DOCUMENT RESUME

ED 110 919 CS 001 945

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TITLE Some Relationships Between Listening Comprehension and Rate of Presentation.
PUB DATE Jun 75
NOTE 116p.; M.Ed. Thesis, Rutgers The State University of New Jersey

EDRS PRICE MF-$0.76 HC-$5.70 Plus Postage
DESCRIPTORS Elementary Education; Elementary School Students; Grade 6; *Listening Comprehension; Reading Ability; *Reading Comprehension; Reading Research; Reading Skills; *Reading Speed; *Speech Compression

ABSTRACT

This study was conducted to determine the relationship between listening comprehension and rate of presentation using meaningful prose materials. A total of 103 students from a suburban sixth-grade class in a central New Jersey school district participated in the study. To determine reading comprehension levels, the students were administered the comprehension subtest of the Gates-MacGinitie Reading Test, Survey D. It was concluded that as the rate of presentation increased, comprehension decreased among sixth-graders. Furthermore, above-average readers tend to comprehend listening material better than other readers. (Author/RB)

SOME RELATIONSHIPS BETWEEN LISTENING COMPREHENSION AND RATE OF PRESENTATION

A THESIS

SUBMITTED TO THE FACULTY

OF THE GRADUATE SCHOOL OF EDUCATION

OF

RUTGERS

THE STATE UNIVERSITY OF NEW JERSEY

BY

ANN KUPERBERG

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE

OF

MASTER OF EDUCATION

NEW BRUNSWICK, NEW JERSEY JUNE 1975

APPROVED: _____

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DEAN: _____

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COMMITTEE CHAIRPERSON: Martin Kling, Ph.D.

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ABSTRACT

A study was conducted to determine the relationship between listening comprehension and rate of presentation, using meaningful prose material. The problems posed were three-fold:

1. Do students comprehend more if listening rate is increased or decreased?

2. Does reading level affect listening comprehension at different rates of presentation?

3. Will there be an interaction between groups?

The entire sixth grade (N = 103) of a suburban school in a Central New Jersey district was administered the comprehension subtest of the Gates-MacGinitie Reading Test, Survey D, to ascertain reading comprehension levels of students. Upon tabulation of the raw scores, subjects were divided into upper-third, middle-third, and lower-third reading groups. A set of three tapes was prepared using the same passage at three different rates of presentation.

One-third of each reading group was then randomly selected to listen to one of the three tapes. A total of 36 subjects heard the passage at 75 words per minute, 34 subjects heard the passage at 150 words per minute, and 33 subjects heard the tape at 225 words per minute.

Upon completion of the listening portion of the

test, all students were presented the Reading Storage Test (RS-test). A short sample passage preceded the main selection on tape as well as in the format of the RS-test. Subjects were asked to identify 19 errors on the test by marking each error with an X.

An analysis of variance and multiple-range test were used to evaluate and interpret the results. Means on the Reading Storage Test at each rate of presentation were not significant. Increasing the rate from 75 words per minute to 150 and 225 words per minute resulted in a loss of information for all groups. There was no interaction among the groups with rate of presentation.

When an analysis was conducted of the reading groups, the above-average group (upper-third) was significantly better in listening comprehension than the other groups. There was no statistical significance in the results of the average (middle-third) or below-average (lower-third) groups.

A correlation of .54 was obtained between reading achievement and listening comprehension, with the RS-test as the measurement of listening comprehension. The reliability of the RS-test was substantiated with a reliability coefficient of .89.

In conclusion, the results of this study suggest that as rate of presentation is increased, comprehension

decreases among sixth-graders. Furthermore, above-average readers may tend to comprehend listening material better than other readers. The RS-test appears to be a reliable measure of comprehension of factual information.

ACKNOWLEDGMENTS

Sincere gratitude and appreciation are extended to the faculty of the Rutgers Reading Center whose encouragement allowed this thesis to meet its fruition. My deep respect goes to Dr. Martin Kling who helped me through the years of trauma as well as exhilaration. His kind words and easy manner made him a worthy advisor.

Special acknowledgment goes to Dr. Edward Fry whose adroit manner brought this work together. His patience allowed this investigator to assimilate and finally interpret the course work that preceded the writing of this study.

With deep appreciation I thank Gloria Lukacs, who is much more than a secretary at the Reading Center, and Jane Li, who is much more than a statistical analyst at the Center for Computer and Information Services. Both women were a friend, an advisor, and an aid whenever I needed them. Others who provided support and direction for this study must be acknowledged as well, especially Dr. Alberto Montare and Dr. Reinhart Kussat, who were always willing to give needed information. To Dr. Ronald Carver of the University of Missouri is extended appreciation for his time and advice. John Gulish was extremely

helpful with his technical skill in producing excellent expanded and compressed tapes.

Acknowledgment is due to the administration, teachers, and students of the East Brunswick, New Jersey, school district. Those involved cooperated willingly and with enthusiasm.

A final and most lasting tribute goes to my family. To my husband, Lou, and my two young sons, Harry and Stephen, I extend heartfelt love and gratitude. Their pride and faith in my accomplishments allowed me to persevere.

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CHAPTER I

INTRODUCTION

In an attempt to find alternate methods for teaching and/or transmitting relevant information to students, a variety of media are being used for experimentation. Since some students learn better through the visual or printed mode, whereas others learn better through the auditory or listening mode, materials are being designed to suit individual needs. There is evidence that the auditory mode is stronger in the primary grades, and diminishes as the student gets older when reading skills are more developed (Armstrong, 1966; Williams & Williams, 1972; Young, 1972). Even with individualized instruction, listening skills play an important part in learning.

More and more schools are incorporating audiovisual material to aid the student in understanding the subject matter at hand. Remedial reading techniques are now including tape recordings, records synchronized with filmstrips, and all three interspersed with trade books. Tachistoscopes, Language Masters, Controlled Readers, etc. are mechanical devices to aid the student. Computers and talking typewriters have been experimented with for

classroom use as well. Postlethwait, Novak, and Murray (1972) have reported success with the audio-tutorial approach to learning where tapes, individually paced, along with filmstrips, texts, group discussion, and use of concrete materials all provide a multisensory approach.

Therefore, further exploration with the use of tape recordings would be worth investigating. One consideration when discussing a listening device is to determine which type of individual might benefit from such a device. Will a child who exhibits above-average skill in reading benefit from the use of tape recordings for comprehension development, or will he be bored? Will speed, or rate of presentation, of the material make a difference in how well he attends to the information transmitted? Does he have an underlying ability to project conclusions when listening to a passage of prose material, thereby benefiting from a faster rate of presentation?

What about the below-average reader? Can he attend to listening materials successfully? Will he be influenced by rate of presentation? Will this mode of presentation be more beneficial to him for comprehension purposes?

Researchers have attempted to test reading and listening comprehension using compressed speech. There have been studies with students ranging in grade from

elementary to college level. Early studies used rudimentary techniques such as physically increasing or decreasing normal speech by speaking slowly or more rapidly. This technique was highly unreliable since there was no control, and the exact speeds could not be replicated. Basically, however, the premise was that by controlling rate of speech, the experimenter could measure comprehension levels through the auditory mode. Friedman, Orr, and Grace (1967) elucidated the need for compressed speech procedures.

> In recent years a method has been developed for time compressing auditory signals which holds great promise for research and communication. This technique is capable of shortening the duration of tape-recorded speech without significantly distorting either the pitch of the signal or the overall intonation patterns [p. 279].

They reported that two important findings have resulted from research in this area: (1) exposure to compressed speech in a systematic way leads to improved comprehension of new compressed material, and (2) nearly all of the more than 150 subjects tested from 1963-1967 found it to be an acceptable and desirable mode of communication for the educational situation.

Recent studies with compressed speech for regulating rate of presentation have tested comprehension of prose material using a new instrument. Previously, multiple-choice questions followed the prose passage and, in

the last few years, cloze techniques have been used. The Reading Storage Test (RS-test), however, has been described as a more accurate measure of listening comprehension since it was designed specifically to indicate the amount of information retained on a short-term basis, yet not involving complex skills such as drawing inferences (Carver, 1973c).

If tape-recorded passages could be regulated to accommodate to the individual's level of comprehension, this could become an important teaching tool for reading and listening. Just as we adults enjoy audio as well as visual stimulation, children also like to vary their modes of learning. When a child becomes tired of attending to the printed page, what a convenience it would be for him to have access to a tape recording which could give him the same information at a rate he is comfortable in listening to. If a student in the classroom becomes distracted by the noise level of the environment, it would be nice to know that he could go to a corner, put on a set of earphones, and be learning from the material he hears without external auditory distraction.

Kussat (1974) investigated the use of various rates of presentation with meaningful prose material on Junior-college students. What made his study unique was his use of a fairly new measuring instrument for analyzing

comprehension. The RS-test proved to be a reliable measure of comprehension in the study and did not have the limitations of other measurement instruments because it was an objective test that can be easily prepared and scored by following the computer model of reading. This test was designed to reflect factual information rather than inferential judgment.

The present study was a downward extension of the Kussat project, using sixth-graders selected for experimentation. Compressed and expanded speech were used as independent variables, with the RS-test as the measurement instrument. It was hypothesized that this instrument would be a more accurate indication of comprehension.

Statement of the Problem

The purpose of this study was to investigate the following problems:

1. Do students comprehend more if listening rate is increased or decreased?

2. Does reading level affect listening comprehension at different rates of presentation?

3. Will there be an interaction between rate of presentation and reading ability?

More specifically, given a group of sixth-graders who have been separated according to reading level, based on the Gates-MacGinitie Reading Test, will above-average,

below-average, or average readers score differently on an RS-test after being presented meaningful prose material at the rates of 75, 150, and 225 words per minute?

It was hypothesized that

1. There will be no significant difference on the mean scores of the RS-test between groups of students listening at 75, 150, and 225 words per minute.

2. There will be no significant difference between students with above-average, average, and below-average reading comprehension scores at the three different rates of presentation.

3. There will be no interaction between rate of presentation and reading groups.

Importance of the Study

The data gathered in this investigation may aid teachers in identifying strengths and weaknesses in individual students. There may be a tendency in students with either superior or inferior reading skills toward proficiency in listening comprehension. Therefore, teachers can use specific auditory material such as compressed speech in tape recordings as part of the diagnostic teaching method. Since rate of presentation may affect comprehension, using compressed speech rates according to individual needs illustrates flexibility and adjustment to the student's requirements for success.

The compressed speech device can allow individuals who absorb listening information at a faster rate to acquire more knowledge by increasing the amount of information within a shorter period of time. Fatigue, due to excessive reading and attending to printed symbols, can be compensated for by access to the tape recorder for the same information.

The results of this investigation may help further define characteristics of specific students in the reading program within the intermediate grades. By measuring amount of information retained on a short-term basis, a more realistic evaluation of listening comprehension could be obtained. The process of using the RS-test with compressed speech had not been used with sixth-graders previous to this study. Its efficacy may suggest use within the elementary school as a finer instrument for evaluating not only listening comprehension but reading comprehension as well. This study may also reflect the success of a technique for facilitating learning by allowing the subject to interact with the material both through the auditory and visual channels.

Definitions of Terms

Compressed speech. As referred to in this study, compressed speech is defined as a mechanical procedure whereby normal speech is regulated at an increased speed

by use of the Eltro Information Rate Changer. This process involves deletion of certain small segments of words in passages, yet allowing the passages to be intelligible. There is neither distortion in pitch nor intonation of sound. This same procedure can be used to decrease or expand speech.

Listening comprehension. The ability to absorb information from meaningful prose passages presented through the auditory mode and reflected in scores on the RS-test.

Reading Storage Test. A specific test designed by Carver (1973c) to measure the amount of information retained on a short-term basis by deletion of the initial letter in every second word of the passage presented. Also referred to as the RS-test.

Above-average readers. Those students who, at a designated grade level, score in the upper third of their group on the comprehension section of a standardized reading test.

Below-average readers. Those students who, at a designated grade level, score in the lower third of their group on a standardized reading test.

Average readers. Students whose reading test scores reflect reading ability at the middle third of their group on a specified grade level.

Limitations of the Study

This investigation does not purport to suggest efficacy of compressed speech for all students. It is confined only to sixth-graders with different reading abilities. The three groups were specifically chosen to ascertain differences in an average suburban class. In a more discriminating group with more varied scores, these differences may be more acutely reflected than in this study.

Since the experiment is measuring short-term memory by recall of specific literal information through the auditory mode, the results cannot be generalized to all types of comprehension on abstract levels.

There is no training involved in this procedure, nor is it of long duration. Therefore, these factors must also be considered in interpreting the data.

Overview of the Study

In Chapter II, a search of the literature on compressed speech, rate of presentation, and listening comprehension will be discussed in detail. Relevant research in the field by Carver and Kussat will be analyzed for comparison with the present investigation. The procedures used, including subjects, materials, and statistical design, are expounded upon in Chapter III. The following chapters discuss the results of the experiment, statistical data, summary, and conclusions.

CHAPTER II

REVIEW OF THE LITERATURE

Research in the area of listening comprehension and one of many variables--rate of presentation--has been abundant in the last decade. Conferences have been arranged to discuss the latest findings and suggest future exploration. The Center for Rate Controlled Recordings at the University of Louisville specifically investigates uses of compressed speech. Various conflicting theories and test results have been published attempting to establish a relationship between comprehension and expanded and/or compressed speech. Speech rate has been manipulated from the normal range of 150 words per minute to 350 words per minute and above. Expanded speech has been decreased to 75 words per minute to determine effectiveness. To date, the conflict in results has not been resolved.

This chapter will attempt to identify aspects of the discrepancies and consolidate the findings. Listening will be defined through various sources to illustrate the broad scope of meaning, and its components will be identified. The relationship between listening and

reading will be supported by previous studies, and the use of rate of presentation with comprehension will be discussed in detail. Included in the review of studies using rate of presentation and comprehension will be specific studies done with intermediate-grade subjects to provide comparison with the present study. In conclusion, the Kussat study (1974) will be presented in depth as the focal point of the present investigation. The RS-test designed by Carver (1971c, 1973c) will be identified as the specific measuring device common to both studies, and results of the Kussat experiment can then be compared with the results obtained from the present experiment.

The Nature of Listening

In order to measure listening, the term itself should be defined. Dechant (1970) described listening as a thinking activity.

