></th>
<th>Personal Conversation</th>
<th>Ask Ques. or Assist.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal</strong></td>
<td><strong>r</strong> 1.000</td>
<td><strong>r</strong> 1.000</td>
</tr>
<tr>
<td><strong>Conversation</strong></td>
<td><strong>p</strong> .000</td>
<td><strong>p</strong> .000</td>
</tr>
<tr>
<td><strong>Ask Ques. or</strong></td>
<td><strong>r</strong> .701</td>
<td><strong>r</strong> .01**</td>
</tr>
<tr>
<td><strong>Assist.</strong></td>
<td><strong>p</strong> .01**</td>
<td><strong>p</strong> .000</td>
</tr>
<tr>
<td><strong>Leaves Work</strong></td>
<td><strong>r</strong> .446</td>
<td><strong>r</strong> .425</td>
</tr>
<tr>
<td><strong>Station</strong></td>
<td><strong>p</strong> .05*</td>
<td><strong>p</strong> .05*</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td><strong>r</strong> .617</td>
<td><strong>r</strong> .01**</td>
</tr>
<tr>
<td></td>
<td><strong>p</strong> .01**</td>
<td><strong>p</strong> .05*</td>
</tr>
</tbody>
</table>

* $p < .05$
** $p < .01$

The variable personal conversation had a very strong positive relationship with the variable asking questions or for assistance ($r =$
and a substantial positive relationship with other activities \(r = .62, p < .01\). The variable asking questions or for assistance had a moderate positive relationship with the variables leaving the work station \(r = .45, p < .05\), and other activities \(r = .43, p < .05\).

A comparison of the correlations of treatment group one (Table 21) and treatment group two (Table 22) indicated the variable (personal conversation) for treatment group one had a moderate positive significant relationship with the variable asking questions or for assistance; while treatment group two had a very strong positive significant relationship between the two variables. The variable personal conversation had a substantial positive significant relationship with the variable rest for treatment group one, but the variables had no significant relationship for treatment group two. The variable personal conversation had no significant relationship with the variable other for treatment group one; however, treatment group two had a substantial positive significant relationship between the variables. The variable ask questions or for assistance had no significant relationship with the variable leaving the work station for treatment group one, but for treatment group two there was a moderate positive significant relationship between the variables. Treatment group one had a very strong positive significant relationship between the variables asking questions or for assistance and the variable rest; while treatment group two had no significant relationship. Treatment group one had no significant relationship between the variables asking
questions or for assistance and the variable other; while treatment group two had a moderate positive relationship between the variables. Treatment group one had a moderate positive significant relationship between the variable leaves the workstation and the variable other; while treatment group two had no significant relationship. One possible explanation for the many differences among the sub-variables was that the operators were communicating differently with the two types of equipment.

**Analyses of Hypothesis Six**

Hypothesis six was:

The number of minutes of non-production by treatment group one will be the same as the number of minutes of non-production by treatment group two following participation in a voice transcription training program.

At the conclusion of the study, the mean number of minutes of non-production by treatment group one was 35.711; the mean number of minutes of non-production by treatment group two was 33.696. A t-test was performed to test whether the two groups were significantly different with reference to the total number of minutes of non-production. As shown in Table 23, there was no significant difference between the total number of minutes of non-production by treatment group one and treatment group two. On the basis of this finding from an analysis of the t-test statistics the researcher accepts hypothesis six.

Even though there was no significant difference between the groups,
treatment group two did average 16 percent fewer minutes for non-production than group one.

Table 23
T-test of Group Total Gross Words Typed Means

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>35.711</td>
<td>11.541</td>
<td>51.0</td>
<td>.470</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>33.696</td>
<td>8.090</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Findings Related to Hypothesis Six

Pearson Product Moment Correlations were calculated to determine the linear relationship of the total number of minutes of non-production by treatment group one and the independent variables. A number of significant correlations were found (Table 24).
Table 24
Correlation Coefficients for Treatment Group One
Minutes of Non-production

<table>
<thead>
<tr>
<th>Non-prod Minutes</th>
<th>Pretest Gross Words</th>
<th>Ask Ques. or Assist.</th>
<th>Rest Interruptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-prod Minutes</td>
<td>r 1.000</td>
<td>-0.385</td>
<td>0.456</td>
</tr>
<tr>
<td></td>
<td>p .000</td>
<td>.05*</td>
<td>.05*</td>
</tr>
</tbody>
</table>

