THE RELATIONSHIP OF RATES OF LANGUAGE PROCESSING USING AURAL AND VISUAL MODALITIES: LISTENING COMPREHENSION OF TIME-COMPRESSED SPEECH AND READING COMPREHENSION USING SPEEDED READING

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ABSTRACT

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The Problem

Since listening comprehension and reading comprehension have been demonstrated to have consistently positive correlations in normal listening and reading situations, the higher level skills required for listening comprehension of time-compressed speech and reading comprehension using speeded reading might also be related. If such a relationship were found to exist between rapid language processing visually and rapid language processing aurally, then perhaps it might be useful not only to teach speeded listening before speeded reading but it also might be possible to increase a child's reading rate and comprehension by giving him practice with speeded listening.

Research Questions

In an attempt to investigate this problem the following research questions were posed:

1. Is there a correlation between the student's initial ability to comprehend material presented in the mode of time-compressed speech

and the student's gain in reading speed acquired by instruction in speeded reading?

2. Is the comprehension of time-compressed speech a sufficient predictor of a student's ability to make gains in reading speed in a program of speeded reading instruction?

3. Is the comprehension of time-compressed speech a predictor of the level of gain in reading speed that a student may make in a program of speeded reading instruction?

Sample

Fifty-four first year junior college students enrolled in two speed reading courses taught on campus during the regular term who had been screened for visual and hearing impairments and initial reading levels comprised the sample for this study.

Instruments Used

Paragraphs II, III, IV, V, and VI of the Nelson-Denny Reading Test, Form B (1960) were used for the comprehension of time-compressed speech as a standardized test instrument for both pre and post tests. The Nelson-Denny Reading Test, Form A (1960) was used to determine pre-post reading speed and comprehension levels.

Methodology

Students were administered pre-listening and pre-reading tests using the Nelson-Denny Reading Test, Form B (1960) and Form A (1960). Students were given instruction in speeded reading techniques twice a

week for 50 minutes during nine weeks of the term. At the end of the instructional period students were administered post listening and reading tests.

Major Findings of the Study

A correlation matrix comparing all measured and transformed variables was developed and each correlation concerned with the research question was tested for significance. There were no patterns of significant correlations for the gain in reading speed versus the comprehension of time-compressed speech when compared with group gains of reading speed. However, when all gains in reading speed which exceeded 900 words per minute (the lowest gain in reading speed considered throughout the experiment) were compared as an ungrouped set versus the listening comprehension of time-compressed speech, all correlations exceeded the .001 level of significance.

Multiple regressions using the covariates listening comprehension of time-compressed speech at 0% compression, listening comprehension of time-compressed speech at 30% compression, listening comprehension of time-compressed speech at 40% compression, listening comprehension of time-compressed speech at 50% compression, and listening comprehension of time-compressed speech at 60% compression were run. When attempting to use the initial listening comprehension scores of time-compressed speech as a predictor for the level of the grouped reading speed gains for reading speed in excess of 900 words per minute, no significant predictions were found. However, when the

initial listening comprehension scores of time-compressed speech were used as a prediction of all reading speed gains in excess of 900 words per minute, the level of significance of the multiple regression coefficients was less than .0001.

Conclusions

Within the limitations of this study, there does appear to be a relationship between the student's initial listening comprehension of time-compressed speech and his ability to gain in reading speed under a program of speed reading instruction. This relationship appears to be sufficient for initial listening comprehension scores of time-compressed speech to be used as a prediction of the students who will make gains in reading speed in a program of speed reading instruction.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF DIAGRAMS

CHAPTER I

INTRODUCTION

Background of the Problem

Reading instruction has primarily concerned itself with the children in kindergarten through sixth grade. It has been thought that by the end of the sixth grade a child would be able to read well and that for the next six years of his education he would simply enlarge and polish his reading skills with little or no formal instruction. Since the early 1950's, with the emphasis on training students in the sciences, it has been learned that many students leaving the elementary schools, and indeed the senior high schools, are deficient in the skills of reading and writing. In order to counteract this deficiency, the junior and senior high schools have begun to offer reading instruction to those students who appear to be remedial. Some senior high schools are even offering reading courses for the improvement of speed, vocabulary, and comprehension for those students not deficient in reading skills.