> Only by associating experiences with symbols can the pupil arrive at meaning. Listening occurs only when the pupil organizes and remembers what is heard. The major goal of all communication, including listening is understanding or comprehension, and this is a central process involving thinking [p. 124].

Rankin (1966a) defined listening ability as the ability to understand spoken language (p. 25). He further explored the individual components of ability to listen. They included ability to hear, recognize words, acquire new words, understand and gain meaning, and by

the ability to concentrate and/or attend, anticipate sequence, associate with ideas, recall, as well as identifying important elements. Bois (1966), Harwood (1966), Nichols and Stevens (1957), and Taylor (1964) have listed similar characteristics of the listening process.

In a study done by Rankin (1966b), using individual records of listening time over a period of 60 days, 29.7% of the average waking day was spent in listening. This percentage was three times as much time as was spent in reading.

Wilt (1966) reported that the amount of time children in elementary school spend in listening came to 57.5% or 158 minutes a day, whereas the teacher estimates of time spent in listening was half that amount, 77.6 minutes. Her study, done in 1949 with 19 elementary school classes, concluded that "neither grade nor classroom type made a significant difference in the amount of time children were expected to listen [p. 79]." She also reported that there was seldom real purpose for listening to what was being said.

Nichols and Stevens (1957) also reported that, after extensive tests with several thousand college students and other adults, the results were that the average person remembers only half of what he had just previously heard.

In discussing factors which influence listening, Taylor (1964) emphasized the necessity for attention and concentration. He suggested that in order to achieve sustained attention, there must be content overload, challenging material, good room environment, acquired attitude, physical and mental well being, and interesting delivery by the speaker. Anderson (1966) and Duker (1966) also referred to many of these same components for successful listening. Johnson (1966) included the affective factor of overly-tense attitude as contributing to inefficient listening. He stated, "The men who most often failed to comprehend the messages were those who strained too intently to recognize every word and syllable [p. 41]."

The Listening Process

Attending. Many studies of the listening process include references to attending. Trabasso and Bower (1968) describe effective stimuli as simply those to which the subject attends. They have postulated the theory that a subject only attends to relevant dimensions of stimuli and learns a classification which forces him to key his responses to that dimension. The process of classification is a part of redundant relevant cues which a subject learns. The learning of these cues helps the learner block his information for memory storage. Moray

(1970) also discusses attention in the learning process. His term "recoding" suggests a reduction in the number of loci to form a single message. This recoding process involves selection, competition, and integration.

Fessenden (1966) has simplified the description of attention by suggesting that there is less physical effort in listening to words and ideas that are easily familiar than words and ideas that are complex and new. His theory suggests that the listener collects several patterns of sound, recognizes the unit, then discharges it in the mental stream to mingle with present impulses in building concepts and ideas.

Bruner (1957) stipulates that what one learns is based on a formal schemata that may be used to organize diverse information. Involved in this schemata is a coding process which is then used for absorbing new information and transferring this information to new events. He includes the need for mastery of the original learning in order for coding to be transferred. Broadbent (1970) also refers to mastery of material and rehearsal to allow short-term memory to function.

Storage and recall: Short-term memory. Human memory is structured into three components: the sensory register, where the incoming information is very brief; the short-term store, which is the working memory; and the

long-term store, which is the permanent memory. Atkinson and Shiffrin (1968) have proposed a system of human memory which involves control processes. In the sensory register, the primary function of the control process would be to select particular portions of information for transfer to the short-term store. They reported results from investigations that, in order for subjects to store information when there is increased presentation rate, it is necessary to rehearse by attending to only a portion of the incoming items. Atkinson and Shiffrin further included the need for storage, search, and retrieval strategies in control processes of short-term store. Prior instruction determines the strategy used.

Atkinson and Shiffrin (1968) included rehearsal as a process of the short-term store. The purpose for rehearsal is "a lengthening of the time period information stays in the short-term store [p. 111]." A second purpose for rehearsal suggested by these authors is to increase the "strength built up in a long-term store, by increasing length of stay in STS (Short-term Store) and by giving coding and other storage processes time to operate [p. 111]."

The rehearsal buffer is present in the short-term store as a filter for selecting items for rehearsal. If items are presented too fast, the input and reorganization

time encroach upon the rehearsal time and some items may not enter the rehearsal buffer. Figure 1 describes the rehearsal buffer in relation to short- and long-term store.

Broadbent (1970) has stated that if one concentrates on rehearsal, the memory process is subject to interference, thereby causing forgetting. However, he agrees that rehearsal is necessary. Atkinson and Shiffrin (1968) suggest that the subject may divert his effort from rehearsal to various coding operations and thereby increase the strength of the stored information.

In studies of comprehension and rate of presentation, the short-term store is being measured. Rehearsal and coding are important elements in this process of storing information. However, in retrieving the information, the mind must search the short-term store. Spinelli (1970) has formulated a theory of retrieval which involves chunking of information in the short-term store, then providing a fraction of the chunk for recall to occur.

In a study by Pinkus and Laughery (1967), chunking strategy was analyzed using pronunciability and presentation rates as variables. When rate was reduced, rehearsal and recoding processes were evident. Trabasso and Bower (1968) have stated that reduction in study time lowers learning rate, suggesting what Pinkus and Laughery

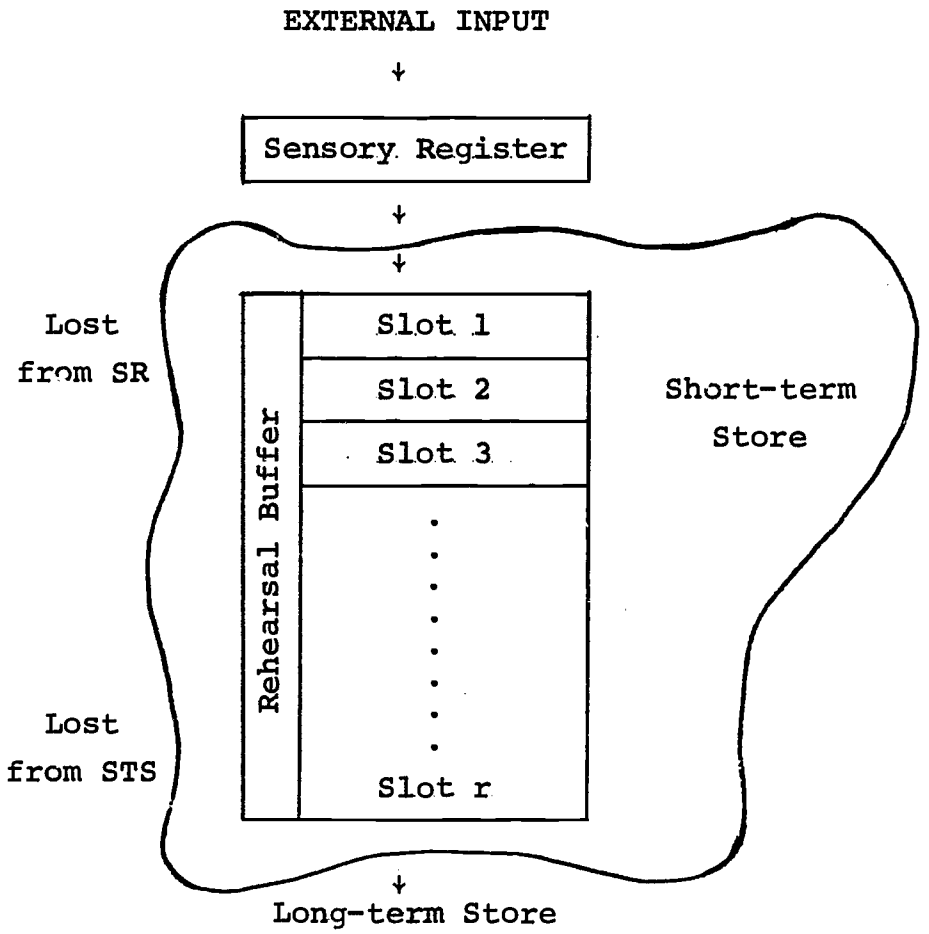


Figure 1. The rehearsal buffer and its relation to the memory system (adapted from Atkinson & Shiffrin, 1969, p. 113).

found in their study. Carver (1973a) reported results of a study where he used a chunked reading test to measure comprehension of prose passages presented at various rates, from 150 words per minute to 450 words per minute. He found that the chunked test, using the passage divided into chunks of five words at a time, with one word deleted, then revised to change the meaning of the passage, was more sensitive to change in rate of presentation than were two other measures of comprehension--the cloze test and the revised cloze test.

Relationship Between Listening and Reading Comprehension

A subject has been presented stimuli which he has proceeded to store in his memory, be it by chunks or item selection. Will comprehension differ due to the mode of presentation, either visual or auditory? Taylor (1964) suggests that reading and listening correlate highly. He maintains that training in thinking skills through listening activities produces a gain in both reading and listening. This point has been debated. Reiland (1970) found that there was no significant difference in using listening activities with reading and listening comprehension tests on intermediate-grade subjects. Yet listening and reading are both receptive communication acts which may involve the same experiential background of the learner

and many of the same thinking skills.

Carver (1970) has isolated four variables in measuring reading which may also apply to listening: (1) knowledge gained, which results from reading a finite body of material; (2) amount comprehended, involving a recall process; (3) reading aptitude, which involves all factors that contribute to individual differences such as background knowledge, reading strategy, and other intellectual factors; (4) reading improvement, changes within the individual as a result of a treatment condition.

In the primary and intermediate grades, listening abilities seem to be more advanced than reading skills for students of average intelligence and scholastic ability. Armstrong (1966) reported a study done with students ages 6½ through 12½, where the auditory summation scores ranged from 2,900 words at age 6½ to 7,720 words at age 12½. Yet the visual scores on this same experiment ranged from 648 words at 6½ to 7,588 at age 12½. The difference between the means became smaller as age increased, with auditory and visual scores becoming closer. Moe (1966) found that auding, measured with mental age, verbal intelligence, and nonverbal intelligence can be used as a predictive measure of reading potential. He concluded that this was a superior measure to reading readiness test scores with first- and second-graders. As a result of

his experiment, auding scores correlated .80 with the California Reading Test. Pratt (1966) found a correlation between listening and reading of .64, whereas Delcamp (1969) found a correlation of .83 and Goldstein (1940) reported .78.

Brassard (1970) reported that in an experiment with intermediate grade subjects (grades 4 to 6), listening was found to be statistically superior to reading comprehension, and that reading comprehension had a higher correlation with listening than with I.Q., mental age, or sex. Horowitz and Berkowitz (1967) also suggest that there is greater accuracy of listeners as observed in style scores of writing and units recalled in a test.

Yet Kessler (1969) found no statistical significance between listening scores and scores on a reading test after increasing comprehension, nor did Reiland (1970).

To add to the conflict, Williams and Williams (1972) found support for the hypothesis they presented that prose materials are best presented aurally as opposed to visually for intermediate-grade students. However, in a study by Oakland, Williams, and Harmer (1973), first-grade Negro children were tested, then trained and tested again after seven months. The group receiving auditory-perception training and supplemental

visual-linguistic reading instruction read slightly better than the group receiving only visual-linguistic or other treatments.

Readability and Listenability

Young (1972) summarized the relationship between reading and listening as being positively correlated, with listening skills apparently stronger at lower grades. In his investigation of reading and listening comprehension, Young included an important variable--readability, as a measure of listenability. His subjects were 211 undergraduates who were presented messages at 175 words per minute through the auditory and visual modes. There was no significant interaction between mode of presentation and rate of testing. However, subjects scored significantly better on passages which were at a grade level equivalent to their own grade level than on passages at lower grade levels. He concluded that this result may be due to passage content. Other studies that used material designated as easy and difficult had mixed results. Sticht and Glasnapp (1972) found evidence that higher aptitude subjects gain as much when listening to more difficult materials as when listening to easier materials, yet lower-aptitude subjects learned more with easier material presented at slow rate of presentation. Delcamp (1969) found no difference in test scores as a result of

passage difficulty with fifth-graders. Although the results on the whole are inconclusive, readability should be recognized as a variable that may affect test results.

Measures of Comprehension

In previous research studies, the multiple-choice test had been widely used to measure comprehension. Yet, as Orr (1971) suggested, its reliability is questionable, and the sample material may be biased. He also conceded that prior knowledge is a problem in ascertaining true measurement of comprehension. Carver (1970) estimates that a subject can score 40% correct without reading the passage. Weaver and Bickley (1967) identified two distinct sources of information for completion of multiple-choice items--the conceptual information the subject brings to the testing situation, and the information gained from previous items to reduce uncertainty about succeeding items. However, most experimentation with comprehension has used and will probably continue to use the multiple-choice format because it is so familiar to educators.

An alternate form of measuring comprehension has been the cloze technique. Delcamp (1969) measured reading and listening comprehension of fifth-graders using this technique. She found no significant difference between reading and listening scores on this form.

Skinner (1972) used two cloze techniques and a multiple-choice format to measure listening comprehension with college students. Material was presented at five different rates of compressed speech. She found a significant difference among mean listening comprehension scores as a function of the test format. The multiple-choice test results exceeded the cloze test results, but the cloze technique provided a more complete coverage.

Coleman and Miller (1968) found the cloze technique infeasible in measuring information gained during prose learning because the scores reflected direct estimates of redundancy (predictable material). Old information could be predicted before reading it. However, the investigators used a "guessing game" technique with college sophomores to determine information gained and found that subjects received maximum information gained when reading a passage written at approximately the fifth-grade level of difficulty.

Carver (1973a) used a chunked reading test along with a cloze and revised cloze test to measure information processing and learning from prose material using rate as a variable. The format of the chunked test is a grouping or chunking of words from a passage into columns of five words per column line, deleting randomly one chunk from each set of five, revising that chunk to

discriminate between readers and nonreaders, and then asking the subject to identify the chunk that changed the meaning of the passage. Carver found the chunked test was more sensitive to changes in the rate variable from 150 words per minute to 450 words per minute than the other two procedures.