*p < .05

Table 24 (Continued)
Correlation Coefficients for Treatment Group One
Minutes of Non-production

<table>
<thead>
<tr>
<th>Non-prod Minutes</th>
<th>Production Minutes</th>
<th>Training Minutes</th>
<th>Interruption Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-prod Minutes</td>
<td>r 1.000</td>
<td>-0.586</td>
<td>0.853</td>
</tr>
<tr>
<td></td>
<td>p .000</td>
<td>.01*</td>
<td>.01*</td>
</tr>
</tbody>
</table>

*p < .01

The total number of minutes of non-production by treatment group one had a moderate negative relationship with the variable pretest gross words a minute ($r = -0.39$, $p < .05$); and a moderate positive
relationship with the variables asking questions or for assistance \( (r = .46, p < .05) \), rest \( (r = .45, p < .05) \), and the total number of interruptions \( (r = .38, p < .05) \). The total number of minutes of non-production had a substantial negative relationship with the variable total number of minutes of production \( (r = -.59, p < .01) \), and a substantial positive relationship with the variable total number of interruption minutes \( (r = .64, p < .01) \). The total number of minutes of non-production had a very strong positive relationship with the variable total number of minutes of training time \( (r = .85, p < .01) \).

Correlations were calculated to determine the linear relationship of the total number of minutes of non-production by treatment group two and the independent variables. A number of significant correlations were found (Table 25).

<table>
<thead>
<tr>
<th>Table 25</th>
<th>Correlation Coefficients for Treatment Group Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes of Non-production</td>
<td></td>
</tr>
<tr>
<td>Non-prod. Minutes</td>
<td>Pretest Spelling</td>
</tr>
<tr>
<td>Non-prod. r</td>
<td></td>
</tr>
<tr>
<td>1.000</td>
<td>-0.402</td>
</tr>
<tr>
<td>p</td>
<td></td>
</tr>
<tr>
<td>.000</td>
<td>.05*</td>
</tr>
</tbody>
</table>

*\( p < .05 \)
**\( p < .01 \)
The total minutes of non-production had a moderate negative relationship with the variables pretest spelling ($r = -.40$, $p < .05$) and gross words a minute ($r = -.41$, $p < .05$) by treatment group two. The total minutes of non-production had a substantial negative relationship with the variable total number of minutes of production ($r = -.57$, $p < .01$). The total minutes of non-production had a very strong positive relationship with the variable training minutes ($r = .82$, $p < .01$).

A comparison of the correlations of treatment group one (Table 24) and treatment group two (Table 25) indicated pretest gross words a minute and minutes of non-production had a moderate negative significant relationship for treatment group one; while treatment group two showed no significant relationship between the variables. Just the reverse was shown with the variable pretest spelling, the relationship was not between pretest gross words a minute and minutes of non-production but rather spelling and minutes of non-production. Treatment group two had a moderate negative significant relationship between pretest spelling and minutes of non-production; while treatment group one had no relationship between the variables. The total number of minutes of non-production had a moderate positive significant relationship with the variables asking questions or for assistance, rest, and the total number of interruptions by treatment group one, but no significant relationships were shown by treatment group two. Both treatment groups had a substantial positive significant relationship between the variables total number of non-production minutes and the total number of minutes...
of production. Both treatment groups also had a very strong positive significant relationship between the variables total number of minutes of non-production and the total number of minutes used for training. The total number of minutes of non-production had a substantial positive significant relationship with the variable total number of minutes used for interruptions by treatment group one, but no significant relationship was shown by treatment group two. The total number of minutes of non-production had a moderate negative significant relationship with the variable total number of gross words typed by treatment group two, but treatment group one showed no significant relationship. One possible explanation for the differences was the tendency of treatment group one to use the minutes of non-production in a greater variety of ways.

Analysis of Hypothesis Seven

Hypothesis seven was:

The number of minutes of production typing by treatment group one will be the same as the number of minutes of production typing by treatment group two following participation in a voice transcription training program.

At the conclusion of the study, the mean number of minutes of production by treatment group one was 127.860; the mean number of minutes of production by treatment group two was 130.303. A t-test was performed to test whether the two groups were significantly different with reference to the total number of minutes of production. As shown in Table 26, there was no significant difference between the total
number of minutes of production by group one and group two. On the basis of this finding from an analysis of the t-test statistics the researcher accepts hypothesis seven.

