June 1978

Compressed Speech as an Aid in Improving the Reading Skills of Junior High School Students

James R. Pierce
East Tennessee State University

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COMPRESSED SPEECH AS AN AID IN IMPROVING THE READING SKILLS OF JUNIOR HIGH SCHOOL STUDENTS

A Dissertation

Presented to

the Faculty of the Department of Education

East Tennessee State University

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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by

James Reuben Pierce

June 1978

APPROVAL

This is to certify that the Advanced Graduate Committee of

JAMES REUBEN PIERCE

met on the

22nd day of May, 1978,

The committee read and examined his dissertation, supervised his defense of it in an oral examination, and decided to recommend that his study be submitted to the Graduate Council and the Dean of the School of Graduate Studies in partial fulfillment of the requirements for the degree Doctor of Education.

Chairman, Advanced Graduate Committee

Dean, School of Graduate Studies

COMPRESSED SPEECH AS AN AID IN IMPROVING THE READING SKILLS OF JUNIOR HIGH SCHOOL STUDENTS

An Abstract

Presented to

the Graduate Faculty

East Tennessee State University

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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by

James Reuben Pierce

June 1978

James Reuben Pierce, B. S., East Tennessee State College, June 1960.
M.M.Ed., Florida State University, January 1962.
Ed. D., East Tennessee State University, June 1978.

COMPRESSED SPEECH AS AN AID IN IMPROVING THE READING SKILLS OF JUNIOR HIGH SCHOOL STUDENTS

Purpose. The purpose of this study was to determine the extent to which compressed speech recordings and regular rate speech recordings could be used to improve the reading speed, accuracy, and comprehension of junior high school students.

Method. Ninety-seven students were randomly selected and assigned to three seventh-grade English classes, to which experimental and control conditions were also randomly assigned. Thirty short reading selections from state-adopted basal reading textbooks were recorded at regular speaking rates and at various compressed rates. Students in the compressed speech experimental group read the selections while simultaneously listening to them at progressively faster rates; the word-per-minute (wpm) rate began at 160 wpm and was gradually increased to 280 wpm. The regular rate experimental group listened and read simultaneously at 160 wpm throughout the entire treatment period of 30 days. The control group was given a pseudo-treatment during the treatment period.

Immediately after the conclusion of the treatment period, a post-test was given which provided raw score data for the dependent variables of reading speed, accuracy, and comprehension. The data were treated with single-classification analysis of variance (ANOVA) to determine if significant differences between groups existed at a .05 level of significance.

Summary. The ANOVA indicated that no significant difference existed between extreme group means for the comprehension variable. It was noted, however, that speech recordings used as reading pacers, whether at normal rates or at compressed rates, did not cause any significant decrease in reading comprehension skills.

For the reading speed variable, a significant difference was found between the compressed speech group mean and the control group mean. For the reading accuracy variable, a significant difference was found between the means of the regular rate speech group and the control group. The Newman-Keuls test for multiple comparisons indicated that no further significant differences existed among group means.

Conclusions. The findings of this study led to the following conclusions:

1. Compressed speech recordings and regular rate speech recordings did not produce significantly superior reading comprehension skills.

2. Compressed speech recordings and regular rate speech recordings did not produce a significant lack of superiority in reading skills.

3. Compressed speech recordings were responsible for significantly superior reading skills.

4. Regular rate speech recordings did not produce significantly superior reading skills.

5. Regular rate speech recordings were responsible for significantly superior reading accuracy skills.

6. Compressed speech recordings did not produce significantly superior reading accuracy skills.

. . . . . .

Dissertation prepared under the guidance of Dr. Charles G. Beseda, Dr. Albert C. Hauff, Dr. Clyde L. Orr, Dr. James E. Stafford, and Dr. John M. Taylor.

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Chapter 1

Introduction

A hundred years ago, a typical member of American society had access to an almanac, the Bible, McGuffey's Reader, and a few other publications. There was no particular reason for reading rapidly, and no particular reason for reading a great deal. Today, however, the enormous amount and availability of material to be read have created a different situation. Harris (1970) noted that:

> There is so much to be read today that the ability to read quickly has become an important asset. . . . A literate adult in today's hectic world goes through more reading material in a week than his great-grandfather probably covered in a year. (p. 480)

Slow readers are severely handicapped in modern society. A student who needs two hours longer to read an assignment than his classmates, a lawyer who requires six hours to read for a case when his colleagues need four, and a teacher who takes twice as long as his fellow teachers to keep up with professional journals waste a great deal of useful time by reading slowly.

According to a study by Bish in 1952, most individuals read at a level of effectiveness below their potential. The logical place to prepare students to read rapidly is in the school.

Harris (1970) commented that:

> In the light of present evidence, training for improved speed of reading should come in as a definite part of a

> developmental reading program at and above the sixth grade. Individual pupils may, of course, need remedial help at lower grade levels because of extremely slow reading; but for the majority, rate can be expected to develop as a by-product of a good reading program until the sixth grade. From then on, specific provisions for speeding up reading seem desirable through high school and at least the first year of college. (p. 512)

In view of the above and of the current widespread criticism of the public schools' efforts in reading preparation, there exists an evident need for more effective methods of improving reading skills in general, and reading rate in particular.

The Problem

Statement of the Problem

The problem of this study was to determine if compressed speech recordings and regular rate speech recordings can be used to improve the reading speed, accuracy, and comprehension of junior high school students.

Hypotheses

1. The group receiving a treatment composed of auding compressed speech narratives at progressively faster rates while simultaneously reading the same narrative will be significantly superior to the group receiving a treatment composed of auding fixed regular rate speech narratives while simultaneously reading the same narratives, with respect to three variables: reading speed, accuracy, and comprehension.

2. The group receiving a treatment composed of auding fixed regular rate speech narratives while simultaneously reading the same narratives will be significantly superior to the control group receiving only a

pseudo-treatment, with respect to three variables: reading speed, accuracy, and comprehension.