Carver has also suggested and used the Reading Input Test (1971a), comparing it to a Memory Dump on a computer which provides a printout of everything that has been stored in memory up to that point. He further expanded upon this theory, devising a computer model of reading that would measure understanding of a passage without invclving making inferences. The outcome of his experimentation was the RS-test (1971c, 1973c). "The elimination of the words on either side of the choice words considerably reduces the contextual constraint and requires that something be stored in memory before the correct answer is apparent [p. 10]," states Carver (1971c). This test has the advantages of being objective in development and scoring, and systematically related to the prose material presented. For further comparison with other measurement, refer to Table 3. Reliability measures of the RS-test suggest that it is a valid measure of learning, understanding, comprehension, or information storing that occurs during reading. Kussat (1974)

found the coefficient of internal consistency of this test to measure .65. Basically, the RS-test format uses a passage divided into 10-word chunks per line. Every other word is deleted with only the initial letter remaining. Of the five initial letters per line, one is randomly selected and replaced with an incorrect letter. The subject must identify the wrong beginning letter per line of 10 words and cross it out. Scoring is based on number right minus one-fourth number wrong.

In comparing the RS-test with the paraphrase technique, Carver (1973c) reported the paraphrase technique to be developed subjectively, although results of testing proved both to be equivalent in scores. Another, more recent, study by Carver (1974c) reported that the paraphrase test appeared more sensitive to the primary effect of reading in one experiment, with more gain due to reading. However, the standard deviation was almost twice as great as with the RS-test results. Therefore, Carver concluded that the Reading Storage test "appears to be much more consistent than the paraphrase type of test [p. 17]."

Comprehension and Compressed Speech

Methods of compression. Once comprehension has been defined by an investigator, he has established a direction in which he can then use manipulative devices to alter his experiment. A variable which has been

identified as having great potential for use with individuals is rate of presentation (Cramer, 1971; Foulke & Sticht, 1969). Early studies manipulated normal speech rate using the physical control of the speaker, or using a speech scanning device, or by accelerating phonographic equipment. The method of accelerating recordings was referred to as the "speed-changing" method, but was limited in control. Intelligibility of the messages remained only at moderate rates. If increased above 10% of normal speech, the articulation became distorted.

Further experimentation in compression techniques using various instruments resulted in the "sampling method." Brief segments of the speech signal are deleted, with the remaining sections of the signal joined together, resulting in more than 90% intelligibility. The problem with this method, as reported by Foulke and Sticht (1969), is that word rate of compressed speech is not directly indicated, and the final rate depends upon the rate of speech before compression. This normal rate of speech before compression is determined by the nature of the material being read and the style of the speaker. In their review of the two methods of compression--speed change and sampling--Foulke and Sticht (1969) concluded that

> there is a slight but significant advantage found for the sampling method as opposed to the speed-changing

> method in some cases--using single words. When connected discourse of considerable interest is used, there is no difference in method [p. 57].

The sampling method has been refined by electromechanical devices such as the Tempo-Regulator, the Fairbanks Model, the Eltro Information Rate Changer, the digital computer, and the Harmonic Compressor.

The use of a razor blade to cut pieces out of a recorded tape, then splicing the remaining pieces together is a tedious job. Yet this method, begun by Black (as reported by Cramer, 1971), led to other studies to refine intelligibility without a rise in pitch.

Evaluating compressed speech effects: The Goldstein study. Goldstein, in 1940, used the speed-changing method of increasing rate of presentation to determine comprehension of meaningful material at gradually increased increments of words per minute. A total of 28 films and 28 records were used at seven different speeds, from 100 to 322 words per minute, to measure comprehension of 280 male and female adults. A variable-speed motor was used for the accelerated rates, producing a rise in pitch as the speed was increased. Passages, as measured by the McCall-Crabbs Standard Test Lessons in Reading, were graded as easy (grade 3.5) and difficult (grade 7.5). Subjects were asked to read or hear the passages, then answer multiple-choice questions. As a result of test

scores among the groups, Goldstein concluded,

> Rates are a highly significant source of variation for both modalities at both difficulty levels. They are apparently more significant in influencing listening than reading comprehension and they exert more pressure at the difficult than at the easy level [p. 31].

He also noted that reading comprehension and listening comprehension decline as rate increases and intelligence of the subject may be a factor in comprehension scores.

As a result of Goldstein's study, other investigators attempted to manipulate rate for use with meaningful verbal material.

Individual differences. Bixler, Foulke, Amster, and Nolan (1961) used compressed speech with blind subjects to determine the effectiveness of this mode for comprehension. A total of 291 Braille readers in grades 6, 7, and 8 were presented two types of material, scientific and literary, at rates from 175 to 325 words per minute. The passages were measured for readability, using the Dale-Chall formula, with resulting levels of fifth- and sixth-grade readability. Using the multiple-choice test as a measure of comprehension, the investigation found no significant loss of comprehension through 225 words per minute for the literary material, and continued comprehension without significant loss through 275 words per minute for the scientific material presented.

Nolan and Morris (1971) reported in a study of

blind elementary and high school subjects that subjects learned more from material heard at slower rates. However, they suggested that the length of the passage, presence and/or length of pauses involved, and total study time may have been contributing factors in the results.

When Foulke and Sticht (1966) experimented with listener rate preference, they found that college students preferred the mean rate of 207 words per minute when listening to literary material of moderate difficulty. Yet Sticht and Glasnapp (1972) suggested that rate and retention are a reflection of individual differences. Their study of high- and low-aptitude men, ages 18 to 25, resulted in the findings that high-aptitude subjects gained as much when listening to more difficult materials as when listening to easier materials. Yet low-aptitude subjects learned more of the easier materials at slower speech rates.

Others who investigated intelligence as a factor in comprehension via compressed speech found that subjects of higher ability were able to comprehend material at faster rates than subjects of lower intellectual ability (Goldstein, 1940; Taylor, 1964). Friedman and Johnson (1968) suggested that a complex level of speech perception is involved in comprehension at various rates. In order to synthesize the material presented, the subject

must be able to process the material accurately and rapidly. This process is compared with the ability to evaluate semantic relations as described in the Guilford structure-of-intellect model of abilities. Foulke (1968) also referred to levels of perception time as a factor in comprehension. A rapid deterioration in comprehension was found beyond the rate of 250 words per minute. The correlation of .69 between listening and intelligence has been found in one study (Delcamp, 1969).

A conflict in interpretation that intelligence will be a factor in comprehension scores is presented in the study by Brassard (1970). She found that intermediate-grade subjects with I.Q.'s below 110 were far superior in listening comprehension than in reading comprehension. This result seems obvious if we consider that these subjects were not as skilled in reading techniques. When Parker (1971) experimented with rate of compression using Junior College students of varying ability, his results were that subjects of all aptitudes had significantly better comprehension when material was simultaneously presented in printed and aural form. Reiland (1970), however, found no significant difference in her study using both modes of presentation.

Woodcock's study (1971) of 711 subjects from grades 3 to 6 along with adolescent mental retardates

over a two-year period of time also suggested that the higher the mental age of the subject, the higher the comprehension rate. He differentiated between comprehension test scores and efficient learning. The highest comprehension scores were found at the slowest rates of 75 to 125 words per minute as a result of practice. However, the most efficient learning took place at the rates of 250 to 300 words per minute. Woodcock described efficient learning as the relative amount of learning per unit of listening time. Friedman et al. (1967) also reported improvement with practice. The effects of reading practice were studied by Thames and Rossiter (1972) with results that reading rate improved, but not comprehension or listening using compressed speech. Yet Sticht (1971) found comprehension improved with repeated selections.

Walker (1971) used sixth-grade gifted subjects in measuring effects of compressed speech as compared with self-improvement methods. His findings reported more of an increase in rate of reading when subjects used the Preston-Botel method of self-improvement than when they used compressed speech. However, since the focal point of that study was on increasing reading rate rather than comprehension, the significance of results should be regarded with care.

Studies of compressed speech effects on comprehension using intermediate-grade students have suggested that as subjects increase in age, the auditory mode of delivery becomes weaker. Gropper (1971) listed two factors that determine efficiency of compressed speech with fourth-graders--intelligibility and comprehension. As sub-factors, he included: (a) difficulty of the passage, (b) vocal quality, (c) style of the reader, and (d) unidentified listener variables.

Compressed Speech and Training in the Intermediate Grades

Reiland (1970) used 428 intermediate-grade subjects to investigate the effect of training in listening to compressed speech with the possibility of compressed speech being used as a reading improvement technique. Experimental groups were divided into reading and listening, listening only, and reading only sections. Eighteen listening passages were compressed from 175 to 300 words per minute. Subjects in the listening-training groups heard three tapes per week, with an increment of 25 words per minute. Pre- and post-measures included the SRA Tests of General Ability, the Gates-MacGinitie Reading Test, and the STEP Listening Test. Results of training proved to be not statistically significant. However, there was a tendency for the reading-listening group to

perform better in the reading comprehension test scores. Sex differences were not a significant factor for improvement in reading achievement or listening ability, but subjects with low intelligence scored weakest in the listening-only method, proving it to be the least effective with them. Other studies using training in listening found no significant difference between training and non-training groups in intermediate grades (Foulke & Sticht, 1969; Kessler, 1969).

Repeating passages has also been used to determine effectiveness in comprehension with compressed speech. Napier (1971) used intermediate-grade, visually handicapped, and normal vision students in an experiment with nine compressed levels from 160 to 367 words per minute. Passages were heard twice, then subjects were tested. The fourth-graders learned more in relation to base rate than the fifth-graders, and Napier suggested that younger subjects of lower intelligence might benefit more from compressed speech than other students. However, the test measurement (five types of test items on the comprehension test) may have been responsible for the results.

The Reading Storage Test

An ideal measure of the knowledge variable would be to have very little gain from pre- to post-reading of

very easy or very difficult passages (Carver, 1970). Then one might recognize the previous knowledge of the reader on the material being used. The RS-test was devised as a more reliable method of measuring knowledge gained from a reading passage rather than past experience. In his discussion of a computer model of reading, Carver (1971a) referred to the complex retrieval skills required in answering traditional standardized reading tests.

> The capability to perform well on these tests not only requires a properly functioning reading-program but also requires complex retrieval and problem-solving programs which are not easily taught in the education system. From the computer analogy, it can be seen that the retrieval and inference requirements are not components of the reading-program and have uncertain relationships to it. In fact, these latter functions are highly similar to what psychologists have traditionally called reasoning and it is not surprising that individual differences in reading test scores in the past have correlated so highly with intelligence test scores [p. 465].

The RS-test was specifically designed to reflect information stored in the short-term store as a result of a prior reading of the passage.

Carver investigated the interrelationships among understanding, information processing, and learning. A total of 108 college students were grouped, then presented 10 passages visually and auditorily. After each passage, subjects were asked to evaluate their percentage of understanding by self-rating. The 10 passages were taken from the Carver-Darby Chunked Reading Test. Rates of

presentation varied from 150 to 450 words per minute. In the results, Carver found the chunked test to be more sensitive to change in rate variables than the 20% cloze test or the revised cloze test. Understanding changed 80% as a result of change in rate, with the 80% score at 75 words per minute and the 0% at 400 words per minute (Carver, 1973a).

In another series of studies using the RS-test compared with the cloze and paraphrase test, Carver found similar results. The objectively developed RS-test is a valid measure of the learning, understanding, comprehension, or information storing that occurs during reading. It proves to be more sensitive to comprehension effects than the cloze and paraphrase test, and involves a more objective scoring (Carver, 1973c).

When Carver administered the RS-test to third-, sixth-, ninth-, and twelfth-graders, his results found this test to discriminate between difficulty levels in passages, when the passages were close to the subjects' reading level (Carver, 1974d).

The Kussat Investigation

A pertinent study of late that is particularly related to the present study was conducted by Kussat (1974). The purpose of that study was to investigate information gained through various rates of presentation.

A group of 567 Junior College students was randomly selected for experimentation. The subjects were divided into seven groups with reading test scores from the Comparative Guidance and Placement Test to determine comparability. Each group heard the same 250-word passage at one of seven rates of presentation, ranging from 75 to 350 words per minute. The passage readability level was measured at grade 7, using the Fry Nomograph. Results of compressed speech above 150 words per minute confirmed Carver's data (1973a) that compression decreases as rate of presentation increases. Kussat also found that expanding (slowing down) rates of presentation below 150 words per minute also decreased the amount of information retained. A coefficient of internal consistency of .65 found the RS-test to be a reliable measure of information retained.

In his conclusions, Kussat (1974) indicated that, although 150 words per minute seems to be the mean comprehension threshold value, "some persons can obviously tolerate moderate amounts of compression without experiencing a significant loss of the information presented [p. 133]." Individual differences were noted that included sex variables, with females scoring higher. However, Kussat suggested that this result may have been an artifact of the study.

Summary

This review of the literature has not attempted to identify and discuss every piece of research connected with compressed speech. However, the investigators represented in this chapter are a good sampling of the trend, past and present. More and more school materials are including listening skills, reflecting the effects of discussions by leading educators such as Rankin. Measures of comprehension are becoming more specifically directed toward short-term memory store activities rather than more global measures which involve aptitude in abstract thinking. Computerized reading activities as well as tests are using the chunking process of learning, with introduction by small steps. The RS-test is proving to be a reliable measure of comprehension that excludes the biases of test experimenter. Rates of presentation are still being manipulated with no one really finding conclusive evidence in favor of one rate over another to produce successful comprehension.

It does appear, however, that researchers are admitting the importance of the individual subject with his unique framework. What may be good for a sixth-grade blind student of average ability may not be good for an average, sighted sixth-grader. Younger subjects may be able to absorb compression rates more easily than adults,

and it seems that elementary-school subjects adapt easily to the auditory mode. However, one cannot generalize because there are so many underlying factors involved in interpreting test results. Training in listening does not seem to affect comprehension scores, nor does sex of the subject to a significant degree. Passage difficulty has not been a contributing factor in comprehension scores with compressed speech as long as the most difficult passages are within the scope of the reader or listener's ability. The implications for use of compressed speech have been illustrated by the research variables. Blind students have used compressed speech successfully as have gifted students, retarded students, elementary-school students, and college students. Meaningful materials have ranged from literary works to scientific procedures. The research has shown the great possibilities for compressed speech in the classroom.

CHAPTER III

PROCEDURE

This study was designed to measure the listening comprehension of sixth-grade subjects presented with a verbal passage at three different rates of presentation. The passage, containing meaningful prose material, was expanded from 150 words per minute to 75 words per minute, and compressed from 150 words per minute to 225 words per minute. The results of the test scores on the Reading Storage Test were then interpreted for measurement of amount of comprehension for each of the three groups of subjects.