Even though there was no significant difference between the groups, treatment group two did average 9 percent more minutes of production than group one.

Table 26

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>DF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>28</td>
<td>127.860</td>
<td>8.992</td>
<td>51.0</td>
<td>.557</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>25</td>
<td>130.303</td>
<td>8.377</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Findings Related to Hypothesis Seven

Pearson Product Moment Correlations were calculated to determine the linear relationship of the total number of minutes of production used by treatment group one and the independent variables. A number of significant correlations were found (Table 27).
Table 27
Correlation Coefficients for Treatment Group One

Minutes of Production

<table>
<thead>
<tr>
<th></th>
<th>Production Minutes</th>
<th>Leaves Work</th>
<th>Training Interventions</th>
<th>Interruptions</th>
<th>Non-prod.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Minutes r</td>
<td>1.000</td>
<td>-0.593</td>
<td>-0.445</td>
<td>-0.445</td>
<td>-0.586</td>
</tr>
<tr>
<td>p</td>
<td>.000</td>
<td>.01**</td>
<td>.05*</td>
<td>.05*</td>
<td>.01**</td>
</tr>
</tbody>
</table>

*p < .05
**p < .01

The total number of minutes of production used by treatment group one had a substantial negative relationship with the variables leaves the work station (r = -.59, p < .01), and the minutes of non-production (r = -.59, p < .01). The total number of minutes of production used had a moderate negative relationship with the variables training minutes (r = -.45, p < .05) and the number of minutes used for interruptions (r = -.45, p < .05).

Correlations were calculated to determine the linear relationship of the total number of minutes of production used by training group two and the independent variables. A number of significant correlations were found. (Table 28)
Table 28

Correlation Coefficients for Treatment Group Two

<table>
<thead>
<tr>
<th></th>
<th>Production Minutes</th>
<th>Ask Ques. or Assist.</th>
<th>Interruptions</th>
<th>Training Minutes</th>
<th>Non-prod. Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>1.000</td>
<td>0.505</td>
<td>0.445</td>
<td>-0.596</td>
<td>-0.574</td>
</tr>
<tr>
<td>Minutes</td>
<td>0.000</td>
<td>.01**</td>
<td>.05*</td>
<td>.01**</td>
<td>.01**</td>
</tr>
</tbody>
</table>

The total number of production minutes used by treatment group two had a substantial positive relationship with the variable asking questions or for assistance ($r = .51$, $p < .01$). The total number of production minutes used had a moderate negative relationship with the variables training minutes ($r = -.60$, $p < .01$), and minutes of non-production ($r = -.57$, $p < .01$). The total number of production minutes had a moderate positive relationship with the total number of interruptions by treatment group two ($r = .45$, $p < .05$).

A comparison of the correlations of treatment group one (Table 27) and treatment group two (Table 28) indicated the variable total number of minutes of production had a substantial negative relationship with the variable leaving the work station for treatment group one, while there was no significant relationship between the variables for
treatment group two. This suggests leaving the work station did not greatly reduce the minutes of production for treatment group two. Treatment group one had a moderate negative relationship between the variables total number of minutes of production and training time; while treatment group two had a substantial negative relationship between the two variables. This implies the more training time used the less production time available, which is true, but one must remember that treatment group two also increased the total number of mailable letters which may have been helped by the additional training. The total number of minutes of production had a moderate negative relationship with the variable total minutes of interruptions for treatment group one; while there was no significant relationship between the variables for treatment group two. This suggests that the reasons for the interruptions by treatment group two may have been for reasons other than reducing the production time. There was a substantial negative relationship between the variables total number of minutes of production and total number of minutes of non-production by both treatment groups. The total number of minutes of production had a substantial positive relationship with the variable asking questions or for assistance for treatment group two, but there was no significant relationship between the variables by treatment group one. This implies that questions were asked by group two to improve upon their use of the number of minutes of production. The total number of minutes of production had a moderate positive relationship with the variable total number of interruptions by treatment group two, but no significant relationship between the
variables was shown by treatment group one. This suggests treatment
group two made short direct interruptions for the purpose of prudent use
of the available production time.