3. The group receiving a treatment composed of auding compressed speech narratives at progressively faster rates while simultaneously reading the same narratives will be significantly superior to the control group receiving only a pseudo-treatment, with respect to three variables: reading speed, accuracy, and comprehension.

Definitions of Terms

Auding

Auding referred to the act of listening with comprehension. Good (1973) defined auding as "the act of listening to spoken symbols in order to recognize and interpret them" (p. 49).

Compressed Speech

Compressed speech was defined as recorded speech which has been accelerated so that the time of presentation is less than the presentation time prior to the compression; this is done without appreciable distortion in tone quality or pitch (Good, 1973).

Gates-MacGinitie Reading Tests

The Gates-MacGinitie Reading Tests (Gates & MacGinitie, 1972) were used to furnish raw score data for this study. The Gates-MacGinitie Tests are composed of three sub-tests: reading comprehension, reading speed and accuracy, and reading vocabulary. The scores from Gates-MacGinitie Reading Tests were used only as a method of comparing for significant differences between group means.

Reading comprehension. Reading comprehension was defined as the ability to read prose passages with understanding. In measuring this ability, the Gates-MacGinitie Reading Tests presented prose selections

into which a number of blank spaces were introduced. A choice of five completions was offered for each blank space. The subject was required to decide which of the five completions best conformed to the meaning of the whole passage. Reading speed was not an important factor in this test, as the time allotted was more than enough for completion of all items.

Reading speed and accuracy. The speed and accuracy tests required multiple choice questions to be answered during a timed reading period. The accuracy test score was based on the number of items answered correctly. The score from this test was therefore a measure of comprehension speed. The score on the speed test was based only on the number of items answered, whether correctly or incorrectly. The score from this test was therefore based strictly on reading speed, and comprehension was not a factor in any way.

Reading vocabulary. The vocabulary test was concerned with word definitions. For each word presented, five choices were given from which a synonym of the original word was to be selected. The vocabulary scores were not relevant to the problem of this study.

Pseudo-Treatment

Pseudo-treatment was defined as a treatment which involved a systematic intervention and interaction on the part of the experimenter with the subjects. This intervention was unrelated to the genuine treatment and was introduced only to control for Hawthorne Effect (Tuckman, 1972).

Reading

Harris (1970) defined reading as "the meaningful interpretation of written or printed verbal symbols" (p. 3). For the purposes of this

study, reading was assumed to involve some degree of understanding.

Reading Rate

Reading rate was defined as "usually measured in terms of the number of words or letters recognized and comprehended per minute or per second" (Good, 1973, p. 475). Reading rate, throughout this study, was synonymous with spoken words per minute, referring simply to the number of words recorded per minute. Subjects read the narratives as they listened to recordings of the same narratives at pre-selected word-per-minute rates.

Words per Minute

Words per minute was a phrase which referred to the rate of speaking or reading. The words per minute (wpm) was determined by dividing the total number of words in a message by the number of minutes required for transmission of the message.

Limitations of the Study

1. This study was limited to seventh-grade students enrolled in a public junior high school in a small town (12,400 population) in upper East Tennessee.

2. The time allotted to the study was the 1977-1978 school year, between September, 1977, and May, 1978.

The treatment of the study was limited to 30 consecutive school days, between the middle of September, 1977, and the middle of December, 1977.

Organization of the Study

Chapter 1 contained an introduction to the study, statement of the problem, and statement of the hypotheses. Also included were the definitions of terms, limitations of the study, and organization of the study.

Chapter 2 presents a review of the literature.

Chapter 3 presents a description of the study, with a discussion of the methods, procedures, and treatment schedules employed in the study.

Chapter 4 is concerned with the presentation and statistical analysis of the data.

Chapter 5 presents the summary, conclusions, and recommendations.

Chapter 2

Review of Literature

Two broad areas of research were the focus for background study and review. The first area dealt with research involving the teaching of reading skills, particularly reading speed. The second area reviewed was compressed speech and its potential as an aid in improving reading skills.

The section on reading skill instruction included optimum grade level for beginning speed training, measurement of reading speed, and experiments involving reading speed and comprehension. The compressed speech review examined research on intelligibility and comprehension of compressed speech and with its past and potential uses in reading instruction.

Reading Skills Instruction

The majority of authorities who have offered opinions about the best grade level for beginning reading rate improvement have favored the upper elementary grades and junior high school. Carillo (1965) wrote that rate training should be the responsibility of the junior and senior high schools, and that elementary reading instruction should be primarily concerned with general reading skills and comprehension. Carillo recommended that improvement of reading speed not be attempted until the factors of general comprehension are firmly established. For most readers, this would mean reading at sixth-grade level before any kind of speed training is encountered.

Wilson and Hall (1972) stated that for elementary students, fast reading usually means careless reading, and that speed is not necessarily important in elementary grades. They noted that instruction concerned with reading speed improvement should be reserved for junior high or senior high school.

Gilliland (1974) wrote that certain reading skills (including comprehension, speed, and vocabulary) can only be developed with material which the students can read easily. Material used in improving these reading skills should be from one to two grade levels below the student's actual reading level. This especially applies to reading speed, as speed can be developed only with reading material which is well within the student's ability to read easily.

Kimberly (1973) found that rate training can be effective at second, fourth, sixth, and eighth grades. Her methods of improving rate included verbal instruction, chalkboard discussion, timed rate drills, and reading machines. Kimberly discovered that a wide variability existed in rate scores at all grade levels, but that experimental group means were significantly higher than control group means. This significant difference applied to informal posttests on both speed and comprehension.

Schale (1968), working with a small group, found that fifth graders could benefit from an adult rapid-reading method. A five-week training program with 15 students showed a considerable gain in speed with only a slight loss in comprehension. Schale's conclusion was that training for speed could succeed without appreciable loss in comprehension.

Working with a group of eight sixth-grade students, McCracken (1960) administered three 45-minute rate training sessions per week for three weeks. Reading speed increased from 202 wpm to 792 wpm, with a slight

gain in comprehension. McCracken noted that rapid reading and mature study habits can be taught much earlier than college.