Subjects

All sixth-grade students from one school in a suburban system, East Brunswick, in Central New Jersey, were selected for experimentation. From the 1970 Census published by the Middlesex County Planning Board, East Brunswick's total population consists of 34,166 people, with 33,755 White, 191 Black, 5 Indian, 186 Other Specified, and 29 Nonspecified. Therefore, it can be concluded that East Brunswick's population is almost all White. The average value of single-unit dwellings was $31,043, with

average monthly rental in apartments being $166.

All students selected were administered the Gates-MacGinitie Reading Test, Survey D, to ascertain accurate levels of reading achievement. Between 35 and 36 students comprised each of the three experimental groups, with a total number of 103 subjects.

Design of the Study

Subjects were administered the Gates-MacGinitie Reading Test, Survey D, to determine reading ability. As a result of the reading test scores, the subjects were then grouped into the upper third, middle third, and lower third of the total sixth-grade class. Three subgroups were then randomly formed from each group and presented one of the three rates of presentation. Nine cells, with 10 to 12 subjects in each cell, were utilized. Table 1 describes the 3 x 3 factorial design used. One-third of each group was presented the passage at 75 words per minute, while another third was presented the passage at 150 words per minute, and another third of the group exposed to 225 words per minute.

As proposed by Campbell and Stanley in "Experimental and Quasi-Experimental Designs for Research" (1963), the Equivalent Materials Design was used in this study, and presented in Table 2 as the Treatment and Testing Plan. This table illustrates the three subgroups

TABLE 1

DESIGN OF THE STUDY USING A 3 x 3 FACTORIAL ANALYSIS

Subjects	Rate of presentation			Total means
	75 wmp	150 wpm	225 wpm	
Above average (upper third)	N = 12	N = 12	N = 11	N = 35
Average (middle third)	N = 12	N = 11	N = 12	N = 35
Below average (lower third)	N = 12	N = 11	N = 10	N = 33
All subjects	N = 36	N = 34	N = 33	N = 103

TABLE 2

TREATMENT AND TESTING PLAN

Above-average readers	
Upper one-third on the Gates-MacGinitie Reading Test	R X_1 O
	R X_2 O
	R X_3 O
Average readers	
Middle one-third on the Gates-MacGinitie Reading Test	R X_1 O
	R X_2 O
	R X_3 O
Below-average readers	
Lower one-third on the Gates-MacGinitie Reading Test	R X_1 O
	R X_2 O
	R X_3 O

Key: X_1 -- Listening at 75 words per minute.

X_2 -- Listening at 150 words per minute.

X_3 -- Listening at 225 words per minute.

O -- Reading Storage Test

within the above-average, average, and below-average groups.

Description of Materials Used

The passage that was used for taping the presentation was taken from the series, Reading for Concepts, Book D, published by the Webster Division of McGraw-Hill Book Company, New York (1970). Permission was granted by the publisher for use of the material for this study. Book D is listed by the publishers as being at the reading grade level of 3.9, with a range of readability from 3.6 to 4.2 using the Dale Chall readability formula. The Fry Readability Graph, however, measured this particular passage, "Taboos" (p. 160), to be at mid-fifth-grade readability.

The committee that formulated each passage in this series were people who were working with children in schools. These committee members had particular subject-area interests and background.

The use of a fifth-grade passage allowed for the subjects to comprehend the material without difficulty, since listening level should be commensurate with reading level (Kussat, 1974).

A recording was made by the experimenter at the Rutgers Language Laboratory, and then processed on the Eltro Information Rate Changer. This device is capable

of compressing or expanding taped material up to approximately 65% of its original speed in one process. From the original tape, three rates of presentation were produced: 75, 150, and 225 words per minute.

Each processed version was then transferred to cassette tapes for use in the classroom. Brief directions to the students preceded the listening passage at the normal rate of 150 words per minute as well as a sample exercise. The sample was also taken from the same series, Reading for Concepts, Book D, with a readability of fifth-grade level on the Fry Readability Graph. It was presented at 75, 150, and 225 words per minute with an RS-test immediately following the listening section. The answers were already given on the first three lines in order to acquaint the subjects with the method.

Selection of Tests

The Gates-MacGinitie Reading Test. The Comprehension subtest of this battery, Survey D, was administered to all participating subjects prior to experimentation with compressed speech. Although the entire test includes reading speed and accuracy, vocabulary, and comprehension, only the comprehension subtest was used. In the Seventh Mental Measurements Yearbook (Buros, 1972), the comprehension section was described as a test that measures the students' ability to read complete prose passages with

understanding. Reliability of this section was .83 for alternate form and .94 for split-half reliability according to the CSE Elementary School Test Evaluations (Hoepfner, 1970).

The revised edition of the Gates-MacGinitie Reading Test, published in 1965, reduced the range of grades covered by a single test, and differences in performance ratings on the new norms were noted in the technical manual. This particular survey provided an adequate ceiling for superior students as well as an adequate floor for weaker students. The raw scores ranged from 2.0 to 12.0 grade levels and therefore this seemed an appropriate instrument for the study.

The Reading Storage Test. After students were grouped, based on the reading test scores, all listened to the same passage. Ten to 12 from each group heard the passage at 75 words per minute, while 10 to 12 others listened at 150 words per minute, and 10 to 12 more listened at 225 words per minute. Immediately following the listening presentation, all groups were given the RS-test. This test was constructed according to the standardization specifications suggested by Carver (1971c, 1973c). The result was a 19-item test which was conceptually related to the cloze and chunked test techniques. Every 10 words of the passage were arranged in a line, with

every other word replaced by only its initial letter. One of the initial letters per 10-word line was randomly chosen and replaced by an incorrect letter. The subject had to identify and mark the incorrect letter in each line.

Since the reading process is regarded by Carver (1973a) as an experiential event difficult to measure as being experienced or stored, Spinelli (1970) suggested a theory of chunking information which can be measured by a system that provides a fraction of a chunk which will provide the cue to the reader for remembering the information. Carver (1973c) stated, however,

> If too little of a passage is presented, then the original experience will not be reconstructed. If too much of the original passage is presented, it will be difficult to determine whether that which is played back provides evidence that the information was originally stored or whether the individual was able to correctly infer most of the original passage from the information he was presented on the test [p. 10].

A comparison between four measures of reading comprehension is listed in Table 3, as compiled by Carver (1973c). This information was accumulated after years of experimentation by Carver using the RS-test in comparison with cloze procedures and multiple-choice tests. His conclusions supported the RS-test as a valid indicator of the primary effects of reading information gained. Kussat (1974) successfully used the RS-test with a group of

TABLE 3

A COMPARISON OF FOUR READING MEASUREMENT APPROACHES

Criteria	Approaches			
	Multiple-choice Test	Cloze Test	Reading Input Test	Reading Storage Test
1. Units systematically related to the material.	No	Yes	Yes	Yes
2. Easy to develop an objective test.	No	Yes	Yes	Yes
3. Can be scored objectively.	Yes	Yes	Yes	Yes
4. Can be scored automatically.	Yes	No	Yes	Yes
5. Fits into a theory or model.	No	No	Yes	Yes
6. Use to investigate readability.	No	Yes	Yes	No
7. Use to investigate comprehension on amount learned.	Yes	Yes	Yes	Yes
8. Highly sensitive to changes in understanding.	Yes	No	No	Yes
9. Interval or ratio scale.	No	No	No	Yes

Adapted from Carver (1973c).

college students to measure information gained with compressed speech.

Administration of Tests

Individual classroom teachers administered the Gates-MacGinitie Reading Test, Survey D, Comprehension subtest to all sixth-grade students in the study. The technical manual was followed by all participating teachers.

Tests were collected and scored by hand by the experimenter. Students were then grouped according to test scores into above average (upper third), average (middle third), and below average (lower third). Ten to 12 subjects from each group were randomly selected to go to a separate room where the experimenter instructed them to listen to a passage on the cassette tape-recorder carefully because they would be required to recall the passage and identify errors. A practice exercise was provided with an accompanying RS-test sample.

The tape was then presented to the first group at 75 words per minute, with the RS-test immediately following the recording of the sample. Papers were collected and the main selection was introduced. The subjects were told to mark the incorrect letter in each line of the test. The same procedure was used with the other two groups of 10 to 12 each, varying only the rate of

presentation. Copies of the sample exercise used to familiarize the subjects with the test format, along with the actual test used, are included in Appendix B. Directions given to the students and teachers are presented in Appendix A.

Students were not timed on the RS-test. They were allowed as much time as they felt necessary to identify the errors. The actual tape listening time with instructions, sample test, and actual test passage was approximately 20 minutes long.

Each test was hand scored and corrected for guessing (number right minus ¼ number wrong) as recommended by Carver (1971c, 1973c). The scores were then transferred to IBM cards for computer analysis. The analysis of variance procedure was used to compare and interpret the scores of the various experimental groups. Using the 150 words per minute rate as a control, the other rates of 75 words per minute and 225 words per minute were compared to determine change in the amount of information retained. The .05 level of confidence was used for differences in group mean scores between rates of presentation in order to evaluate statistical significance.

Statistical Design

Group mean scores were collected for each rate of presentation and for each of the groups shown in Table 1.

An analysis of variance was run to see if there were significant differences between rates of presentation for all subjects and above-average, average, and below-average students (across the rows). Differences within the three rates of presentation between the above-average, average, and below-average groups (down the columns) were analyzed. Interaction or lack of interaction was also noted.

A correlation analysis between standardized reading-test scores and RS-test scores was used to interpret the relationship between reading ability and listening.

CHAPTER IV

FINDINGS AND DISCUSSION

The results reported in this chapter will be presented with two pilot study findings followed by the results of the primary investigation. Mean scores will be reported comparing each rate of presentation with all subjects, and a separate report of mean scores by each of the groups on all rates of presentation. Any interaction between groups will be so noted.

A correlation between the Reading Storage Test (RS-test) and the reading comprehension scores of the Gates-MacGinitie Reading Test will be analyzed and interpreted, and the reliability of the RS-test as a measurement will be supported by statistical formula.

Pilot Study #1

Three sixth-grade students from a suburban community were randomly selected and asked to participate in this study to determine whether the RS-test could be used successfully with 11- and 12-year-olds. The passage, "The Ground that Gives Way," from Reading for Concepts, Book G, by Webster/McGraw-Hill, was taped by the experimenter at approximately 150 words per minute. A brief

introduction as well as a sample passage, "Form Page to Knight," taken from Book D of the Reading for Concepts series by the same publisher, were included in the tape presentation.

The main selection, "The Ground that Gives Way," was analyzed for readability level, using the Fry Readability Graph. A level of sixth-grade readability was established, although the publishers of Reading for Concepts reported that passages in Book G ranged from 5.5 to 6.1 with an average of 5.8, using the Dale-Chall Readability Formula.

The sample selection, "From Page to Knight," taken from Book D of the same series, was measured at fifth-grade readability, using the Fry Readability Graph, with the publishers giving this series a range of 3.6 to 4.2 and an average reading level of 3.9.

Each of the three students were given the Fry Oral Reading Criterion Test (1971) to establish reading grade level, with primary focus on their ability to read sixth-grade material. All succeeded in reading from fourth- through sixth-grade passages without difficulty. Two of the three boys were able to read the seventh-grade passage on the independent level. Therefore, the examiner assumed that these subjects would have little or no difficulty reading the passages that were taped.

After listening to the instructions and completing the sample test, the three boys listened to the main selection, then proceeded to complete the RS-test. The range of RS-test scores of 1.2 to 13.7 with three cases suggested the possibility that this test does discriminate among abilities, and might indicate a relationship between reading ability and listening ability. Subjects who read seventh-grade material scored higher than the boy who read to the sixth-grade level on the Fry Oral Reading Criterion Test. This test was considered an appropriate measure of reading comprehension.

Pilot Study #2

A second pilot study was administered to three other sixth-graders from the East Brunswick community, randomly selected, to determine if an easier passage would produce different scores. Again the Fry Oral Reading Criterion Test was administered by the experimenter, and all students were able to read sixth-grade passages, with two students able to read the seventh-grade passage independently.

The main selection in this tape was "Taboos," taken from Reading for Concepts, Book D, which would place the passage at 3.6 to 4.2 readability, as listed by the publishers, but at the fifth-grade level as measured by the Fry Readability formula. As in the first pilot

study, subjects who read independently at the seventh-grade level, scored higher than the subjects who read at the sixth-grade level.

On the basis of the two pilots, "Taboos," the easier passage was used in the main study. The students reported the sample and main selection very interesting, although they found the RS-test format difficult.

The Main Study

The results of this study, using the material and procedures described in Chapter III, are reported in order to answer the hypotheses presented. Mean raw scores and standard deviations are given for all three rates of presentation as well as for all three reading groups. All scores were computed with the BMD Two-Way Analysis Variance, following the program outlined in BMD: Biomedical Computer Programs (Dixon, 1973), and use of the SPSS multiple-range tests (Statistical Package for the Social Sciences).

Hypothesis 1. Hypothesis 1 stated that there would be no significant difference on the mean scores of the RS-test between groups of students listening at the rates of 75, 150, and 225 words per minute. Table 4 reports the results of the rate of presentation and all students. Subjects scored higher on the RS-test at 75 words per minute than on the other rates of presentation. However, there was no significant difference between the

TABLE 4

MEAN SCORES AND STANDARD DEVIATIONS OF READING STORAGE TEST ON ALL SUBJECTS

Students	Rate of presentation*			Total
	75 wpm	150 wmp	225 wpm	
N	36	34	33	103
Mean score[a] (RS-test)	7.63	6.41	5.68	6.60
S.D.	4.0	3.4	3.6	3.7

[a]Maximum score possible on the RS-test is 19.

*No significant difference between means of three rates of presentation.

TABLE 5

ANALYSIS OF VARIANCE BETWEEN READING GROUPS

Source of variation	Sum of squares	df	Mean square	F ratio
Between group	638.1914	2	319.0957	22.327*
Within group	1429.1641	100	14.2916	
Total	2067.3555	102		

*$F(2/100) = 4.82$; $p > .01$.

mean scores, therefore substantiating the hypothesis. The results confirm Carver's theory that if the stimulus is not distorted, subjects will do better at decreased rates of presentation. However, comprehension will be better at 150 words per minute than at 225 words per minute. The trend of the means is consistent with Atkinson and Shiffrin's theory (1968) that if items selected for short-term memory store are presented too fast, the input and reorganization time will encroach upon the rehearsal time and prohibit some items from entering the Rehearsal Buffer, therefore making storage and recall difficult.