During the last ten years, the proliferation of community or junior colleges has begun. These institutions are generally designed to provide post-secondary training in vocational, pre-professional and professional careers and to meet the special educational needs of their respective communities. Many of these schools have an open-door policy

which enables any person regardless of age and prior educational background to enroll. Because of the nature of these institutions and the populations which they serve, the need for instruction at all levels of reading skills is apparent. Many of these schools offer instruction in remedial reading, developmental reading, and speeded reading.

The literature concerning reading and related skills generally has been directed to the reading problems found at the elementary level. Recently, there have been more studies done with students at the secondary level. However, the major concern of this study is the reading comprehension of speeded reading and listening comprehension of time-compressed speech of junior college subjects. Information about reading courses and reading skills at the junior college level is still sparce and uneven with regard to the specifics. This writer was unable to locate any research which discussed the skill relationships of speeded listening comprehension and speeded reading comprehension of junior college students.

Purpose of the Study

The purpose of this study was to determine whether there was a positive relationship between the higher levels of listening comprehension skills needed for time-compressed speech and the higher levels of reading comprehension skills needed for speeded reading of junior college students. It should be noted here that the purpose of this study was not to investigate the merits of one type of speeded reading

over another but to use speeded reading and speeded listening techniques as the vehicle to study the rate of language processing.

Justification of the Study

This investigator was unable to find any literature comparing listening comprehension of time-compressed speech and reading comprehension of speeded reading. Since many junior colleges are now offering courses in speed reading to their students and since very few institutions have yet discovered the educational possibilities of time-compressed speech, it was felt that it would be beneficial to investigate the relationships of these two demanding, yet promising skills. The relationships of these two skills might be used in the sequencing of instruction and in the selection of students for the appropriate time in the skill sequences.

Statement of the Problem

Speed reading has been taught for a number of years in reading courses found in junior colleges. Since it is generally agreed by educators that speed reading is the final skill to be learned in the heirarchy of reading skills, students who were remedial readers were excluded from the courses. Even though the mature readers exhibited a high degree of homogeneity with respect to the reading skill measured by the pre-tests, it was found by the end of the course of instruction that a wide disparity of speed and comprehension skills existed among the students. Colleagues have reported the same disparities, and it has been reported and verified in the literature. Since all students

received the same instruction for the same amounts of time, it became apparent that something other than reading instruction might have accounted for the differences in scores. One of the possible explanations might be the differences in the rates of processing language found among the students. Since listening comprehension and reading comprehension have been demonstrated to have consistently positive correlations in the normal listening and reading situations, it was felt by this writer that the higher level skills required for listening comprehension of time-compressed speech and reading comprehension using speeded reading might also be related. The understanding of language processing would be useful both from a theoretical standpoint as well as a practical one. For example, if such a relationship were found to exist between rapid language processing visually and rapid language processing aurally it might be possible to use a student's comprehension of time-compressed speech to predict a student's ability to profit from instruction in speeded reading. It might be useful to teach speeded reading. In addition, a child's reading rate and comprehension may be improved by giving him practice with speeded listening.

Rationale for the Study

Listening and reading skills have shown close relationships in elementary and secondary school students. Following the trend of research into the upper levels, the conclusions of the research state that good listeners are good readers. If this is the case, then it

would appear that listening comprehension, using time-compressed speech, and reading comprehension, using speeded reading, might also show a positive relationship.

Research Questions

To guide the investigation the following research questions were formulated:

1. Is there a correlation between the student's initial ability to comprehend material presented in the mode of time-compressed speech and the student's gain in reading speed acquired by instruction in speeded reading?