Walker (1970) compared two methods for increasing sixth-grade students' reading rate. The students were assigned to experimental groups on a basis of sex and fast or slow reading rates, as determined by a pretest. The methods were the compressed speech method and the Preston-Botel Self-Improvement Method. The compressed speech experimental group read and listened simultaneously to selections. The Preston-Botel experimental group allowed subjects to time themselves and to keep a visual graph indicating how many pages were read during each treatment session. A control group did normal seatwork involving various types of reading for the same amount of time required by the experimental group treatments. Immediate posttests indicated that both experimental groups were significantly superior to the control group with respect to rate. No significant difference between groups was found with respect to sex. A delayed posttest six weeks later, however, indicated no significant difference between experimental and control groups. Walker concluded that the treatment was effective on a short-term basis, but did not have a lasting effect.

Reading authorities are in agreement that the maximum reading rate humanly possible is between 800 and 900 words per minute, when reading refers to the act of reading all of the words in the selection. Spache (1963) noted that ". . . it is impossible to read faster than 800 to 900 words per minute" (p. 264). More recently, Miller, Dye, and Ladd (1976) agreed that "It is physically impossible for human eyes to see and read every word at rates over 800-900 wpm" (p. xix).

Taylor (1937) found that for seventh-grade students, a normal reading rate was 210 wpm. In a more recent study, Taylor, Frackenpohl, and Pettee

(1960) found an average reading rate of 195 wpm for seventh-grade students. Mellon (1975) reported that in a study sponsored by the National Assessment of Educational Progress, data were collected on reading skills. The study involved over 100,000 subjects. Data concerning reading speeds for all public school grade levels were well below that indicated by earlier studies. The median reading speed for seventh- and eighth-grade students was only 169 wpm. Harris (1970) surveyed a number of standardized reading tests and found that median rates for seventh-grade students ranged from 176 wpm to as much as 246 wpm, depending on the test surveyed.

Harris (1968) surveyed a number of studies and reported that in conventional programs designed to increase speed of reading, gains of 20% to 50% were common, with no significant change in comprehension. Fry (1963) stated that reading rate can be increased substantially without any appreciable loss in comprehension, but that when the increased rate is more than double that of the original rate, comprehension can be expected to decline sharply.

A number of mechanical devices have been used to help increase reading rate. These machines encourage the reader to read at specified rates which become progressively faster as the reader's proficiency improves. The tachistoscope and the controlled reader are the most popular of these machines. Reading machines have typically presented material for the reader at a pre-selected rate, either by projecting text onto a screen or receiving surface, or by gradually covering the text from the top to the bottom of the page, thus forcing the reader to read at a set rate. These methods all depend solely on visual presentation of written material. In his discussion of such devices, Harris (1970) noted that "The problem with these . . . is that the amount of carryover to natural reading

situations is sometimes disappointingly small" (p. 503).

Compressed Speech

The earliest and simplest method of speeding up recorded speech was to play the tape at a faster speed than the speed with which the recording was originally made. This resulted in a saving in the amount of time required for presentation of the information concerned. Only a moderate saving was possible, however, since both the quality and the pitch of the original recording were distorted in proportion to the rate of increase. The sound produced by such acceleration was all but impossible to understand. Normal tone and pitch could only be retained by cutting the tape, removing small segments, and splicing the remainder. This method of accelerating recorded speech was employed by Garvey (1953) in one of the earliest studies with speech acceleration. Garvey reported that the result of this cutting and splicing was to produce a recording which preserved most of the original quality when played at the original speed. The drawback to this method was that it required a great deal of time and skill.

More recently, improvements in electronic technology have made it possible to speed up recorded speech without any appreciable change in pitch or tone. Most research done on such speech compression has used one of two methods. One method involved the electronic omission of periods of silence between words and the omission of parts of vowel sounds. This method was referred to as selective deletion, and was discussed in more detail by Jester and Travers (1966). The other method, systematic sampling, was described by Lee (1972). In this method, brief segments of the original message were electronically deleted on a random basis, much as Garvey's deletion was done by hand. The remaining segments therefore

take less time to play at a normal rate.

After a review of many studies in which verbal materials were presented visually, aurally, or through both senses simultaneously, Day and Beach (1950) wrote that a combination of visual and auditory presentation resulted in more efficient comprehension than the presentation of either visual or auditory material alone.

Orr (1964), in research concerned with the intelligibility of rapid auditory material, found that auditory comprehension drops rapidly as the auditory rate exceeds the normal reading rate of the listener. He also found, however, that the use of rapid auditory material to pace reading resulted in significant increases in reading speed without loss of comprehension.

Johnson (1971) worked with fourth-grade students assigned to three groups: control, timed-test, and compressed speech. Members of the compressed speech group used compressed speech recordings at progressively faster rates to pace their reading. The members of the timed-test group read the same material, but without auditory pacing. At the end of the treatment, no significant differences were found between groups for either reading speed or reading comprehension. Johnson concluded that for the fourth-grade students in this study, standard classroom reading instruction, with no particular emphasis on reading speed, was as effective as either of the experimental methods employed in her study.

Reiland (1970) used compressed speech recordings with sixth-grade students in comparing three kinds of training: reading only, listening only, and reading and listening simultaneously. The compressed speech was presented at progressively faster rates from 175 to 300 wpm. Reiland found no significant differences between the effects of three treatments

for the variables of reading comprehension, reading speed and accuracy, and listening comprehension. She did report that the group which read and listened simultaneously performed slightly better, as indicated by mean gain scores, on reading comprehension.

Musial and Maple (1975) investigated the relationship of compressed speech to the reading, listening, and verbal comprehension of eighth-grade students. The study used tape recordings compressed at 225 wpm. Experimental groups read and listened simultaneously to materials for 15 minutes per day for six weeks. The control group was given 15 minutes to read the same material, but did not listen to the spoken narrative. Musial and Maple reported that while no significant difference was found between experimental and control group scores on the Durrell Listening-Reading Tests, the subjects in the experimental groups did consistently exhibit higher mean scores on the reading, listening, and verbal comprehension tests.