Summary

Chapter IV reported on the statistical tests made to accept or
reject seven hypotheses. A t-test was performed to determine whether
the treatment groups were significantly different with reference to
production as measured in terms of mailable letters and the nonverbal
activities of the operator. Of the seven hypotheses tested the
researcher failed to accept hypothesis one and hypothesis four. Pearson
Product Moment Correlations were calculated to determine the linear
relationship among the variables. Significant correlations were found
between 65 combinations of the variables.
Chapter V

Summary of Findings, Conclusions, Recommendations, and Speculations

This chapter presents a summary of the findings of the study, the conclusions, and the recommendations for future research.

Summary of the Research

The Problem

The word processing industry according to Business Week and other sources is growing well in excess of thirty percent a year (Foster, 1983). Automation, particularly through computerization of equipment has contributed dramatically to making this growth possible. However, not all products within the word processing industry have been automated, the transcription machine is one example. The purpose of this study was to test a prototype of an automated transcription machine. The computerized system attached to a transcription machine controlled the speaking rate of dictated material at a rate predetermined by the operator. The study was designed to analyze the relationships between two types of voice transcription equipment (manual and automated) and transcription production. A related problem was to investigate the relationship of the two types of transcription machines upon nonverbal communication.
The Population

The subjects for this study were 53 students from five different schools in the Columbus, Ohio, area. The students represented a four year college, an inner city comprehensive high school, an inner city vocational high school, a suburban comprehensive high school, and a suburban vocational high school. The prerequisites for participation in the study were that students had to demonstrate the ability to type a minimum of 20 words a minute on a five minute typing timed writing and that they had no previous experience using transcription equipment.

The Design

A nonequivalent control group design was used for this study. Campbell and Stanley (1963) point out that this design is used when the treatment groups constitute naturally assembled collectives such as classrooms, as similar as availability permits but yet not so similar that one can dispense with the pretest. The assignment to a treatment group was random and under the control of the researcher. A pretest was administered prior to the study to establish the level of typing skill and spelling ability for each student.

The students received the treatment on an individual basis within groups of six, three students used a manually controlled transcriber and three students used an automated transcriber. Posttest measurement was based upon the measurement of production and a visual observation of the use of time.

Analysis of Data

The data collected in this study were obtained from treatment group one and treatment group two; the pretest, the number of mailable
letters, the word count of typewritten material, and the recorded observations of the time for production and non-production were used for analyses. The data were analyzed by various descriptive and correlational statistics. More specifically: the mean, and standard deviation were determined. The t-test was used to test the difference between the means of the two groups. Pearson Product Moment Correlations were calculated to determine the linear relationships among variables.

Summary of Findings

The following is a re-statement of the hypothesis developed for this study along with a summary of the findings of each:

Hypothesis 1: The number of mailable letters typed by treatment group one will be the same as the number of mailable letters typed by treatment group two following participation in a voice transcription training program.

Findings: There was a significant difference between the total number of mailable letters typed by treatment group one (manual) and group two (automated). Group two typed 40 percent more mailable letters than group one. Both groups had a substantial positive relationship between the number of mailable letters and the pretest variables spelling and gross words a minute. Treatment group one had a higher level of positive relationship between the total number of letters typed and gross words typed than group two. Treatment group two had a higher level of negative relationship between the total number of mailable letters and typographical errors than group one. Both treatment groups had a moderate negative relationship between the total number of
Hypothesis 2: The gross number of words typed by treatment group one will be the same as the gross number of words typed by treatment group two following participation in a voice transcription training program.

Findings: There was no significant difference between the total mean gross number of words typed by group one and group two. Treatment group two did type 9 percent fewer words than group one. For both groups spelling was significantly related to the gross number of words typed. Treatment group two showed a lower level of relationship than treatment group one between the variable gross words typed and the variables pretest gross words a minute and mailable letters. The minutes of non-production (which contained training time) had a negative relationship to the gross words typed for treatment group two. The time used for interruptions by treatment group one had a negative relationship to gross words typed.

Hypothesis 3: The number of typographical errors made by treatment group one will be the same as the number of typographical errors made by treatment group two following participation in a voice transcription training program.