2. Is the comprehension of time-compressed speech a predictor of a student's ability to make gains in reading speed in a program of speeded reading instructions?

3. Is the comprehension of time-compressed speech a predictor of the level of gain in reading speed that a student may make in a program of speeded reading instruction?

Milieu of the Study and Selection of Students

This study was carried out with first year junior college students. Since this writer taught two speed reading classes on campus, the students in these courses were the sample for the study. This approach has been justified by Erickson and Ryan (1966) who controlled for teacher effect by having the same teacher teach both groups. Enrollment in these courses was voluntary and open to any student reading at grade level. Because of the enrollment practice of this

institution, students assigned themselves to the 12 speed reading sections that were available. All sections of speed reading at this institution seemed representative of all other sections of speed reading showing the same ranges in age, academic preparation, and academic goals of the students. Therefore, these students should be representative of the speed reading students at this institution. For the specific population, the sample of students used in this study meet the necessity for randomness.

Scope and Limitations

This study has been restricted to two sections of speeded reading students attending a junior college on the west coast of Florida. Although the student body is very cosmopolitan with a broad range of socioeconomic backgrounds represented, it must be remembered that only one school is involved. The materials and methodology used in all of the speeded reading sections on this campus were similar so that the students involved were not aware that they were in an experimental situation.

This study was limited to the determination of whether or not there is a relationship between listening comprehension of time-compressed speech of junior college students and speeded reading.

Assumptions of the Study

1. Since all students chosen for this study were high school graduates, it was assumed that they all had had the same general reading experiences and the same general experiences in listening and comprehending speech.

2. It was assumed that all people process speech in the same general way unless they have an organic learning impairment.

3. It was assumed that all people who are taught the same method and become proficient in speeded reading, process the written word in the same manner in order to comprehend the written word at a 70% level.

4. It was assumed that since there was not a wide range of age within the students selected for this study, they all had had similar exposure to general vocabulary usage.

5. It was assumed that the sex of the student did not contribute to either listening or reading comprehension.

6. Since a time-compressed speech test was given in the same room on consecutive periods on the same day, it was assumed that any auditory interferences during that portion of the study were common to all students being tested.

7. Since all students were administered the Nelson-Denny Reading Test (1960) by the same examiner in the same room during consecutive periods it was assumed that no differences in test administration were present within the study.

8. It was assumed that any extraneous variables outside the actual classroom situation would be operating similarly in any speed reading section on this campus. Therefore, no attempt was made to control these variables.

Definition of Terms

Time-Compressed Speech. Speech which has been mechanically speeded without distortion in pitch.

Speeded Reading. Reading done by the mature reader, that does not require eye fixations on each word.

Remedial Reading. Reading instruction designed for those students whose reading proficiency levels are retarded two or more grade level years.

Developmental Reading. Reading instruction designed for students reading at grade level.

Mature Reader. Any reader who has mastered the reading skills and who evidences comprehension at or above 70% in adult reading material.

Comprehension. The ability to understand the meaning of material processed either visually or aurally.

Aural Perception. The ability to hear, perceive and comprehend oral language.

Oral Language. Normal speech used for communication.

Chunking. A type of reduction coding in which the limited capacity of the central processor (7 ± 2) is overcome by making each of those units larger while the number of units stays within the processing limits.

Precategorical Acoustical Store (PAS). A brief store of distorted acoustical information that does not require attentional mechanisms and contains immediate or unanalyzed material.

Primary Memory (PM). A limited capacity system whose stimuli is only held by rehearsal of the stimulus.

Secondary Memory (SM). Consists of overlearned, well-known and meaningful events that have undergone a great deal of central processing.

Short Term Memory (STM). A large capacity, rapid decay system.