Thames and Rossiter (1972) worked with high school sophomores in using compressed speech recordings as a reading pacer to improve reading rate and listening ability. The control group read the same material without accompanying compressed speech recordings. Thames and Rossiter found that reading practice with compressed speech as a pacer resulted in a significantly greater increase in reading speed without loss in comprehension for the experimental group when compared with the control group. No significant difference was found for listening ability. A delayed posttest nine months later seemed to indicate that the increase in reading rate was more than temporary, as a significant difference between experimental and control group means still existed.

Fairbanks, Guttman, and Miron (1957) found that with information presented at progressively faster rates over a period of time, no significant loss of comprehension occurred until approximately 280 wpm. From that point on, comprehension dropped rapidly as the rate increased. Jester and Travers (1966) concluded that very little drop in comprehension occurred from 200 to 300 wpm, but that a very sharp and sudden drop occurred above 300 wpm. Foulke and Sticht (1969) agreed, reporting that comprehension of rapid speech declines slowly as the rate is gradually increased to approximately 275 wpm, but declines more rapidly as faster rates are attained.

Summary

The first subject discussed in this chapter was the proper starting place for training for reading speed improvement. The majority of authorities noted that, based on research, junior high or perhaps the sixth grade was the earliest level to begin successful reading speed instruction. Also reviewed was the matter of determining an appropriate median reading speed for seventh-grade students. Research indicated that average reading speed for seventh-grade students has declined in recent years. A number of authorities also reported that reading speed can generally be increased as much as 50% before any appreciable loss in comprehension occurs.

Research into the intelligibility of speech compressed at rapid rates showed that comprehension does not show any appreciable drop until approximately 275 wpm, but declines rapidly after that rate is reached.

The studies involving compressed speech in reading skills improvement showed no consistent pattern. Studies involving older students were more successful than studies with elementary students.

Chapter 3

Method and Procedure

Method

Subjects

During the summer of 1977, 97 students from a population of 228 students were randomly selected and assigned to three seventh-grade English classes for the fall semester of 1977. Randomization was implemented by using a table of random numbers (Meredith, 1967). Experimental and control conditions were randomly assigned to the three classes in the same manner.

Design

A posttest-only control group was used in this study. This design is based on random selection and assignment to insure statistical initial equivalence of groups. No pretest is required. The posttest-only control group design is a true experimental design, and will control, according to Campbell and Stanley (1963), for all sources of contamination of internal validity. These extraneous variables are history, maturation, testing, instrumentation, regression, selection, mortality, and interaction of selection and maturation. This design also controls for the threat to external validity of interaction of testing and treatment. The design of the study is shown in Table 1.

Treatment

Thirty short reading selections were selected from state-adopted, sixth-grade basal reading textbooks. A number of authorities (Dechant, 1970; Gilliland, 1974; Shubert & Torgerson, 1976) stated that reading

Table 1

Posttest-Only Control Group Design

Group	Selection	Treatment	Posttest
Experimental A	R	X_1	0
Experimental B	R	X_2	0
Control C	R	(X_3)	0

instruction must start at a level at which the child can read efficiently. This applies especially to instruction which is designed to increase reading speed. For this reason, the reading selections were taken from sixth-grade reading textbooks, which represented one grade level below that of the subject population.

These selections took from 8 to 12 minutes to read at normal word per minute rate of 160-170 wpm. Each of the experimental groups used the same selections in the same order.

Experimental Group A read and listened simultaneously to the text compressed at increasingly faster wpm rates. Experimental Group B read and listened simultaneously to the text at a normal, fixed wpm rate. Control Group C received a pseudo-treatment as control for possible Hawthorne Effect. The rate of compression and the daily treatment schedule are shown in Table 2.

The Dale-Chall Formula (Dale & Chall, 1948) for predicting readability in terms of grade-level difficulty was applied to each of the 30 selections, as a means of determining appropriate level of readability for the subjects in the sample. The Dale-Chall Formula is based on a

Table 2

Treatment Schedule

Time	Group A	Group B	Group C
First 6 days	160 wpm	160 wpm	pseudo-treatment
Next 8 days	200 wpm	160 wpm	pseudo-treatment
Next 8 days	240 wpm	160 wpm	pseudo-treatment
Next 8 days	280 wpm	160 wpm	pseudo-treatment

combination of average sentence length and percentage of unfamiliar words contained in the selection being analyzed. The unfamiliar words are those which do not appear on a list of 3,000 words which represents words known by 80% of fourth-grade students. (Computational procedures for the formula are presented in detail in Appendix A.)

The word list and the formula are intended to provide an overall statistical device for computing an index of the difficulty of reading selections. The formula permits appraisal of reading material suitable for different grade levels, beginning with fourth-grade material and ranging upward to reading material suitable for college graduates. The Dale-Chall Formula analysis of the reading selections used indicated that the 30 stories had an average readability level which was appropriate for the seventh-grade students who participated in the study. (The results of the readability analysis are shown in Appendix A.)

A posttest, Survey E, Form 1M, of the Gates-MacGinitie Reading Tests, was administered to the three groups at the conclusion of the treatment. This test supplied scores for the three criteria: reading speed and

accuracy, reading vocabulary, and reading comprehension.

Apparatus

The 30 selections were read, taped, and compressed by staff members of the Perceptual Alternatives Laboratory at the University of Louisville, Kentucky. Tapes were played on a Wollensak reel-to-reel tape recorder, model 1500S. The taped material was presented through identical, individual headphones with 400 ohm impedance. Headphones were equipped with individual volume control switches, which permitted adjustment to allow for individual hearing differences. An examination of school health records indicated that none of the subjects had hearing difficulties of any kind.

The use of individual headphones and a series of connected junction boxes, one for every eight subjects, served to eliminate background noises which might have distracted the subjects' attention during the treatment sessions. The individual headphone arrangement was essential, as the building in which the study was conducted was over 30 years old and had undergone no renovation or remodeling, and no soundproofing or acoustical controls existed.