Findings: There was no significant difference in the total number of typographical errors made by group one or group two. Treatment group two did make 38 percent fewer errors when compared with treatment group one. Both groups indicated spelling was significantly related to the number of typographical errors made in the typing of letters. Word
omissions and additions had a higher level of positive relationship to the number of typographical errors for treatment group one than for treatment group two. Treatment group two had a very strong positive relationship between typographical errors and the number of mailable letters while treatment group one had a substantial negative relationship. There was a substantial positive relationship between the total number of typographical errors made in typing letters and the number of errors made on the pretest for treatment two, treatment group one showed no significant relationship between the two variables.

**Hypothesis 4:** The number of word omissions or additions made by treatment group one will be the same as the number of word omissions or additions made by treatment group two following participation in a voice transcription training program.

**Findings:** There was a significant difference between the total number of mean word omissions or additions made by group one and group two. Group two had 83 percent fewer word omissions and additions than group one. For both groups the typing of mailable letters was significantly related to the number of words omitted or added. Treatment group one showed no significant relationship, while treatment group two showed a moderate negative relationship between the variables word omitted or added and pretest spelling.

**Hypothesis 5:** The number of interruptions of production typing by treatment group one will be the same as the number of interruptions of production typing by treatment group two following participation in a voice transcription training program.

**Findings:** There was no significant difference between the total
number of interruptions of production typing by group one and group two. Treatment group two did average 5 percent fewer interruptions of production typing than group one. Treatment group one had more personal conversations, asked fewer questions or for assistance, left the work station less, rested at the work station more often and had more miscellaneous interruptions than treatment group two. Treatment group two had a higher level of positive significant relationship than group one between the variables personal conversation and asking questions or for assistance. The variable personal conversation had a substantial positive significant relationship with the variable rest for treatment group one, but no significant relationship between the variables for group two. The variable ask questions or for assistance had no significant relationship with the variable leaving the work station for treatment group one, but for treatment group two there was a significant relationship between the variables. Treatment group one had a very strong positive significant relationship between the variables asking questions or for assistance and the variable rest, treatment group two had no significant relationship.

**Hypothesis 6:** The number of minutes of non-production by treatment group one will be the same as the number of minutes of non-production by treatment group two following participation in a voice transcription training program.

**Findings:** There was no significant difference between the total number of minutes of non-production by treatment group one and treatment group two. Treatment group two did average 16 percent fewer minutes of non-production than group two. Pretest gross words a minute had a
moderate negative significant relationship with the number of minutes of non-production for treatment group one but no significant relationship between the variables was shown by group two. Treatment group two had a moderate negative significant relationship between pretest spelling and minutes of non-production, but treatment group one had no relationship between the variables. The total number of minutes of non-production had a moderate positive significant relationship with the variables asking questions or for assistance, rest, and the total number of interruptions by treatment group one, but no significant relationships were shown by treatment group two. Both treatment groups had a very strong positive significant relationship between the variables total number of minutes of non-production and the total number of minutes used for training. The total number of minutes of non-production had a substantial positive significant relationship with the variable total number of minutes used for interruptions by treatment group one, but no significant relationship was shown by treatment group two. The total number of minutes of non-production had a moderate negative significant relationship with the variable total number of gross words typed by treatment group two, but treatment group one showed no significant relationship.

**Hypothesis 7:** The number of minutes of production typing by treatment group one will be the same as the number of minutes of production typing by treatment group two following participation in a voice transcription training program.

**Findings:** There was no significant difference between the total number of minutes of production by group one and group two. Treatment
group two did average 9 percent more minutes of production than treatment group one. The variable total number of minutes of production had a substantial negative relationship with the variable leaving the work station for treatment group one, but there was no relationship between the variables by group two. Treatment group two had a higher level of negative relationship than group one between the variables total number of minutes of production and training time. The total number of minutes of production had a moderate negative relationship with the variable total minutes of interruptions for treatment group one, but no significant relationship between the variables was shown by treatment group two. The total number of minutes of production had a substantial positive relationship with the variable asking questions or for assistance for treatment group two, but there was no significant relationship between the variables by treatment group one.

Conclusions

The analysis of the data provided the basis for the following conclusions for the population of the study:

1. Operators using an automated transcription machine produced significantly more mailable letters than operators of a manually controlled transcription machine.

2. Operators using an automated transcription machine made significantly fewer word omissions or additions when typing letters than operators of a manually controlled transcription machine.