CHAPTER II

REVIEW OF THE LITERATURE AND RELATED RESEARCH

Overview

For many years researchers have been saying that there is a direct relationship between listening and reading. All of these skills are subgroups of language, with reading being the most complex, because it requires both listening and speech as its foundation.

Reading and Learning Theory

In the last two decades many conflicting theories have been presented about how the human being receives visual and auditory stimuli, how he takes these stimuli and organizes them into meaningful sequence, and finally how he arranges them into thoughts. These theories have been presented by behavioralists, psychologists, audiologists, speech pathologists, linguistic specialists and educators. Each field has its own methods of investigation, interpretation, and applications; yet as conflicting theories are continually presented, the educator is left with the feeling that investigators are only groping at the frontiers as far as definite knowledge about how thought processing occurs under normal circumstances.

This writer will attempt to review, from the standpoint of this paper, some of the theories of how one perceives stimuli and then organizes these stimuli into meaningful thoughts.

Sperling (1960) in experiments dealing with visual perception, found that at the normal distance for reading the mind is able to perceive visual stimuli found in an oval 1" high by 2" long. He stated that this iconic buffer is able to hold 17 or 18 letters presented in three rows of six.

Many specialists feel that phonological coding is necessary in order for one to process written visual stimuli into thought. However, Kolers (1972) stated that the reader goes directly from print to meaning. Posner et al. (1972) also concurred that meaning is connected directly to visual form. Kolers argued that fluent readers do not move from representations of the word names but rather that the visual forms themselves are related to complex meanings. He also stated that syntax and semantic features of a text are more important to reading than the graphemic features. The close procedure used in the teaching of reading would apply this theory within its methodology.

Brewer (1972) stated that homophones such as "chute" and "shoot" cannot be dealt with phonologically since visual information must have been used to retrieve the appropriate meaning. He stated that preceding and following information contributed to reading a particular lexical item.

Liberman (1957) stated that rate is a primary cause of reading difficulties. If it takes too long to read a given word or words, preceding words are forgotten before phrases and sentences are completed because of rapid temporal decay in the primary memory.

Tinker (1969) stated that it takes 250 msec. to read an initial line, and 40 to 54 msec. to make the return sweep.

Laberge (1972) suggested that the code in which visual materials is cast in route to comprehension processes may be neither exclusively auditory nor exclusively visual for a given reader but that both the auditory and visual may make contact with comprehension processes either parallel or one at a time during reading by fluctuating between the modalities.

Pre-Categorical Accoustical Store

Norman (1972) stated that pre-categorical accoustical store (PAS) is too selective to be sensory and not selective enough to be cognitive. He further stated that language cannot be understood by interpreting each word or phrase as it arrives (as material from split infinitives must be shunted aside so that the main theme processing of the sentence can continue without disruption).

Routh (1971) assumed an autonomous continual readout of information from PAS into perception categorization mechanisms and a directed readout from PAS under the subject's control.

Short Term Memory (STM)

There have been many theories proposed about the part that STM plays in learning. One theory generally accepted is that STM is a large capacity, rapid decay system. Gough (1972) found that more words are retained when used in sentences than when used in word lists. This supports previously stated theories that context is of equal or more

import than single words. He further contended that PM contents are integrated and can be cleared when new items are entered. Thus when word lists are presented first, the primary memory is full when the sentence arrives and the sentence can only be processed at the cost of several words. However, when the sentence arrives first it is quickly understood and cleared.

Secondary Memory (SM)

It is generally accepted by researchers that secondary memory consists of over-learned, well-known and meaningful events that have undergone a great deal of central processing. Miller (1956) proposed that one form of reduction coding is "chunking" in which the limited-capacity of the central processor (7 ± 2) is overcome by making each of those units larger, while the number of units stays within the processing limits.

Murdock (1961) stated that the number of items that can be held at any one time in PM is determined by the processing capacity of the system but that the contents of the items are specified jointly by the perceptual input and what is retrieved from SM.