The junction box connection and individual headphone arrangement also allowed the subjects to retain their usual seating arrangement in the classroom. Eight subjects were seated at each of four large tables, with two subjects seated at one small table, for a total seating capacity of 34 students. Figure 1 shows the seating arrangement used during the treatment sessions, during the regular classroom activities, and during the testing sessions.

Visual presentation of the material was handled by giving each subject a copy of the text at the beginning of each treatment session,

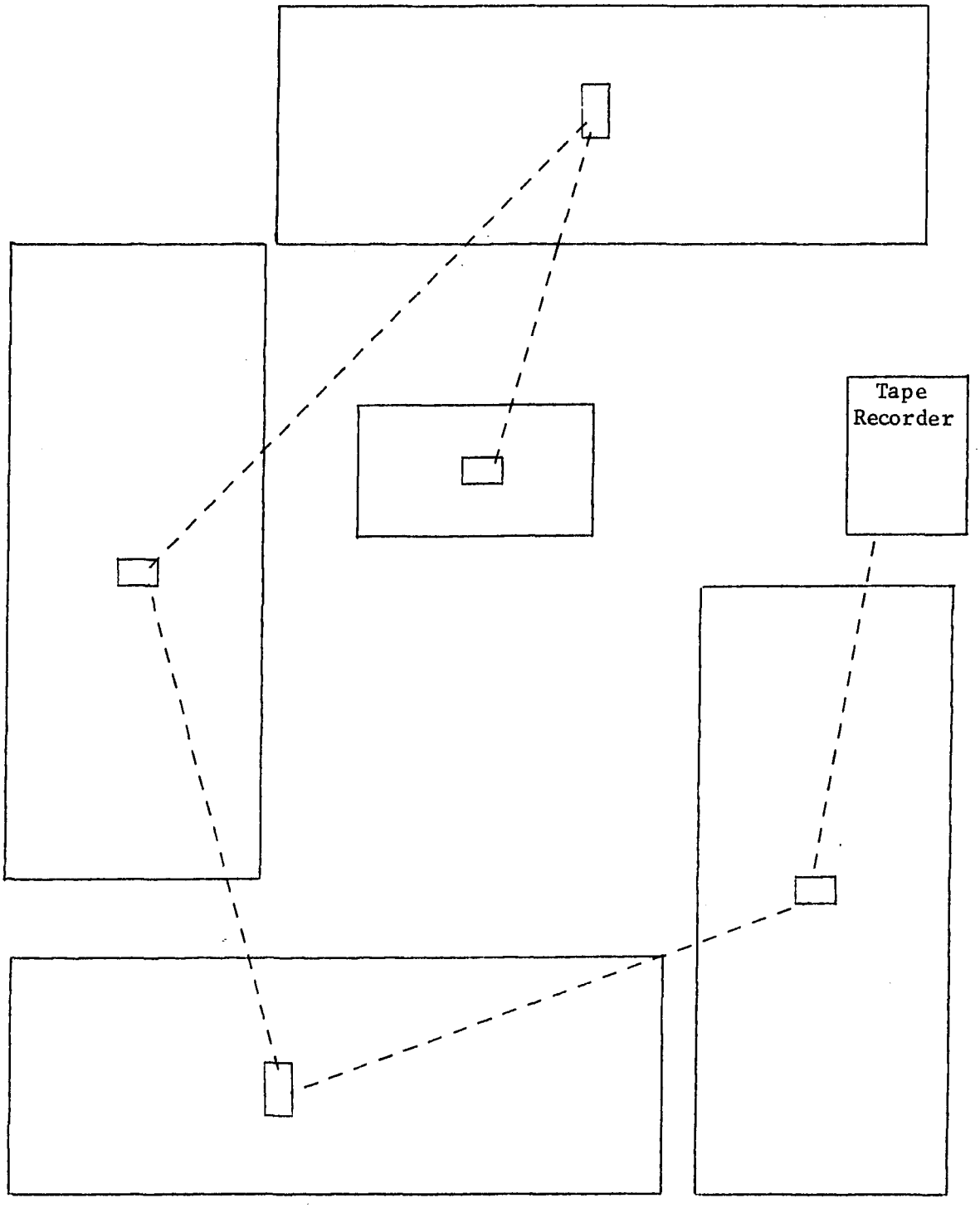

Figure 1. Seating arrangement during treatment sessions, classroom activities, and testing sessions.

and taking back the copy at the conclusion of the session. The same procedure was followed during the testing sessions with both test booklets and answer sheets.

Procedure

Subjects received preliminary instruction in the use of the headphones, but received no further information regarding the nature of the treatment. When the treatment began, the two experimental groups were instructed to read the text while listening to the tape recording. Approximately three seconds of unrelated material was played at the beginning of each session to allow each subject to adjust the volume level.

Subjects were instructed to keep the printed text face down on their desks until given instructions to begin, and to place it face down again at the end of the session. The procedure for distributing and connecting junction boxes, patch cords, and headphones took less than five minutes. At the conclusion of each treatment session, the same amount of time was required to collect and store the same material and equipment. (Instructions are shown in detail in Appendix B.)

The pseudo-treatment for the control group lasted from 8 to 12 minutes, approximately the same amount of time required for the treatment sessions for each of the two experimental groups. The pseudo-treatment met two requirements: no reading was involved in any way, and the treatment represented a departure from usual English class activities. This provided the control group an activity which set them apart from other classes. All groups were "special" in some way, so that any existing Hawthorne Effect was created equally for the three groups.

The pseudo-treatment included spelling bees, music listening sessions (with headphones, to provide similarity to the experimental groups), problems in logic, mathematics problems, and five sessions of listening to taped short stories with headphones, but without any written text.

A review of literature showed that studies which involved a method of improving reading skills covered periods ranging from 10 days to six weeks, with a median of approximately 20 days. Thirty consecutive school days was the treatment period selected for this study.