Hypothesis 2. Hypothesis 2 stated that there would be no significant difference between students with above-average, average, and below-average reading comprehension scores at the three rates of presentation. Table 5 reports the analysis of variance between the groups, and Table 6 presents the results of the reading groups and the three rates of presentation. Above-average subjects were significantly higher than the average and below-average groups. The total means for all rates of presentation were beyond the .01 level of confidence. The Newman-Keules Multiple-Range Test and the Duncan Multiple-Range Test substantiated that above-average students were, in fact, significantly higher than either of the other two groups at the .05 level of confidence.

TABLE 6

3 x 3 FACTORIAL DESIGN OF LISTENING COMPREHENSION AND RATE OF PRESENTATION WITH MEAN SCORES

Reading group		Rate of presentation			Total means
		75 wpm	150 wpm	225 wpm	
Above average (upper third)	N	12	12	11	35
	$\bar{X}$	11.06	10.58	7.71	9.84*
	S.D.	4.00	3.62	3.15	3.81
Average (middle third)	N	12	11	12	35
	$\bar{X}$	6.88	5.45	5.60	5.99
	S.D.	4.98	3.25	3.87	4.05
Below average (lower third)	N	12	11	10	33
	$\bar{X}$	4.94	2.82	3.54	3.81
	S.D.	2.97	3.39	3.91	3.43
All subjects	N	36	34	33	103
	$\bar{X}$	7.63	6.41	5.68	6.60
	S.D.	4.00	3.40	3.60	4.50

*F ratio = 23.25; $F(2/98) = 4.83$; $p > .01$.
Significant beyond .01 level of confidence.

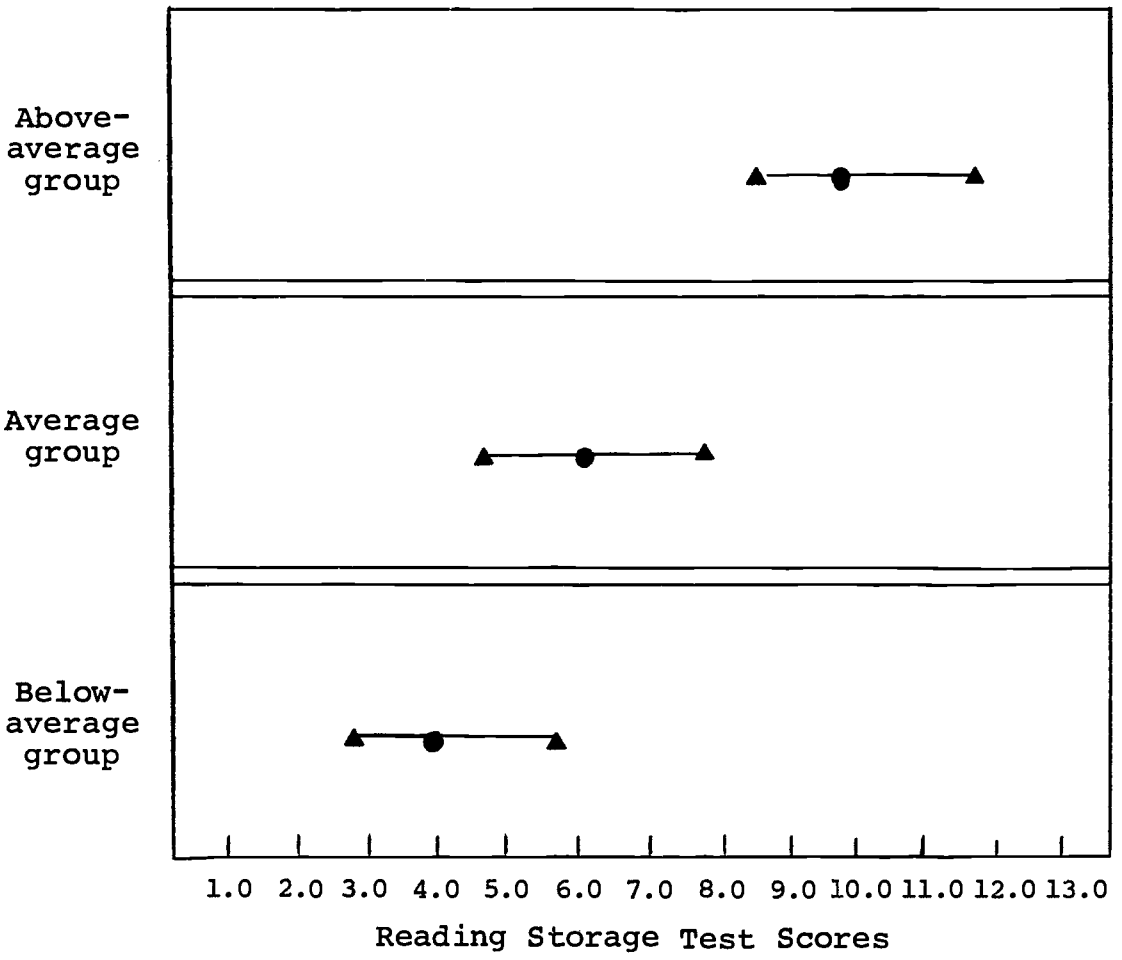
There was, however, no significant difference between the average and below-average groups. The confidence interval presented in Figure 2 confirms that while there was a significant difference between the above-average group and the other groups, the differences between the average and below-average groups cannot be accepted, for these differences may be due to random errors.

The hypothesis can be accepted to a limited extent; there was no significant difference between the two lower groups in RS-test scores. However, there was a significant difference between the above-average and other groups which would not substantiate the overall initial statement of the hypothesis. The results of the above-average scores would agree with previous studies which reported a high correlation between reading achievement and listening.

Hypothesis 3. Hypothesis 3 stated that there would be no interaction between the rate of presentation and the reading groups. Figure 3 presents a plot of the mean where no interaction has taken place for all groups and all presentations. Therefore, the hypothesis was supported.

Within-group Variability

To analyze the results more thoroughly, a within-group histogram was prepared illustrating the distribution



Above-average group = 8.53 to 11.15
Average group = 4.60 to 7.38
Below-average group = 2.60 to 5.03

Figure 2. Confidence interval for mean of three reading groups on the Reading Storage Test (.95 confidence).

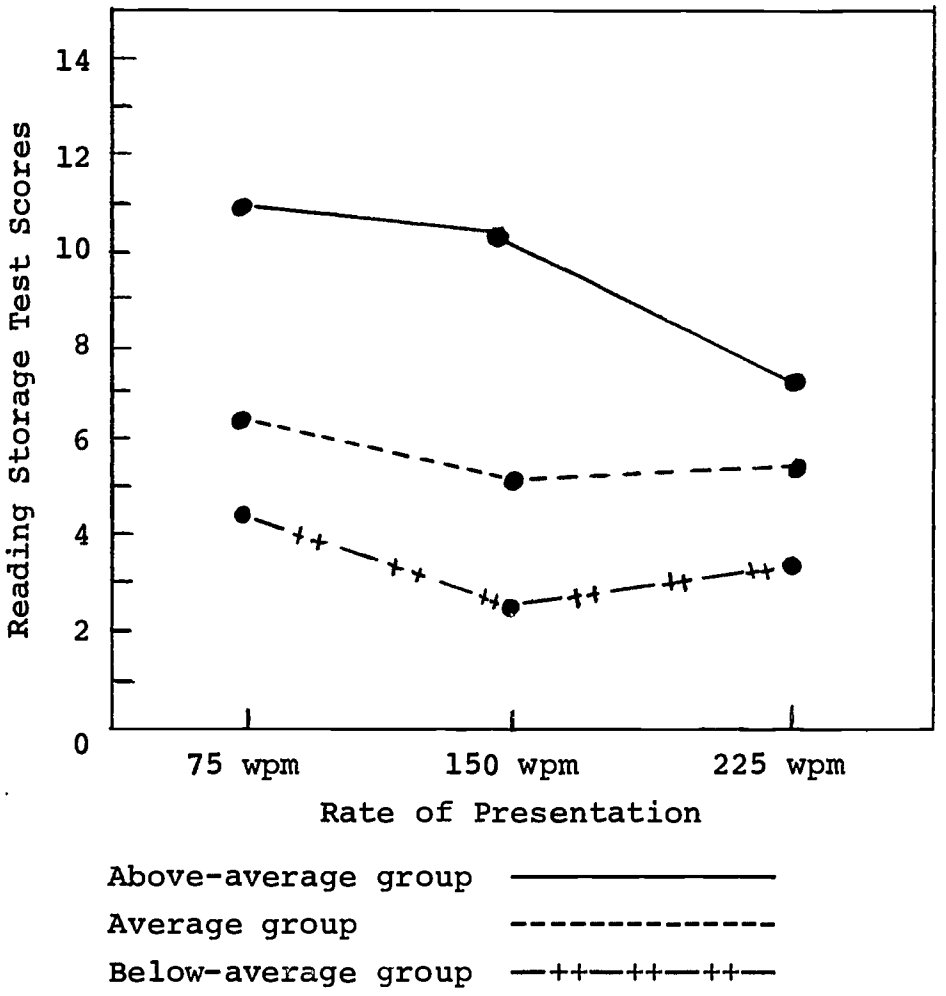


Figure 3. Means of the Reading Storage Test among three reading groups.

of scores. The results are shown in Figures 4, 5, and 6. The above-average group scores on the RS-test clustered at higher levels than did the other groups.

Reliability of the Reading Storage Test

Kussat (1974) reported a moderate reliability of .65 on the RS-test in his study. Based on the assumption that the items were homogeneous, the Kuder-Richardson, formula 20 (Cronbach, 1949) was used to assess reliability. The formula was as follows:

$$r = \frac{n}{n - 1} \left(\frac{1 - \varepsilon pq}{s^2}\right)$$

with $n = 19$

$pq = 4.41$

$s^2 = 26.8$

The reliability coefficient was .89.

Correlation Between the Reading Storage Test and Reading Comprehension Scores

A correlational analysis was computed with the BMD02D program (Dixon, 1973) to determine the relationship between reading comprehension scores and the RS-test. Table 7 presents the results. The correlation of .54 is moderately high, accounting for at least 25% of the variance between reading comprehension and listening. This correlation corresponds with the previous research results in the area of reading comprehension and listening

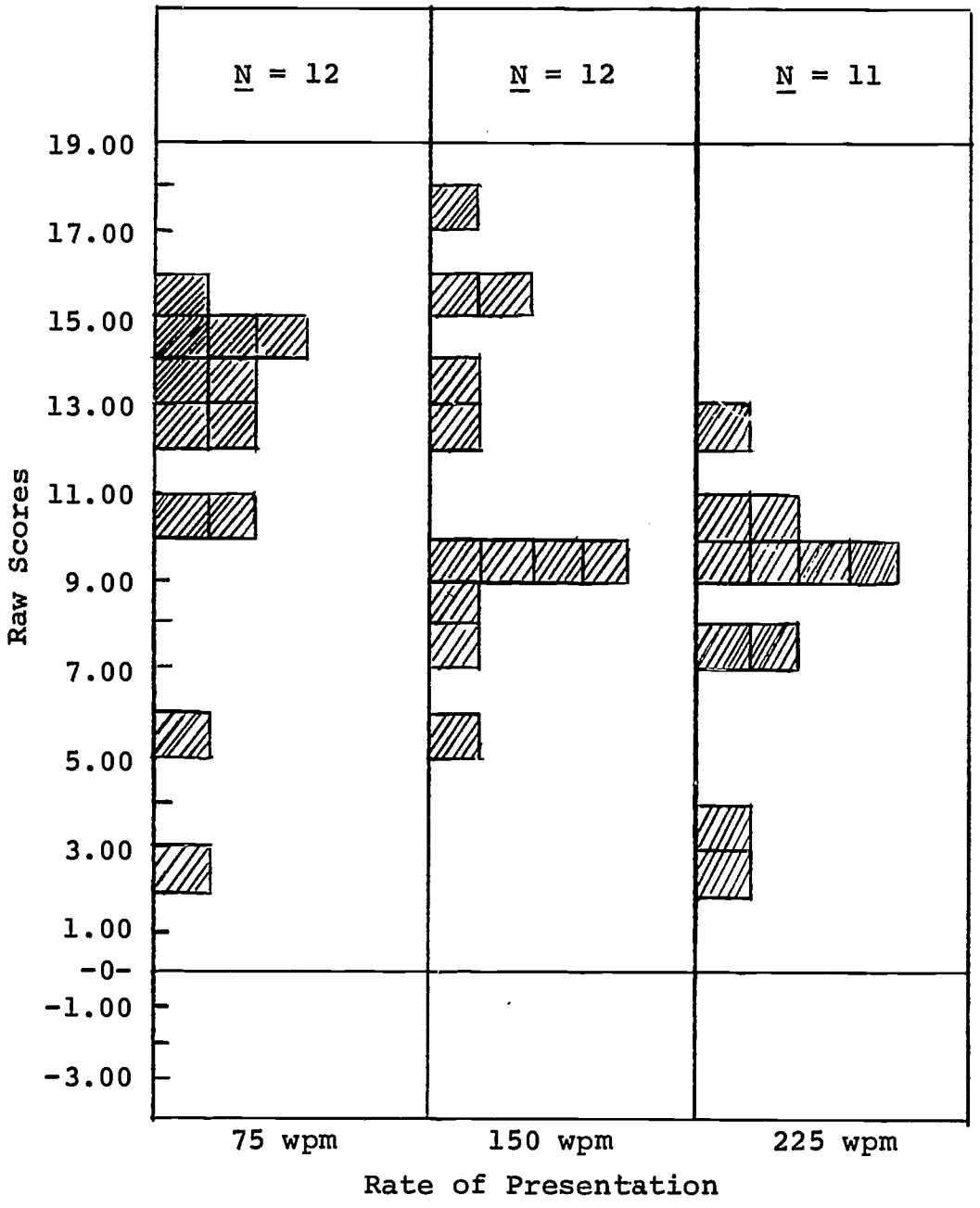


Figure 4. Histogram of Reading Storage Test scores for above-average students (N = 35).