Liberman (1957) quoted Haskins as having stated that perception occurs in reference to production and that some form of "production reference" must be stored in SM and then activated in seemingly instantaneous fashion.

Wickelgren (1966) stated that recall of a constant means recall of a set of features that defines that constant in memory, and each feature is recalled at least semi-independently of the other features.

Data from Sachs (1967) supported the hypothesis that accoustical processing becomes weaker as (or because) the semantic processing becomes stronger. Her results indicate that memory for the semantic content of the messages persisted for a much longer duration than the other formal surface structure features. It is noteworthy to mention that variables such as frequency and length of utterances are well controlled in her experiments. She concluded that the original form of a sentence is stored only for the short time necessary for comprehension to occur. When a semantic interpretation has been made, the meaning is stored. Thus the memory of the meaning is not dependent on memory of the original form of the sentence.

Summary: Reading and Learning Theory

Although many new theories have been and are being proposed in reference to the way the human mind functions in order to process thought, one outstanding factor is to be found about the research: each discipline is testing specific items in the language functioning process and then trying to fit that item into the total picture of language, whereas no one has tested language under the normal language conditions of speaking, listening, or reading. Most of the research seems to be being done in isolation, that is that no field seems aware of research being done or completed in other fields which might have a direct bearing on their theory or research findings. Perhaps testing items in isolation is the only way that the various aspects of language function can be tested, but it seems that until science is far enough advanced to

test language and thought processing under normal language conditions with complete knowledge of findings in all other fields, that conflicting theories will persist and perhaps mask the knowledge and understanding of the real processes occurring during normal language and thinking functioning.

Factors Common to Speech and Initial Reading

Van Riper (1954) stated that communication skills, both speech and reading, have much in common: (1) they both begin with the single letter approach to phonics, (2) they both require the acquisition of certain motor skills, (3) reading reversals are paralleled by speech reversals, (4) cluttering appears in both speakers and oral readers, (5) scanning in reading and echo shadowing in speech both involve the same kinds of rapid responses and often have poor comprehension, (6) parallel talk does not necessarily mean comprehension has occurred and word callers often do not comprehend, (7) both poor readers and speakers suffer terrible frustrations and scars because of their handicaps, and (8) both have multiple causes.

Dechant (1964) stated that both reading and speech require an association between the experience (object) and a symbol. The child must have meaning in spoken context before he can learn speech with meaning. He further stated that listening and speaking provide the vocabulary and sentence pattern for reading and that training in listening develops auditory discrimination, which in turn serves as a basis for phonemic analysis in reading.

Jones (1951) stated that some of the common factors between speech and reading are as follows: (1) neither can be considered as basic biological functions, (2) both require the ability to associate meanings with symbols and are dependent upon intelligence, (3) both presuppose a state of readiness, (4) both may be reflected by personality, emotional and/or environmental factors, and (5) both may be deterred by physical factors.

Language Factors That May Retard Reading

Mattingly (1972) believed that the process of learning to read is a process of transfer from auditory signs for language signals which the child has already learned to new visual signs for the same signals. He also believes that reading depends on linguistic awareness which varies among people and that some people never master minimum units of phonological representation or cannot acquire it by being taught. Mattingly also stated that some causes for failure are the following: (1) the written text is a grosser and far less redundant representation than speech; (2) a written symbol stands for much more information than one speech clue and is not repeated elsewhere in the text; (3) speakers and listeners can respond sloppily to clues because clues are repeated; (4) a reader's tolerance to noise input is lower than a listener's; therefore, a person with a slight visual perception difficulty may have serious problems in reading; and (5) if a reader reads too slowly, he may not be able to keep up with his own process of linguistic synthesis and will be unable to comprehend what he reads.

Hildreth (1946) pointed out that many varieties of language difficulties may retard reading: (1) inadequate or immature coordination, (2) poor auditory discrimination for speech sounds, (3) indistinct and inaccurate articulation, (4) inhibiting emotional conflicts, (5) sensory and motor aphasia, (6) spasm and stuttering, and (7) bilingual background.