Permission for selection, assignment, and treatment procedures and conditions was secured from the appropriate school officials. The director of this study was a full-time teacher in the school, and taught the classes involved in the study.

Chapter 4

Results and Discussion

The problem of this study was: (a) to determine the extent to which auding compressed speech narratives while simultaneously reading the same narratives could be effective in improving reading speed, accuracy, and comprehension; and (b) to determine the extent to which auding regular rate speech narratives while simultaneously reading the same narratives could be effective in improving reading speed, accuracy, and comprehension.

Null Hypotheses

To facilitate statistical analysis, the research hypotheses presented in Chapter 1 were presented here in the null hypothesis format.

H_o1: For the reading speed variable, there will be no significant differences among the mean scores of the three groups: compressed speech treatment group, regular rate speech treatment group, and control group.

This null hypothesis may also be written:

$$H_o1: \text{ (speed) } \mu_A = \mu_B = \mu_C$$

H_o2: For the reading accuracy variable, there will be no significant differences among the mean scores of the three groups: compressed speech treatment group, regular rate speech treatment group, and control group.

This null hypothesis may also be written:

$$H_o2: \text{ (accuracy) } \mu_A = \mu_B = \mu_C$$

H_o3: For the reading comprehension variable, there will be no significant differences among the mean scores of the three groups: compressed speech treatment group, regular rate speech treatment group, and control group.

This null hypothesis may also be written:

$$H_o3: \text{ (comprehension) } \mu_A = \mu_B = \mu_C$$

Method of Analysis

A single classification analysis of variance (ANOVA) was used to determine the statistical significance of treatment effects. A separate analysis was made for each of three variables: reading speed, accuracy, and comprehension. A .05 level was established to determine statistically significant differences among group means.

The null hypotheses stated that there would be no significant differences among the three groups in this study, with respect to three variables: reading speed, accuracy, and comprehension. Raw score data for these three variables were supplied by the posttest. (Raw scores for the three groups are presented in Appendix C, page 47.)

The ANOVA was conducted by personnel at the East Tennessee State University Computer Center. Data were placed on an IBM 80-column Fortran coding form, and transferred to an IBM 5081 card deck. An IBM 370/135 computer was used for the analysis.

Analysis

Group means and standard deviations are presented in Table 3. Results of the ANOVA for the dependent variable of reading speed showed a significant difference between means of Experimental Group A and the Control Group. The obtained value of F was 4.529, which exceeded the critical value of F at the .05 level of significance. The null hypothesis

Table 3

Means and Standard Deviations for Speed, Accuracy, and Comprehension

Variable	Group A		Group B		Group C	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Speed	9.24	2.49	8.50	2.57	7.33	2.37
Accuracy	8.69	2.40	8.74	2.27	7.26	2.50
Comprehension	6.92	2.57	7.76	2.59	8.05	3.30

concerning reading speed was therefore rejected. Results of the ANOVA of reading speed data are shown in Table 4.

Table 4

Summary of Analysis of Variance of Posttest Data for Reading Speed Scores

Source	df	SS	MS	F
Between Groups	2	55.6797	27.8398	4.529*
Within Groups	87	534.7500	6.1466	
Total	89	590.4297		

*$p \leq .05$

Results of the ANOVA for the reading accuracy variable indicated a significant difference between means of Experimental Group B and the Control Group. The obtained value of F was 3.658, which exceeded the

critical value of F at the .05 level of significance. The null hypothesis concerning reading accuracy was also rejected. Results of the ANOVA of reading accuracy data are presented in Table 5.

Table 5

Summary of Analysis of Variance of Posttest Data for Reading Accuracy Scores

Source	df	SS	MS	F
Between Groups	2	42.4688	21.2344	3.658*
Within Groups	87	505.0156	5.8048	
Total	89	547.4844		

*$p \leq .05$

Results of the ANOVA for the reading comprehension variable indicated that no significant difference existed between extreme group means. The obtained F—ratio was 1.287, which did not equal or exceed the critical value of F at the .05 level of significance. For the reading comprehension variable, the null hypothesis could not be rejected. Table 6 shows the results of the ANOVA for the reading comprehension data.

The Newman-Keuls test for multiple comparisons was made for both the speed and accuracy variables. This test indicated that no further significant differences existed among group means.

Discussion

The ANOVA of raw score data showed no significant differences among the three groups in reading comprehension. The ANOVA of raw score data

Table 6

Summary of Analysis of Variance of Posttest Data for Reading Comprehension Scores

Source	df	SS	MS	F
Between Groups	2	20.8008	10.4004	1.287
Within Groups	87	702.8320	8.0785	
Total	89	723.6328		

for the other variables, reading speed and reading accuracy, did indicate a significant difference between extreme group means. Because of the high degree of control for internal validity which was present in this study, differences among group means were attributed to the treatment.

The null hypothesis that the three groups were equal with respect to reading comprehension was not rejected. It was concluded that the speech recordings used as reading pacers with the experimental groups were not effective in increasing reading comprehension skills. A further conclusion, however, was that speech recordings used as reading pacers, whether at normal rates or at compressed rates, did not cause any significant decrease in reading comprehension skills.

The null hypothesis that the three groups were equal with respect to reading speed was rejected. The extreme group means for this variable were between the compressed speech group and the control group. The conclusion was that compressed speech recordings used as reading pacers were effective in increasing reading speed skills. Regular rate speech recordings used as reading pacers did not produce any significant

increase in reading speed skills.

The null hypothesis that the three groups were equal with respect to reading accuracy was rejected. The extreme group means for this variable were between the regular rate speech group and the control group. The conclusion was that regular rate speech recordings used as reading pacers were effective in increasing reading accuracy skills. Compressed speech recordings used as reading pacers did not produce any significant increase in reading accuracy skills, although the mean for the compressed speech group was substantially greater than that of the control group.

Chapter 5

Summary, Conclusions, and Recommendations

Summary

Problem

The problem of this study was to determine the extent to which compressed speech recordings and regular rate speech recordings could be used to improve the reading skills of junior high school students.