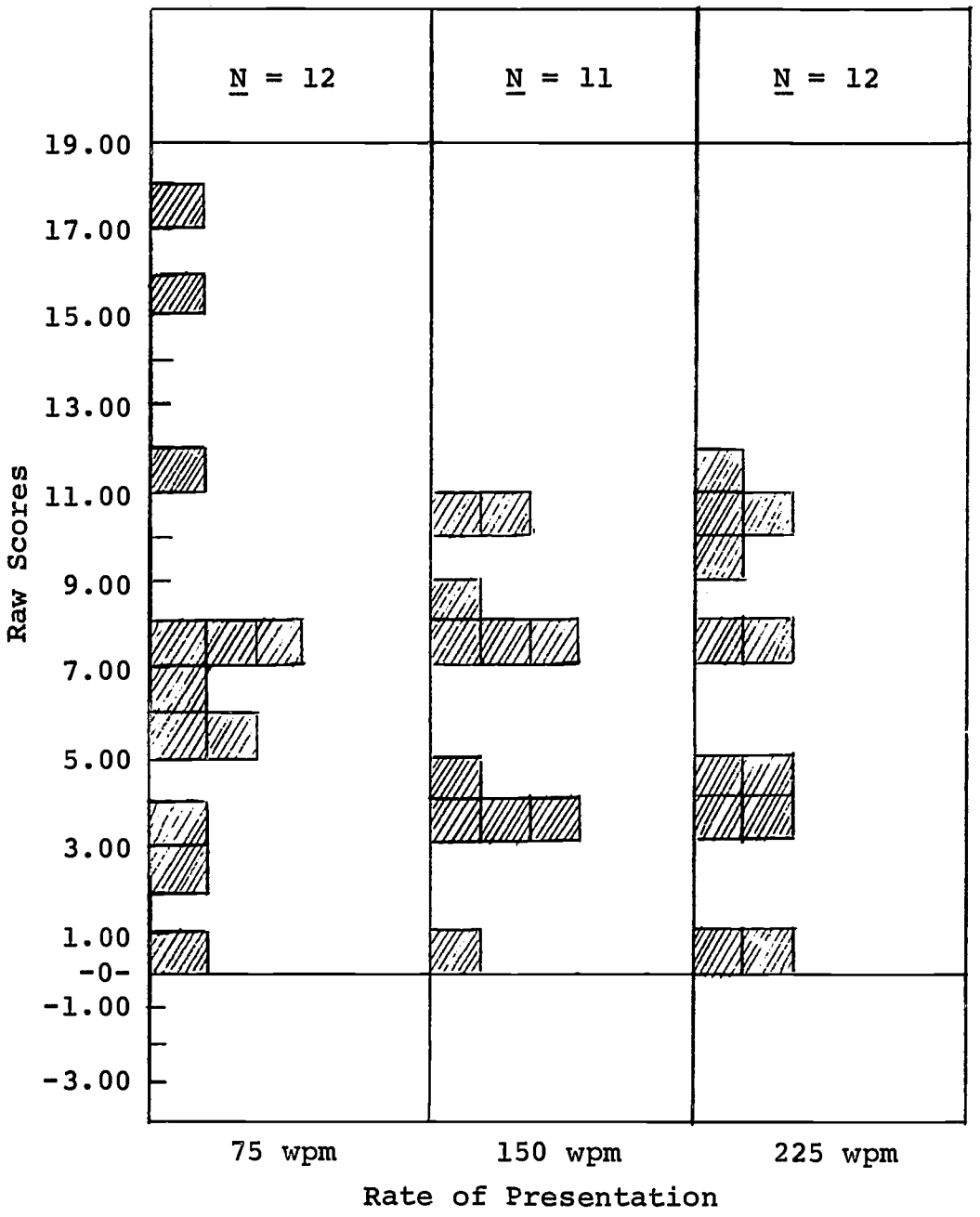


Figure 5. Histogram of Reading Storage Test scores for average students (N = 35).

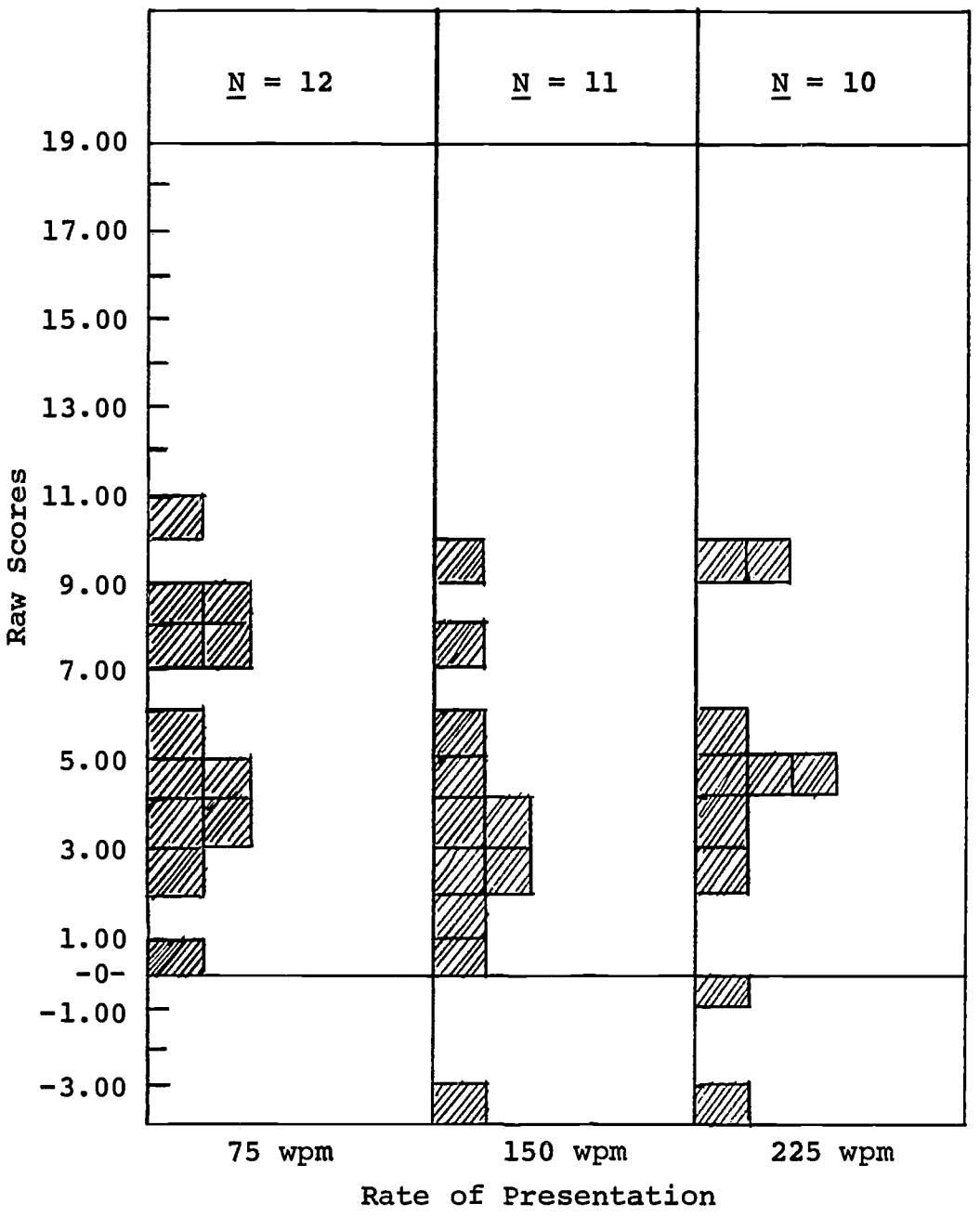


Figure 6. Histogram of Reading Storage Test scores for below-average students (N = 33).

TABLE 17

MEANS AND STANDARD DEVIATIONS OF READING COMPREHENSION TEST SCORES AND READING STORAGE TEST SCORES WITH CORRELATIONS

	Reading Comprehension* raw score	Reading Storage Test raw score
Means	44.85	6.60
S.D.	5.58	4.50
Correlation	.54	.54

*Gates-MacGinitie Reading Test, Survey D; comprehension subtest. Total possible raw scores = 52.

comprehension. After reviewing 20 studies from grade 2 through adulthood, Kuthy (1969) noted that the range of correlations between listening and reading varied between .21 to .80, with a median of .64.

It should be noted that the correlation of .54 in this study was obtained by comparison of a standardized test and the RS-test. Different correlations may reflect the specific reading and listening instruments used.

CHAPTER V

SUMMARY, CONCLUSIONS, AND DISCUSSION

This study attempted to establish the relationship between listening comprehension and rate of presentation. The problems were three-fold:

1. Do students comprehend more if listening rate is increased or decreased?

2. Does reading level affect listening comprehension at different rates of presentation?

3. Will there be an interaction between rate of presentation and reading ability?

In order to answer the questions and test the hypotheses, the entire sixth grade of one school in a suburban community in Central New Jersey was administered the comprehension subtest of the Gates-MacGinitie Reading Test. After raw scores were tabulated, the total of 103 subjects was divided into upper third, middle third, and lower third, and designated above average, average, and below average, respectively. One-third of each group was randomly selected to listen to a 192-word passage on a cassette tape at 75 words per minute, while another third, randomly selected, listened to the same passage at 150

words per minute, and the third group listened to the passage at 225 words per minute. A total of 33 to 36 students listened to each tape.

After listening to the tape, all groups were immediately given the Reading Storage Test (RS-test) with a total of 19 errors to be identified. Raw scores were then tabulated, and an analysis of variance conducted.

Effect of Rate of Presentation

The results of the data analyzed through analysis of variance indicated that sixth-grade students, regardless of reading ability, were better able to function with meaningful prose material presented at 75 words per minute as compared with 150 words per minute and 225 words per minute as measured by the RS-test. These results did not support those of Kussat (1974) and Carver (1973c), although their studies involved college students as subjects. All RS-test scores decreased when rate of presentation was increased, although the decrease was not statistically significant. It was noted that the mean scores were higher at 225 words per minute than at 150 words per minute for the average and below-average readers, but neither group scored anywhere near the above-average group.

It is possible to conjecture that the students in this study did not score higher at the 150 words per

minute rate of presentation than at 75, as was the case with college students, because their age did not permit them the scope of reading experience that college students would have. Perhaps their levels of abstraction and flexibility were not as sophisticated as those of college students, which is suggestive of Piaget's theory of development, whereby 11-year-olds may be at the concrete-operational level and college students have advanced to the formal operational level. Therefore, the recall processes of short-term memory may not be as responsive with sixth-graders as those of college-age subjects. This would suggest that sixth-graders need more time to process information. As Carver (1973b) suggested, "the duration threshold may vary in magnitude between individuals depending upon their ability and background experience [p. 125]."

Since there was no interaction between groups, it appears that rate of presentation affects comprehension directly with all students, regardless of reading ability. It is interesting to observe that as the above-average group continued a decrease in comprehension as reflected in their mean score, with the greatest loss at 225 words per minute, the other groups exhibited a contrary pattern with the lowest comprehension score found at the 150 presentation rate. None of the scores from the average and

below-average groups, however, were statistically significant. It would be interesting to observe these groups at another time to determine if these trends would be repeated or whether, in fact, these results reflected the uniqueness of the testing instrument. This investigator noted that many students had difficulty adapting to the new test format. Perhaps students attended to the testing instrument at the expense of recall.

Reitman (1970), in her study of information processing, using computer similation, found that the primacy effect (number of items recalled in sequence) varied with the rate of presentation of the items. In comparing results, she concluded, ". . . the runs with slower rates of presentation produced longer initial sequence of items [p. 132]." Perhaps, then, the pattern exhibited in this study is a more accurate reflection of information processing than other studies where comprehension appears highest at 150 words per minute as opposed to 75 words per minute.

The Reading Storage Test

The RS-test has been substantiated as a reliable instrument for measuring reading comprehension, as had been stated by Carver (1973c) and Kussat (1974). Reliability was measured by the Kuder-Richardson formula 20 to be .89. Since the RS-test is an objective measure

which can be easily administered, and compares favorably with other testing instruments such as the cloze procedure, it is recommended that this instrument be considered in future research involving reading and listening comprehension. This test specifically measures factual recall of information rather than abstract thinking and inferential judgment where intellectual ability, as opposed to comprehension of material, is being measured.

For those who may say that the RS-test is an exercise in memorization, Carver (1974c) states, ". . . it would seem to be impossible to concentrate on memorizing words and do very well on the Reading Storage Test since the amount of time allowed per word is so small [p. 17]."

In order to test for the primary effects of reading, Carver (1974a, c) administered the RS-test to subjects with and without prior reading of a passage. The relatively consistent results suggested that this test is sensitive to the primary effects of reading.

Reading Ability and Listening Comprehension

There was a positive correlation between reading ability and listening comprehension of .54, suggesting, as indicated in previous research, that a relationship does exist between reading and listening.

The above-average group scored significantly

higher than other groups at the .01 level of confidence regardless of the rate of presentation. However, they and the other groups all scored highest at the rate of 75 words per minute. It would appear that above-average readers can successfully use expanded and compressed tapes with meaningful prose material presented.

Suggestions for Future Research

A possible source for future investigation would be to compare these groups after an initial training period to measure the results after subjects have become accustomed to the various rates of presentation and/or the RS-test as a specific instrument for measuring comprehension.

Another area that may suggest different interpretation of the effects of rate of presentation would be to measure subjects with passages of varied difficulty and length using the RS-test specifically as the measuring instrument.

Feigenbaum (1970) suggested several theories involving the processing of information in human memory. Scanning stimuli encodings and images serially, by using an adaptive attention-focusing strategy, or assembling cue tokens, may aid in processing information in the memory system. It is possible that students who are more adroit in reading tasks will also be more adept at

listening tasks because their processing system is more discriminating than the processing system of students who are not as skilled in reading. Further research in the area of information processing may provide needed clarification of the reading-listening process.

Limitations and Implications of the Study

This investigation of the relationship between listening comprehension and rate of presentation was limited in scope to sixth-graders from a suburban community, presented with three different rates of presentation. As indicated in Table 7, the mean of the Gates-MacGinitie comprehension subtest of 44.85 is comparable to grade 8 level, as interpreted by the Teacher's Manual. Therefore, the reading comprehension level for the mean was approximately one-and-a-half years above the norm. The population of this study appears to be above the average for a sixth-grade group. The results should not be projected to other populations, nor should they be used to predict the effect of other rates of presentation.

While comparing these data with previous studies using compressed speech, one must be aware that the measuring instrument (the RS-test) was only used in studies reported by Carver (1971c, 1973c) and Kussat (1974).