3. Accurate spellers produced more mailable letters and typed more gross words a minute when using a transcription machine than less accurate spellers.
4. The operators tended to establish relationships with the machines in much the same way they respond to other people. They responded through various degrees of nonverbal activity to the match created between the operator and the type of machine.

5. This study supports Fried’s (1978) conclusion that more emphasis should be placed on the development of spelling skills of words found in business vocabulary.

Implications

1. Offices should consider the use of automated transcription machines for transcriptionist to improve office productivity.

2. Schools should consider the use of automated transcription machines for instruction to better prepare students and to give them a competitive edge in the job market.

3. Manufacturers of new transcription machines should consider the automated system design as an optional feature.

4. Offices should consider implementing automated machines to reduce the possibility of embarrassment when an important word or figure is omitted, or when unwanted words are added that change the intent of a communication.

5. Students learning voice transcription on automated transcription machines may find the learning process simpler and might make fewer word omissions or additions.

6. Pre-employment tests should include spelling when tests are used to help select transcriptionist.

7. Schools should include spelling as a required component of transcription skills training.
8. The intensity of the nonverbal communication, generated by the relationship between people and machines, should be of concern to those responsible for interfacing people with machines in an office or a school.

Recommendations

The following recommendations for further research are made on the basis of findings of this study and the investigator's experience while conducting the study.

1. Research of this nature should be conducted in a controlled laboratory environment such as the one in this study. The distractions are minimal for the participants, and the item under investigation can be isolated and studied without contamination.

2. A replication of this study should be made drawing from an office worker population. The office workers should be taken from their office environment and placed in a laboratory such as the one in this study for the replication. The information would help determine if any changes occur due to maturity.

3. A study should be undertaken to determine the extent to which spelling should be included in a curriculum to prepare high school students to become a proficient transcriptionist. This information would help to provide information for the writing of future textbooks.

4. An experimental study comparing various types of automated equipment and the relationship of operating such equipment to the nonverbal communication responses of people should be undertaken. This may add a new dimension to the study of ergonomics.

5. A long-term study of the impact of automated equipment on
operators job satisfaction should be undertaken.

6. A study of transcription productivity should be undertaken to determine if greater productivity on the automated machine continues over an extended period of time.

Speculations

The literature would lead us to believe that people only identify with inanimate objects by giving them human identity. This study goes far beyond that surface association by saying people can actually form working relationships with technology. Just as when two people meet, they bring to the relationship simply what they are, and when through time a match occurs they respond as one. Both responding to life with a richer quality than either could have accomplished alone. The same is true when people meet a new technology, when enough time is allowed for the match to occur between the two they become as one, and both are better off for having the relationship. There is a synergy created by the match that changes the flow of the rhythm pattern, and a meaningful use of time is expressed through higher levels of achievement. Most important of all—this study has shown that equipment can be designed to enrich the quality of the match between people and technology.
APPENDIX A

Patent
The invention is a device for controlling a sound reproduction transcriber which provides alternate playback intervals and stopped intervals. The playback interval length is words and the average word reproduction rate are manually selectable by a secretary or instructor. The device meters the reproduced words during the playback interval and initiates the stopped interval at the first audio pause after the selected number of words have been played back. The required total cycle time is computed by effectively dividing the number of words played back during the playback interval by the selected average word reproduction rate. A timer, which counts the time elapsed since the playback interval was initiated, has its counted time compared to the computed total cycle time so that the stopped interval is terminated, the circuit is reset and the playback interval is again initiated upon coincidence of the computed time and the elapsed time.

[37] ABSTRACT

FOREIGN PATENT DOCUMENTS

U.S. PATENT DOCUMENTS

References Cited

16 Claims, 4 Drawing Figures
APPENDIX B

Personal Evaluation
Personal Evaluation of the Transcriber
Training Sessions

Complete this form quickly without thinking too much about each item. For each of the following items, circle the number that best describes the degree to which the statement fits you.