Procedure

Ninety-seven students were randomly selected and assigned to three English classes, to which experimental and control conditions were also randomly assigned. Thirty short reading selections from state-adopted reading texts were recorded at regular speaking rates and at various compressed rates. Students in the experimental groups read these selections while simultaneously listening to them. The control group was given a pseudo-treatment during the treatment period of 30 days.

Immediately after the conclusion of the treatment period, a post-test was given. This posttest provided raw score data for reading speed, accuracy, and comprehension. These data were treated with single-classification analysis of variance to determine if significant differences between groups existed at a .05 level of significance.

Results

The analysis of variance indicated that a significant difference did not exist between the extreme group means for the comprehension variable. For the reading speed variable, a significant difference was

mean. For the reading accuracy variable, a significant difference was found between the regular rate speech group and the control group. The Newman-Keuls test for multiple comparisons indicated that no further significant differences existed among group means.

Conclusions

The findings of this study led to the following conclusions:

1. Compressed speech recordings and regular rate speech recordings did not produce significantly superior reading comprehension skills.

2. Compressed speech recordings and regular rate speech recordings did not produce a significant lack of superiority in reading skills.

3. Compressed speech recordings were responsible for significantly superior reading speed skills.

4. Regular rate speech recordings did not produce significantly superior reading speed skills.

5. Regular rate speech recordings were responsible for significantly superior reading accuracy skills.

6. Compressed speech recordings did not produce significantly superior reading accuracy skills.

Recommendations

The following recommendations were based on the findings of this study.

1. Research should be replicated with less time at the slower compressed rates. The study might have been more effective with most of the treatment period spent at 240 wpm and 280 wpm. Observation of students during the treatment indicated that they had little or no difficulty following and understanding at the faster speeds.

2. Reading instructors should consider the use of compressed speech recordings as pacers in reading instruction, both for improving skills and as a possible matter of motivation.

3. A long-term study should be made concerning the effectiveness of compressed speech recordings in improving reading skills. To date, no such research has been reported.

4. Research should be replicated using a maximum compressed rate of approximately 400 wpm. The subjects' apparent ease in understanding the maximum rate in this study indicated that faster rates might be practical.

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Appendixes

Appendix A

Dale-Chall Formula Procedures and Results

Dale-Chall Procedure

The Dale-Chall Readability Formula was applied to each short-story selection used in the study. The Dale-Chall Readability Formula used two factors: percentage of unfamiliar words, and average sentence length.

The following procedure was used.

1. Two or three samples were taken from each story.

2. The total number of words in each sample was counted. Totals ranged from 101 to 167 words per sample.

3. The number of complete sentences per sample was counted.

4. The number of unfamiliar words was counted. Unfamiliar words were those not on the Dale List.

5. The average sentence length was computed by dividing the number of words in the sample by the number of complete sentences in the sample.

6. The number of unfamiliar words was divided by the total number of words in the sample. The result was multiplied by 100, and was referred to as the Dale Score.

7. The average sentence length was multiplied by .0496. The Dale Score was multiplied by .1579. The products of these two computations were added to a constant of 3.6365 to obtain a raw score. (The figures used here are those prescribed in the original report on the Dale-Chall Readability Formula [Dale & Chall, 1948, p. 18].)

8. The raw score was converted to a grade level score by using the Dale-Chall corrective table. The correction aids in the interpretation of the raw scores.

Table A1

Dale-Chall Correction Table

Formula Raw Score	Corrected Grade-Levels
4.9 and below	4th grade and below
5.0 to 5.9	5th-6th grade
6.0 to 6.9	7th-8th grade
7.0 to 7.9	9th-10th grade
8.0 to 8.9	11th-12th grade
9.0 to 9.9	13th-15th grade (college)
10.0 and above	16+ (college graduate)

Table A2

Dale-Chall Formula Results

Story	Raw Score	Adjusted Score
Choosing a President	5.6	5th-6th
The Sorcerer's Apprentice	6.5	7th-8th
Treasure	5.5	5th-6th
I Have Not Yet Begun to Fight	6.9	7th-8th
Meat-Eating Plants	7.1	9th-10th
Beasts of the Tar Pits	6.4	7th-8th
Clean Air--Sparkling Water	6.0	7th-8th
The Emperor's New Clothes	6.1	7th-8th
The Girl with the Unlighted Lantern	5.9	5th-6th
Miss Liberty	6.0	7th-8th
Never Bite a Shark	6.5	7th-8th
Leonardo da Vinci	6.4	7th-8th
The Trojan Horse	6.6	7th-8th
The Bear in the Black Hat	5.3	5th-6th
Moon of the Young	6.2	7th-8th
Cars that Ran on Oatmeal and Molasses	6.2	7th-8th
Tom Sawyer and His Band	6.7	7th-8th
Sand to Glass to Lenses	6.8	7th-8th
A Short Trot with an Author	6.1	7th-8th
The Night the Bed Fell	7.0	9th-10th
Miracle	6.1	7th-8th

Table A2

(continued)

Source	Raw Score	Adjusted Score
Three Days to See	6.6	7th-8th
L'Enfant's Great Plan	6.3	7th-8th
Fragmentizer and Carbasher	6.1	7th-8th
David and Goliath	5.2	5th-6th
Igor Sikorsky and His Helicopter	6.3	7th-8th
First American in Space: I	6.9	7th-8th
First American in Space: II	6.4	7th-8th
Is There Life Out There?	6.8	7th-8th
Green Fingers	6.3	7th-8th

Appendix B

Treatment Session Procedure and Instructions to Subjects

Treatment Session Procedure

Two days before the first treatment session, the subjects in all groups received instruction on the use of headphones and related equipment. This instruction included distribution of headphones and other equipment, adjustment for proper fit of headphones, volume control, and collection and storage of headphones and other equipment. Student assistants were appointed in each group, including the control group, to distribute and set up the equipment. A music recording was used for the instructional session.