Interpretations of the test results appear to indicate the pragmatic use of expanded speech with

above-average readers, as defined in this study. An alternate form, beside reading, for transmitting information has been used successfully with these students. Listening to passages at 75 words per minute can be another technique in building comprehension. Future studies may indicate that once subjects become more familiar with this new measuring instrument, comprehension levels will increase across the reading-ability groups.

BIBLIOGRAPHY

Anderson, H. A. Needed research in listening. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 174-186.

Armstrong, H. C. Auditory and visual vocabulary skills: Their relationship to reading achievement and potential. In Sam Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 106-117.

Atkinson, R. C., & Shiffrin, R. M. Human memory: A proposed system and its control processes. The pscyhology of learning and motivation. Vol. 2. New York: Academic Press, 1968.

Bixler, R. H., Foulke, E., Amster, C. H., & Nolan, C. Y. Comprehension of rapid speech by the blind. Cooperative Research Project No. 1005, Department of Psychology and Social Anthropology. Louisville, Ky.: University of Louisville, 1961. (Mimeographed)

Bois, J. S. A. The art of listening. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 43-47.

Brassard, M. B. Direct comparisons between listening and reading as language comprehension abilities in the intermediate grades. Paper presented at the conference of the American Educational Research Association, Minneapolis, Minn., March 1970.

Broadbent, D. E. Recent analysis of short-term memory. In K. H. Pribram & D. E. Broadbent (Eds.), Biology of memory. New York: Academic Press, 1970. Pp. 15-19.

Brown, E. R. The effect of pause deletion schemes on speech comprehension under time-compression conditions. New York: New York University, Department of Educational Psychology, July 1973. ERIC #ED084567.

Bruner, J. S. Going beyond the information given. Contemporary approaches to cognition. A symposium held at the University of Colorado. Cambridge: Harvard University Press, 1957.

Buros, O. K. (Ed.) The seventh mental measurements yearbook. Highland Park, N. J.: Prentice-Hall, 1970.

Campbell, D. T., & Stanley, J. C. Experimental and quasi-experimental designs for research on teaching. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963. Pp. 171-246.

Carver, R. P. What is reading comprehension and how should it be measured? In G. B. Schick & M. M. May (Eds.), Reading: Process and pedagogy. Nineteenth Yearbook of the National Reading Conference. Milwaukee, Wis.: National Reading Conference, 1970. Pp. 99-105.

Carver, R. P. A computer model of reading and its implications for measurement and research. Reading Research Quarterly, Summer 1971, 4, 449-471. (a)

Carver, R. P. Manual for the reading progress scale. Silver Spring, Md.: Revrac Publications, 1971. (b)

Carver, R. P. Procedures for constructing a variety of information-processing measures appropriate for prose materials. Silver Spring, Md.: Revrac Publications, 1971. (c)

Carver, R. P. Understanding, information processing, and learning from prose materials. Journal of Educational Psychology, 1973, 64, 76-84. (a)

Carver, R. P. Effect of increasing the rate of speech presentation upon comprehension. Journal of Educational Psychology, 1973, 65, 118-126. (b)

Carver, R. P. New techniques for measuring and improving reading comprehension. Silver Spring, Md.: American Institutes for Research, Technical Report No. 1, 1973. (c)

Carver, R. P. Measuring the primary effect of reading: Reading-storage technique, understanding judgments, and cloze. Journal of Reading Behavior, 1974, 3, 249-274. (a)

Carver, R. P. Revised procedures for developing reading-input materials and reading-storage tests. Journal of Reading Behavior, 1974, in press. (b)

Carver, R. P. Comparing the reading-storage test to the paraphrase test as measures of the primary effect of prose reading. Journal of Educational Psychology, 1974, in press. (c)

Carver, R. P. Reading-storage test, reading ability, passage difficulty, and understanding judgments. Unpublished manuscript, 1974. (d)

Coleman, E. B., & Miller, G. R. A measure of information gained during prose learning. Reading Research Quarterly, 1968, 3, 369-386.

Cramer, H. L. An introduction to speech time compression techniques: The early development of speech time compression concept and technology. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971.

Cronbach, L. J. Essentials of psychological testing. New York: Harper & Bros., 1949.

Dechant, E. V. Improving the teaching of reading. Englewood Cliffs, N. J.: Prentice-Hall, 1970.

Delcamp, R. M. Reading and listening comprehension of fifth-grade pupils as measured by the cloze procedure. Unpublished master's thesis, Rutgers--The State University of New Jersey, 1969.

Dixon, W. J. (Ed.) BMD: Biomedical computer programs. (Rev. ed.) Los Angeles: University of California Press, 1973.

Duker, S. Goals of teaching listening skills in the elementary school. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 203-210.

Feigenbaum, E. A. Information processing and memory. In D. A. Norman (Ed.), Models of human memory. New York: Academic Press, 1970. Pp. 451-468.

Fessenden, S. A. Levels of listening--a theory. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 28-33.

Finkenbinder, R. L. A descriptive study of the Goldman-Fristoe-Woodcock Test of auditory discrimination and selected reading variables with primary school children. Journal of Special Education, Summer 1973, 7, 125-131.

Foulke, E. Listening comprehension as a function of word rate. The Journal of Communication, 1968, 18, 198-206.

Foulke, E., & Sticht, T. G. Listening rate preferences of college students for literary material of moderate difficulty. Journal of Auditory Research, 1966, 6, 397-401.

Foulke, E., & Sticht, T. G. Review of research on the intelligibility and comprehension of accelerated speech. Psychological Bulletin, 1969, 72, 50-62.

Friedman, H. L., Orr, D. B., & Grace, C. N. Effects of listening aids and self-pacing on the comprehension of time-compressed speech. Proceedings of the 75th Annual Convention of American Psychological Association, 1967, 2, 279-280.

Friedman, H. L., & Johnson, R. L. Compressed speech: Correlates of listening ability. Journal of Communications, 1968, 18, 207-218.

Fry, E. Oral reading criterion test. Highland Park, N. J.: Dreier Educational Systems, 1971.

Gates, A. I., & MacGinitie, W. H. Teacher's Manual: Gates-MacGinitie Reading Tests, Survey D. New York: Teachers College Press, Columbia University, 1965.

Ginsburg, H., & Oppen, S. Piaget's theory of intellectual development: An introduction. Englewood Cliffs, N. J.: Prentice-Hall, 1969.

Goldstein, H. Reading and listening comprehension at various controlled rates. Contributions to Education, No. 821. New York: Bureau of Publications, Teachers College, Columbia University, 1940.

Gropper, R. L. Comprehension of narrative passages by fourth-grade children as a function of listening rate and eleven predictor variables. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on

rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971. Pp. 231-252.

Guilford, J. P., & Hoepfner, R. The analysis of intelligence. New York: McGraw-Hill, 1971.

Harwood, K. A. A concept of listenability. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 21-24.

Heise, R. The intelligibility of compressed words. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971. Pp. 70-79.

Hoepfner, R. (Ed.) CSE elementary school test evaluations. Los Angeles, Calif.: UCLA Graduate School of Education, Center for the Study of Evaluation, 1970.

Horowitz, M. W., & Berkowitz, A. Listening and reading, speaking and writing: An experimental investigation of differential acquisition and reproduction of memory. Perceptual and Motor Skills, 1967, 24, 207-215.

Jester, R. E. Comprehension of connected meaningful discourse as a function of individual differences and rate and modality of presentation. (Unpublished doctoral dissertation, University of Utah, 1966.) Ann Arbor, Mich.: University Microfilms, No. 66-10488.

Johnson, W. Do you know how to listen? In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 34-42.

Keller, P. W. Major findings in listening in the past ten years. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 145-154.

Kessler, J. Aural and visual presentation of comprehension exercises and the effect upon reading achievement and listening achievement. Unpublished master's thesis, Rutgers--The State University of New Jersey, 1969.

Kussat, R. G. Information retained as a function of presentation rate of time-compressed speech. Unpublished doctoral dissertation, Rutgers--The State University of New Jersey, 1974.

Kuthy, N. Listening comprehension of good and poor readers in ninth grade. Unpublished master's thesis, Rutgers--The State University of New Jersey, 1969.

Liddle, W. Reading for concepts. Book D and Book G. New York: Webster/McGraw-Hill, 1970.

Maccoby, E. E., & Konrad, K. W. The effect of preparatory set on selective listening: Developmental trends. Monographs of the Society for Research in Child Development, 1967, 32, No. 4.

McGaugh, J. L. Memory storage processes. In K. H. Pribram & D. E. Broadbent (Eds.), Biology of memory. New York: Academic Press, 1970. Pp. 51-61.

Meyerson, L., & Michael, J. L. The measurement of sensory thresholds in exceptional children. Cooperative Research Project #418, University of Houston, Houston, Texas, 1960.

Moe, I. L. Measuring listening skills to predict reading potential. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 118-123.

Moray, N. Attention: Selective processes in vision and hearing. New York: Academic Press, 1970.

Murdock, B. B. Short- and long-term memory for associations. In K. H. Pribram & D. E. Broadbent (Eds.), Biology of memory. New York: Academic Press, 1970. Pp. 11-13.

Napier, G. D. An investigation into extended use of time-compressed speech with intermediate-grade subjects. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971.

Nichols, R. G., & Stevens, L. A. Are you listening? New York: McGraw-Hill, 1957.

Nolan, C. Y., & Morris, J. E. Effects of motivation and word rate on aural comprehension. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971. Pp. 224-230.

Norman, D. A. Introduction: Models of human memory. In D. A. Norman (Ed.), Models of human memory. New York: Academic Press, 1970. Pp. 1-15.

Norman, D. A. Memory and attention: An introduction to human information processing. New York: Wiley, 1969.

Oakland, T. D., Williams, F. C., & Harmer, W. R. A longitudinal study of auditory perception and reading instruction with first-grade negro children. Journal of Special Education, Summer 1973, 7, 141-154.

Orr, D. B. Time compressed speech--a perspective. The Journal of Communication, 1968, 18, 288-292.

Orr, D. B. The measurement of listening comprehension. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971. Pp. 219-223.

Parker, C. C. Effect of rate of compression and mode of presentation on the compression of a recorded communication to junior college students of varying aptitudes. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971.

Pinkus, A. L., & Laughery, K. R. Short-term memory: Effects of pronunciability and phonemic uniqueness of chunks. Proceedings of the 75th Annual Convention of the American Psychological Association, 1967, 2, 65-66.

Postlethwait, S. N., Novak, J., & Murray, H. T., Jr. The audio-tutorial approach to learning. Minneapolis, Minn.: Burgess Publishing, 1972.

Pratt, L. E. Effectiveness of listening instruction. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 234-237.

Rankin, P. T. Listening ability and its components. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 25-27. (a)

Rankin, P. T. Frequency of use of listening. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 51-62. (b)

Reiland, M. L. The effect of compressed speech on reading and listening abilities of sixth-grade children. Unpublished doctoral dissertation, Rutgers--The State University of New Jersey, 1970.

Reitman, J. S. Computer simulation of an information-processing model of short-term memory. In D. A. Norman (Ed.), Models of human memory. New York: Academic Press, 1970. Pp. 117-148.

Rossiter, C. M., Jr. Rate-of-presentation effects on recall of facts and of ideas and on generation of inferences. AV Communication Review, 1971, 19, 313-322.

Skinner, P. H. Listening comprehension of time compressed speech as a function of variations in word rate and type of evaluation instrument. (Unpublished doctoral dissertation, University of Pittsburgh, 1972.) Ann Arbor, Mich.: University Microfilms, 1972. No. 72-22 701.

Spinelli, D. N. OCCAM: A computer model for a content addressable memory in the central nervous system. In K. H. Pribram & D. E. Broadbent (Eds.), Biology of memory. New York: Academic Press, 1970. Pp. 293-306.

Sticht, T. G. Studies on the efficiency of learning by listening to time-compressed speech. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971. Pp. 80-89.

Sticht, T. G., & Glasnapp, D. R. Effects of speech rate, selection difficulty, association strength and mental aptitude on learning by listening. Journal of Communication, 1972, 22, 174-188.

Taylor, S. E. Listening. Washington, D.C.: American Educational Research Association, 1964.

Thames, K. H., & Rossiter, C. M., Jr. The effects of reading practice with compressed speech on reading rate and listening comprehension. AV Communication Review, 1972, 20, 35-42.

Trabasso, T., & Bower, G. H. Attention in learning: Theory and research. New York: Wiley, 1968.

Walker, C. R. A comparison of two techniques for increasing the rate of reading of sixth-grade gifted pupils: The compressed speech machine and the self-improvement methods. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971. Pp. 253-259.

Weaver, W. W., & Bickley, A. C. Sources of information for responses to reading test items. Proceedings of the 75th Annual Convention of the American Psychological Association, 1967, 2, 293-294.

Williams, D. V., & Williams, J. P. Children's verbal learning and comprehension in the aural and visual modes. New York: Ithaca College, 1972.

Wilt, M. E. Demands on the listening skills of elementary school children. In S. Duker (Ed.), Listening: Readings. Metuchen, N. J.: Scarecrow Press, 1966. Pp. 63-80.

Woodcock, R. W. The application of rate-controlled recordings in the classroom. In E. Foulke (Ed.), Proceedings of the Second Louisville Conference on rate and/or frequency-controlled speech. Louisville, Ky.: Center for Rate-Controlled Recordings, University of Louisville, 1971. Pp. 90-102.

Young, R. Q. An experimental investigation of reading and listening comprehension and of use of readability formulas as measures of listenability. (Unpublished doctoral dissertation, Ohio University, 1972.) Ann Arbor, Mich.: University Microfilms, 1972, No. 72-22, 072.

APPENDIX A

DIRECTIONS GIVEN TO STUDENTS

VIA TAPE RECORDING

(Directions given at the rate of 150 wpm. Only the sample passage and main selection varied with each group.)

Hello Boys and Girls!

You are being asked to listen very carefully to a passage and then take a short comprehension test based on the information you have heard. Try to remember the words.

After the passage is completed, you will be given a copy of the story. However, every other word has been left out. Only the beginning letter of the word remains. Be careful! You must be a good detective. One of the beginning letters in every line is wrong. See if you can find that wrong letter.

Here is a sample for you. Listen for the word "begin" and concentrate on the passage. Be ready to find the errors on the test that follows. Ready. "Begin."

The title of this story is "From Page to Knight."

(Insert sample passage here)

Teachers, please hand out the test forms. Stop the tape until everyone has a test. (Pause.)