EXAMPLE: A. The room temperature.
Cold 1 2 3 4 5 Hot

1. The voices on the tapes.
Hard to understand 1 2 3 4 5 Easy to understand

2. The foot pedal/auto operation. (Please circle the operation used.)
No problem 1 2 3 4 5 A big problem

3. The speaking rate of the dictator.
Too slow 1 2 3 4 5 Too fast

4. Operation of the transcriber.
Difficult 1 2 3 4 5 Easy

5. The dictionary.
Not needed 1 2 3 4 5 Needed

6. The written instructions.
Easy to understand 1 2 3 4 5 Difficult to understand

7. Wearing the headset.
Hurt 1 2 3 4 5 Did not hurt

8. A 15 minute break during the training session
Not needed 1 2 3 4 5 Needed

9. A demonstration of the equipment.
Not needed 1 2 3 4 5 Needed

10. A teacher in the room all the time.
Needed 1 2 3 4 5 Not needed

11. The TV camera.
Noticed a lot 1 2 3 4 5 Not noticed

12. The spelling of words and indications of punctuation.
Needed less 1 2 3 4 5 Needed more

13. Hours of instruction.
More needed 1 2 3 4 5 Less needed

14. Rewinding of the tape to hear words again.
Many times 1 2 3 4 5 Few times

15. Other people working in the test area.
   Noticed a lot 1 2 3 4 5 Not noticed

16. Prior use of a transcriber
   Never 1 2 3 4 5 Many times
APPENDIX C

Five Minute Timed Writing
PLEASE NOTE:

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These consist of pages:

Appendix C, page 94

Appendix D, page 96

Appendix H, pages 108-121
APPENDIX D

Spelling Test
APPENDIX E

Letters Granting Permission to Use Typing Test and Spelling Test
March 16, 1984

Mr. Walter M. Sharp
Business Education
The Ohio State University
288 Arps Hall
1945 North High Street
Columbus, OH 43210-1172

Dear Mr. Sharp,

Our person in charge of permissions is away from the office for a few days. So that you will not be held up further, I am hereby giving you permission to reproduce the materials identified in your letter of March 3.

You understand that these reproduced materials are to be used for research purposes only and that they may not now or in the future be used for any commercial purpose. An appropriate credit line must be given in the research report to each of the individual pieces of duplicated material.

We are pleased to assist your research project in this way, and we shall be interested in the results of your study. Good luck to you in the pursuit of new knowledge.

Sincerely yours,

Jerry W. Robinson
Assistant Vice President
and Senior Editor

SOUTH-WESTERN PUBLISHING CO.

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Cincinnati, OH 45227 • Dallas, TX 75229 • Palo Alto, CA 94304 • West Chicago, IL 60185 • Pelham Manor, NY 10803
February 24, 1984

Mr. Walter W. Sharp  
Graduate Teaching Assistant  
The Ohio State University  
College of Education  
288 Arps Hall  
1945 North High Street  
Columbus, OH 43210

Dear Mr. Sharp:

You have my permission to use the spelling test located in APPENDIX S, page 127 of my dissertation, as a pretext for your study.

Best wishes with your dissertation, and please send me a report when your project is complete.

Sincerely,

N. Elizabeth Fried, Ph.D., CCP

mt/GT101
APPENDIX F

Letter of Instruction to Teachers
Dear (Teacher):

This is a follow-up of our recent conversation. I am very happy you have agreed to let your students participate in a microcomputer workshop and word processing study on March 1, 1984. The microcomputer workshop will offer your students hands-on experience and the use of recently developed software. The purpose of the study will be to test two types of voice transcription equipment for use in word processing.

Three hours of instruction have been planned for the microcomputer workshop, with an additional three hours for learning voice transcription. Considering the time for breaks and lunch, the students will be at the university for approximately six and one half hours. The program will begin at 8:00 A.M. and will end promptly at 3:15 P.M. Lunch will be provided. During the breaks there will be soft drinks and doughnuts.

The voice transcription portion will be video taped. An Ohio State University policy requires written permission from the student if he/she is an adult or from the student's parent or guardian if the student is a minor. Ask each student to complete one of the enclosed permission slips.

Also enclosed are two tests, a spelling test and a five minute timed writing. Please administer both tests prior to coming to the university. The timed writing may be given twice, only the better of the two will be used. It is important that the tests be worked into your regular classroom instruction with as little attention to the voice transcription study as possible.

I am looking forward to seeing you and your students. I believe your students will have a lot of fun learning about micros in addition to contributing to a research project. If you should have any questions please do not hesitate to call me, my office number is 422-5431, my home number is 863-6420.