At the beginning of each treatment session, immediately after the bell signaling the beginning of the class period, the student assistants distributed and prepared the equipment for operation. One student distributed junction boxes. Another student connected junction boxes and tape recorder with patch cords while two other students distributed headphones. One student at each listening station connected the headphones to the junction boxes. One student placed the written narratives face down on the desk in front of each student in the group. The same students were responsible for collecting and packing all equipment and material for storage at the end of the treatment session.

Instructions

When you put the headphones on, be ready to adjust the volume control knob so that the sound is the way you want it. When you hear the voice, turn the volume up or down--whatever you wish, so that the voice is easiest to understand. All right, put the headphones on and adjust them so they are comfortable.

- -

Pause while headphones were adjusted comfortably. Tape was played for approximately four seconds to allow subjects to adjust volume control.

- -

Could everyone hear all right? (Pause) All right, we are ready to go. There is a booklet on the desk in front of you. Turn it over and read it while you listen to the tape. Everyone ready? Here goes.

- -

These instructions were repeated for each treatment session. As students became familiar with the routine, some parts of the instructions were omitted, so that the following instructions became routine.

- -

Put on the headphones. (Pause)

Adjust the volume. (Pause)

Everyone hear all right? (Pause) Turn the booklet over and start. (Pause)

- -

- -

At the conclusion of the taped narrative, the recorder was stopped and the following instructions were given.

- -

Take off the headphones. Unplug the headphones and cords and put everything away.

Appendix C

Raw Score Data

Table C1

Experimental Group A Raw Scores for Speed, Accuracy, and Comprehension

Subject	Speed	Accuracy	Comprehension
001	6.8	6.6	3.4
002	8.4	9.2	11.4
003	10.0	9.9	8.0
004	10.0	9.2	4.3
005	12.5	7.9	5.5
006	7.6	6.6	4.8
007	9.2	9.2	6.2
008	12.5	12.6	6.2
009	10.8	9.9	7.6
010	10.8	11.2	9.6
011	10.8	11.2	12.9
012	10.0	9.9	8.6
013	11.6	11.2	8.9
014	9.2	8.6	5.1
015	12.5	10.5	7.8
016	6.8	6.0	3.9
017	6.0	7.3	8.6
018	10.0	9.9	8.4
019	8.4	7.9	4.8
020	6.8	7.9	5.3

Table C1

(continued)

Subject	Speed	Accuracy	Comprehension
021	12.5	11.9	10.0
022	12.5	9.9	7.8
023	4.7	5.5	4.5
024	5.3	4.7	3.6
025	5.3	4.7	3.4
026	12.5	12.6	10.0
027	10.0	9.2	8.9
028	8.4	6.0	8.0
029	5.3	3.4	3.1
030	10.0	10.5	7.0

Table C2

Experimental Group B Raw Scores for Speed, Accuracy, and Comprehension

Subject	Speed	Accuracy	Comprehension
001	5.3	6.0	4.6
002	9.2	9.2	10.4
003	12.5	11.9	9.6
004	12.5	12.6	10.9
005	8.4	7.9	7.8
006	8.4	9.2	9.2
007	11.6	11.9	10.0
008	11.6	8.6	7.0
009	11.6	11.9	9.2
010	10.0	10.5	10.0
011	6.8	7.9	5.8
012	6.8	7.3	7.4
013	6.8	7.9	6.7
014	3.6	4.1	4.8
015	10.0	9.9	6.5
016	11.6	11.2	12.1
017	6.0	7.3	7.8
018	10.8	10.5	6.5
019	6.0	7.3	4.6
020	7.6	7.9	9.6

Table C2

(continued)

Subject	Speed	Accuracy	Comprehension
021	8.4	9.2	12.9
022	11.6	11.9	11.4
023	6.0	6.0	5.1
024	7.6	7.3	3.4
025	6.8	6.6	7.0
026	10.0	10.5	7.0
027	9.2	9.9	9.6
028	3.9	4.7	3.7
029	9.2	9.2	8.2
030	5.3	6.0	4.1

Table C3

Control Group Raw Scores for Speed,

Accuracy, and Comprehension

Subject	Speed	Accuracy	Comprehension
001	4.7	6.0	6.0
002	6.8	5.3	3.7
003	9.9	9.9	12.9
004	7.6	8.6	8.0
005	6.8	6.6	3.7
006	11.6	11.2	10.4
007	4.2	3.7	2.9
008	3.9	4.1	5.1
009	7.6	8.6	10.9
010	7.6	7.3	7.0
011	10.8	8.6	11.4
012	8.4	9.2	12.1
013	3.9	3.7	4.3
014	3.6	3.0	3.6
015	6.8	4.1	5.1
016	4.7	5.3	7.0
017	5.3	6.0	6.0
018	7.6	7.3	9.6
019	7.6	6.6	5.5
020	6.8	7.9	10.4

Table C3

(continued)

Subject	Speed	Accuracy	Comprehension
021	10.0	10.5	12.9
022	10.0	10.5	6.7
023	12.5	12.6	12.9
024	9.2	7.3	11.4
025	9.2	9.9	10.0
026	3.9	3.7	3.7
027	6.8	7.3	12.9
028	8.4	9.2	9.6
029	6.8	7.9	8.9
030	7.6	7.9	7.0

Appendix D

Basal Reading Textbooks

Basal Reading Textbooks

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Vita

James Reuben Pierce was born in Johnson City, Tennessee, on December 3, 1938. He attended elementary and high school at Fall Branch, Tennessee. He was graduated from East Tennessee State College in June, 1960, with a Bachelor of Science degree with a major in music. He entered graduate school at Florida State University, Tallahassee, Florida, in September, 1960, and received a Master of Music Education degree from that institution in January, 1962. He did further graduate work at Florida State University and at the University of Florida, Gainesville, Florida, during summer sessions for the next four years. During this time he was employed in public school systems in Florida and Tennessee. He enrolled in the graduate school of East Tennessee State University in September, 1975, and received a Doctor of Education degree in June, 1978.