Notice that the first three answers have been done for you. Let us review them together. The passage began--

"During the Middle Ages . . ."

Therefore, D equals During, but G is wrong.

Follow along as I re-read the first three lines.

"During the Middle Ages in England, all boys from important families were expected to become knights. But first, they had to learn many things. When a boy was seven, he. . . ."

Now see if you can find the errors on the next four lines. There is only one error per line. Cross out the wrong beginning letter. After you complete this sample, you will be ready for the main selection.

Now that you have seen what the test is like, be ready to listen carefully and again find the wrong beginning letter in each line. When you hear the word, "begin," the story is ready. The name of this selection is "Taboos." Ready. "Begin. . . ."

The test is now over. Thank you for your cooperation. I hope you enjoyed this selection.

APPENDIX B

PASSAGES USED IN PILOT AND MAIN STUDY AND THE READING STORAGE TESTS USED

SAMPLE PASSAGE USED IN TAPING

From Page to Knight*

During the Middle Ages in England, all boys from important families were expected to become knights. But first, they had to learn many things.

When a boy was seven, he was sent to a friend's castle. There, he started his training as a page. He began by doing all kinds of small tasks. He also learned to ride a horse. He had to do his work well and without a fuss.

*Taken from Reading for Concepts, Book D, by William Liddle, © 1970, with permission of Webster/McGraw-Hill Book Company.

Name_____ Date_____

READING STORAGE TEST

Sample Test

Directions: Cross out the one wrong beginning letter in each row. The first three answers have been done for you.

FROM PAGE TO KNIGHT*

D__ THE ~~G~~__ AGES I__ ENGLAND A__ BOYS F__ IMPORTANT

F__ WERE E__ TO B__ KNIGHTS ~~K~~__ FIRST T__ HAD

T__ LEARN ~~K~~__ THINGS W__ A B__ WAS S__ HE

W__ SENT F__ A F__ CASTLE T__ HE S__ HIS

T__ AS A__ PAGE H__ BEGAN B__ DOING V__ KINDS

O__ SMALL Y__ HE A__ LEARNED T__ RIDE A__ HORSE

H__ HAD T__ DO B__ WORK W__ AND W__ A FUSS

*Taken from Reading for Concepts, Book D, by William Liddle, © 1970, with permission of Webster/McGraw-Hill Book Company.

MAIN SELECTION USED FOR PILOT STUDY

The Ground that Gives Way*

A man steps on what seems like solid ground but discovers with horror that the ground is giving way beneath his feet. The man struggles desperately, but he is trapped. He cannot escape. Slowly he sinks deeper and deeper until at last he is gone, buried in the treacherous earth. The solid ground was solid only in appearance. It was actually quicksand, which is a deep mass of fine sand mixed with water.

How is quicksand formed? Water pushes up from below the surface and is held by the sand. The grains of sand are forced apart by the water. They cannot hold any weight. The subsurface water may have come from a spring, a river, or a stream. Sometimes pools of water near beaches become filled with sand. When the soil under these pools does not allow for good drainage, the sand can become stretches of quicksand.

Is it true that a man who steps into quicksand is doomed to die? No, for men have fought their way from quicksand to firm land again. It is panic that creates the condition that can result in death, for the more a person struggles, the worse matters become. Quick movements will make the sand yield temporarily, but then it rushes back and settles solidly around the body.

A man trapped in quicksand should either lie back, or not move at all, except to stretch out his arms. When the weight of the sand his body has displaced equals his weight, he will stop sinking. With feet held still, and with slow movements of the arms, as in the backstroke in swimming, men have managed to roll to safety and reach firm ground.

*Taken from Reading for Concepts, Book G, by William Liddle, © 1970, with permission of Webster/McGraw-Hill Book Company.

Name_____

THE GROUND THAT GIVES WAY

Directions: Cross out the one wrong letter in each row.

A M__ STEPS O__ WHAT S__ LIKE B__ GROUND B__

DISCOVERS W__ HORROR T__ THE F__ IS G__ WAY B__

HIS F__ THE M__ STRUGGLES D__ BUT H__ IS P__

HE C__ ESCAPE F__ HE S__ DEEPER A__ DEEPER U__

AT F__ HE I__ GONE B__ IN T__ TREACHEROUS E__

THE B__ GROUND W__ SOLID O__ IN A__ IT W__

ACTUALLY Q__ WHICH C__ A D__ MASS O__ FINE S__

MIXED W__ WATER H__ IS Q__ FORMED L__ IS P__

UP F__ BELOW T__ SURFACE T__ IS H__ BY T__

SAND T__ GRAINS O__ SAND A__ FORCED A__ BY M__

WATER T__ CANNOT D__ ANY W__ THE S__ WATER M__

HAVE P__ FROM A__ SPRING A__ RIVER O__ A S__

SOMETIMES P__ OF W__ NEAR C__ BECOME F__ WITH S__

WHEN T__ SOIL U__ THESE P__ DOES N__ ALLOW H__

GOOD D__ THE N__ CAN B__ STRETCHED O__ QUICKSAND I__

IT T__ THAT A__ MAN W__ STEPS F__ QUICKSAND I__

DOOMED T__ DIE N__ FOR D__ HAVE F__ THEIR W__

FROM Q__ TO F__ LAND V__ IT I__ PANIC T__

CREATES I__ CONDITION T__ CAN R__ IN D__ FOR T__

MORE A__ PERSON L__ THE W__ MATTERS B__ QUICK M__

WILL M__ THE S__ YIELD T__ BUT H__ IT R__

BACK A__ SETTLES V__ AROUND T__ BODY A__ MAN T__

IN Q__ SHOULD N__ LIE B__ OR N__ MOVE A__

ALL E__ TO S__ OUT W__ ARMS W__ THE W__

OF T__ SAND H__ BODY C__ DISPLACED E__ HIS W__

HE WILL STOP SINKING

MAIN SELECTION USED IN TAPING

AND IN READING STORAGE TEST

Taboos*

There are certain things which people think they must not so. These are called taboos. People who have a taboo act in a certain way. They think that to act differently would bring bad luck. Some people think that walking under a ladder will bring bad luck.

For the people of one tribe in Africa, it was taboo to count anything. If a man wanted to know how many goats he had, he looked quickly at them. Then he guessed how many goats were there. He thought something bad would happen to his goats if he counted them.

For another tribe in Africa, it was taboo to talk about the misfortune of a forefather. These people thought the forefather's spirit would hear them and become angry. Then the spirit would punish them.

Saying his own name was taboo for a Polar Eskimo. He believed evil spirits were always listening when he spoke. It would not be safe for him to say his name out loud. The evil spirits would cause bad luck. If someone asked, "Who is there?" the Eskimo would only answer, "It is I." He would never give his name.

*Taken from Reading for Concepts, Book D, by William Liddle, © 1970, with permission of Webster/McGraw-Hill Book Company.

Name_____ Date_____

READING STORAGE TEST

Directions: Cross out the one wrong beginning letter in each row.

TABOOS*

T__ ARE C__ THINGS W__ PEOPLE H__ THEY M__ NOT

D__ THESE A__ CALLED T__ PEOPLE R__ HAVE A__ TABOO

A__ IN A__ CERTAIN Y__ THEY T__ THAT T__ ACT

D__ WOULD B__ BAD M__ SOME P__ THINK T__ WALKING

U__ A T__ WILL B__ BAD L__ FOR T__ PEOPLE

O__ ONE T__ IN S__ IT W__ TABOO T__ COUNT

Q__ IF A__ MAN W__ TO K__ HOW M__ GOATS

H__ HAD H__ LOOKED T__ AT T__ THEN H__ GUESSED

H__ MANY H__ WERE T__ HE T__ SOMETHING B__ WOULD

H__ TO H__ GOATS I__ HE S__ THEM F__ ANOTHER

T__ IN A__ IT W__ TABOO T__ TALK R__ THE

M__ OF A__ FOREFATHER H__ PEOPLE T__ THE F__ SPIRIT

D__ HEAR T__ AND B__ ANGRY T__ THE S__ WOULD

P__ THEM S__ HIS O__ NAME C__ TABOO F__ A

P__ ESKIMO H__ BELIEVED N__ SPIRITS W__ ALWAYS L__ WHEN

H__ SPOKE I__ WOULD F__ BE S__ FOR H__ TO

S__ HIS K__ OUT L__ THE E__ SPIRITS W__ CAUSE

J__ LUCK I__ SOMEONE A__ WHO I__ THERE T__ ESKIMO

W__ ONLY A__ IT C__ I H__ WOULD N__ GIVE

H__ N__

*Taken from Reading for Concepts, Book D, by William Liddle, © 1970, with permission of Webster/McGraw-Hill Book Company.

APPENDIX C

DISTRIBUTION CHART OF SUBJECT RAW SCORES

DISTRIBUTION CHART OF SUBJECT RAW SCORES

Student No.	Grade	Reading Comprehension score (Gates-MacGinitie Reading Test)	Group Designation	Reading Storage Test
				at 75 wpm
1	6	52	A-A	10.2
2	6	52	A-A	14.0
3	6	51	A-A	12.7
4	6	51	A-A	15.2
5	6	50	A-A	10.2
6	6	50	A-A	12.7
7	6	49	A-A	14.0
8	6	49	A-A	5.2
9	6	49	A-A	11.5
10	6	49	A-A	11.5
11	6	49	A-A	14.0
12	6	48	A-A	1.5
13	6	48	A	16.5
14	6	48	A	10.5
15	6	48	A	0.2
16	6	47	A	6.5
17	6	47	A	5.2
18	6	47	A	5.2
19	6	46	A	15.2
20	6	45	A	1.5
21	6	45	A	6.5
22	6	44	A	6.0
23	6	44	A	6.5
24	6	43	A	2.7
25	6	42	B-A	1.7
26	6	42	B-A	10.2
27	6	42	B-A	3.0
28	6	41	B-A	6.5
29	6	40	B-A	-0.2
30	6	40	B-A	4.0
31	6	40	B-A	7.7
32	6	38	B-A	4.0
33	6	37	B-A	6.5
34	6	34	B-A	8.0
35	6	32	B-A	2.7
36	6	24	B-A	5.2
				at 150 wpm
37	6	52	A-A	9.0

DISTRIBUTION CHART OF SUBJECT RAW SCORES (continued)

Student No.	Grade	Reading Comprehension score (Gates-MacGinitie Reading Test)	Group Designation	Reading Storage Test
38	6	52	A-A	8.2
39	6	51	A-A	15.2
40	6	50	A-A	12.7
41	6	50	A-A	16.5
42	6	50	A-A	15.2
43	6	49	A-A	9.0
44	6	49	A-A	9.0
45	6	49	A-A	9.0
46	6	49	A-A	11.5
47	6	49	A-A	6.5
48	6	48	A-A	5.2
49	6	48	A	7.7
50	6	48	A	6.5
51	6	48	A	4.0
52	6	47	A	10.2
53	6	47	A	10.2
54	6	46	A	2.7
55	6	46	A	2.7
56	6	45	A	6.5
57	6	45	A	0.2
58	6	44	A	6.5
59	6	43	A	2.7
60	6	43	B-A	5.2
61	6	42	B-A	1.5
62	6	41	B-A	3.2
63	6	41	B-A	6.5
64	6	40	B-A	2.7
65	6	40	B-A	9.0
66	6	39	B-A	0.2
67	6	38	B-A	0.5
68	6	37	B-A	1.5
69	6	33	B-A	-3.5
70	6	31	B-A	4.2
				at 225 wpm
71	6	52	A-A	10.2
72	6	51	A-A	8.7
73	6	51	A-A	10.2
74	6	50	A-A	9.0
75	6	50	A-A	9.0
76	6	50	A-A	9.0

DISTRIBUTION CHART OF SUBJECT RAW SCORES (continued)

Student No.	Grade	Reading Comprehension score (Gates-MacGinitie Reading Test)	Group Designation	Reading Storage Test
77	6	49	A-A	6.5
78	6	49	A-A	6.5
79	6	49	A-A	11.5
80	6	49	A-A	2.7
81	6	49	A-A	1.5
82	6	48	A	9.0
83	6	48	A	0.2
84	6	48	A	2.7
85	6	47	A	4.0
86	6	47	A	2.7
87	6	47	A	10.2
88	6	46	A	6.7
89	6	46	A	11.5
90	6	45	A	0.2
91	6	44	A	9.5
92	6	44	A	4.0
93	6	43	A	6.5
94	6	43	B-A	4.0
95	6	42	B-A	9.0
96	6	42	B-A	5.2
97	6	41	B-A	1.5
98	6	41	B-A	-1.0
99	6	40	B-A	9.0
100	6	38	B-A	4.2
101	6	36	B-A	3.0
102	6	33	B-A	4.0
103	6	29	B-A	-3.5

COURSE WORK FOR MASTER'S DEGREE IN READING

Course		Instructor
Summer 1962		
PS 566	Survey of Educational Systems (Butler University, Indiana)	Dr. Best
Spring 1971		
15: 290:510	Social Psychology in the Classroom	Dr. Tuckman
Fall 1971		
15: 230:570	Foundations of Education	Dr. Hostetter
Fall 1972		
15: 299:561	Foundations of Reading	Dr. Kling
Spring 1973		
15: 299:501	Introduction to Education Tests and Measurements	Dr. Geyer
Summer 1973		
15: 299:564	Remedial Reading	Dr. Zelnick
15: 299:565	Lab in Remedial Reading	Dr. Zelnick
Fall 1973		
15: 290:512	Infancy and Early Childhood	Dr. Shannon
Spring 1974		
17: 610:521	Materials for Children	Dr. Fitzgibbons

Course		Instructor
Summer 1974		
61: 830:212	Topics in Applied Psychology	Dr. Fusella
Fall 1974		
15: 290:519	Introduction to Exceptional Children	Dr. Chase
15: 299:566	Seminar in Reading	Dr. Fry
Spring 1975		
15: 299:599	Master's Thesis Research	Dr. Kling

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College: Hunter College
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September 1957 to June 1961, B.A.

Brooklyn College
Brooklyn, New York
January 1962 to June 1962

Butler University
Indianapolis, Indiana
July 1962 to January 1963

Rutgers--The State University
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January 1971 to June 1975, M.Ed.

Professional Experience:

1961-1962 Teacher--Grade 2
P. S. 167
Brooklyn, New York

1962-1963 Teacher--Grade 2
School 102
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1964-1966 Teacher--Grade 3
Brookside School
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1974 Supplemental Instructor
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