Sincerely

Walter M. Sharp
Researcher

Enclosures
APPENDIX G

Letters of Consent
Dear Student:

A study is being conducted on business education students in the Columbus Metropolitan Area. The purpose of this study is to discover the differences between two modes of voice transcription.

Your participation in this study will require working on a voice transcription machine for three hours during a period of seven and one half hours. In order to schedule the three hours of participation, you will have to come to the university's Business Education Laboratory in 287 Arps Hall. Two work breaks and lunch will be provided at no expense to you. Your performance in this research will remain confidential.

By participating in this study, you will help the schools maintain quality vocational programs as they keep pace with advancing technology. Please read and sign the attached consent form and return it to your teacher as soon as possible. If you have any further questions about this study, feel free to contact me at my office at: 422-5431.

Sincerely,

Walter M. Sharp
Researcher

Attachment
THE OHIO STATE UNIVERSITY

CONSEN TO SERVE AS A SUBJECT IN RESEARCH

I consent to participate in the research study in business education which will be conducted by Walter M. Sharp.

I have read the attached letter, and I understand that any questions I have will be answered. I also understand that my identity will not be revealed in any publication or record of any type which has to do with this study. Finally, I understand that I am free to drop out of the study at any time I notify Mr. Sharp or my classroom teacher.

Signed

__________________________________________

Teacher

__________________________________________

Researcher

__________________________________________

Date
Dear Parent: A study is being conducted on business education students in the Columbus Metropolitan Area. The purpose of this study is to discover the differences between two modes of voice transcription.

Your child's participation in this study will require working on a voice transcription machine for three hours during a period of seven and one half hours. In order to schedule the three hours of participation, your child will have to come to the university's Business Education Laboratory in 287 Arps Hall. Two work breaks and lunch will be provided at no expense to you. Your child's performance in this research will remain confidential.

By allowing your child to participate in this study, you will help the schools maintain quality vocational programs as they keep pace with advancing technology. Please read and sign the attached consent form and have your child return it to his/her teacher as soon as possible. If you have any further questions about this study, feel free to contact me at my office at: 422-5431.

Sincerely,

Walter M. Sharp
Researcher

Attachment
CONSENT FOR A MINOR CHILD TO SERVE AS A SUBJECT IN RESEARCH

I consent to allow my child to participate in the research study in business education which will be conducted by Walter M. Sharp.

I have read the attached letter, and I understand that any questions I may have about this research will be answered. I also understand that my child's identity will not be revealed in any publication or record of any type which has to do with this study. Finally, I understand that my child is free to drop out of this study at any time he/she notifies Mr. Sharp or the classroom teacher.

Signed __________________
Parent of Guardian

Signed __________________
Student

__________________________
Teacher

__________________________
Researcher

__________________________
Date
APPENDIX H

Student Guide
APPENDIX I

Observation Sheet
<table>
<thead>
<tr>
<th>Time Description/Interruptions</th>
<th>Time Measurement</th>
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| TOTALS |  |  |  |  |  |
APPENDIX J

Observer's Schedule
**OBSERVER'S SCHEDULE**

### DAY 1

<table>
<thead>
<tr>
<th>GROUP</th>
<th>TIME</th>
<th>OBSERVER 1</th>
<th>OBSERVER 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8:30 - 10:00</td>
<td>1, 2, 3</td>
<td>4, 5, 6</td>
</tr>
<tr>
<td>B</td>
<td>10:15 - 11:45</td>
<td>4, 5, 6</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>A</td>
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<td>1, 2, 3</td>
<td>4, 5, 6</td>
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<tr>
<td>B</td>
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### DAY 2

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</thead>
<tbody>
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<td>1, 2, 3</td>
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<td>B</td>
<td>10:15 - 11:45</td>
<td>1, 2, 3</td>
<td>4, 5, 6</td>
</tr>
<tr>
<td>A</td>
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<td>1, 2, 3</td>
</tr>
<tr>
<td>B</td>
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### DAY 3

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### DAY 4

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<td>B</td>
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<td>1, 2, 3</td>
<td>4, 5, 6</td>
</tr>
<tr>
<td>A</td>
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<tr>
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### DAY 5

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<tr>
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<td>4, 5, 6</td>
<td>1, 2, 3</td>
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BIBLIOGRAPHY
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Wolfgang, A. The silent language in the multicultural classroom. Theory into Practice, 1977, 16 (3), 145-152.