Robinson (1946), Eames (1950), and Artley (1958) concurred that speech defects are related to reading difficulties and share some problems in common: (1) low intelligence, (2) reduced auditory acuity, (3) poor auditory discrimination, (4) short auditory memory span, (5) bilingual background, (6) motor coordination, (7) birth injuries, and (8) neurological defects.

Betts (1946) pointed out that speech is an aid in learning to read and that speech patterns may contribute to or impede the development of reading ability; thus, a greater facility in oral language will be reflected in a more successful mastery of reading and writing.

Durrell (1964) stated that non-readers are weak in the major subskill of detecting auditory patterns in spoken words. He believed that most beginning reading difficulties are essentially auditory failures. He stated that the auditory factor is not only the most important but also the most seriously neglected subskill taught in beginning reading; and, to be effective, phonics instruction moves forward from sound to print--not backward from print to sound. He also believes that emphasis on meaning and imagery related words is highly important in the sound-to-print approach, and, when heavy

emphasis on the examination of either the auditory or visual anatomy of a word is taught, it tends to diminish word meaning, with the result that the child works with sound gulps or letter collections rather than meaning.

Savin (1972) stated that characteristics of poor readers at the end of the first grade are as follows: (1) they are unable to analyze syllables into phonemes, (2) they are insensitive to rhyme, (3) whole syllables are easier to identify for them than phonemes, and (4) they seem to identify phonemes only by analyzing syllables they have perceived. He believed that family phonics and readiness drills often fail because the child is not only unready to learn to read but also unready to comprehend the reading readiness curriculum. He futher stated that blending is almost impossible for many children and that this ability is motivational.

MacGinitie (1967) emphasized the importance of the ability to segment spoken words into sounds that correspond sound sequences to letters or letter groups is far more important in the early stages of reading than measures of more elementary auditory ability such as pitch discrimination. He stated that Schonell (1961) concluded that although the nature and extent of the child's speech and physical development are important in the early stages of reading instruction, it is the more vital subtlety of the auditory elements of the words themselves that are gradually assimilated through listening. He considered that auditory discrimination, auditory memory and sequencing abilities are fundamental to good speech and to reading.

Reading, Speech and Intelligence--
Elementary Grades

MacGinitie (1967) conducted a study of third grade boys whose mean age was 8.9 years. These boys were given three perceptual tests as well as tests of intelligence and reading comprehension. Two of the perceptual tests were found to be significant independent predictors of reading scores. The findings of this study, together with the results of related investigations, indicated that visual perceptual ability declines in importance from third to fourth grade, whereas general intelligence and auditory and/or gross motor perception abilities become more important in relation to individual differences in reading ability from third to fourth grade. During the tests, students attended to a purely auditory temporal pattern delivered via earphones and a visual stimulus delivered via a blinking light in another auditory and visual test. During the third test the Birch and Bellmart Pencil Tap test was used to find visual as well as auditory clues. The Lorge-Thorndike Intelligence Scale, Form LL, Level A was administered one week following the perceptual testing. It was found that mental age was a significant independent predictor accounting for about 30% of the variance of reading scores in each equation. The Birch and Bellmart test did not contribute any significant data independent of mental age. Auditory and visual tests were significant predictors in each case, accounting for 11% and 14% of the variance in reading scores, respectfully. In addition to 30% and 27% contributed by MA, a regression equation was constructed to determine whether auditory and visual tests

predicted reading scores independently of one another. A result of this regression equation strongly suggests that the auditory and visual tests are significant predictors of reading independently of one another. It was found in this study that perceptual tests were a better predictor of reading scores for fourth graders than they were for third graders. MacGinitie (1967) stated that the fact that intelligence scores show a higher positive correlation with reading success in fourth graders than in third graders is consistent with Brain's (1964) and Belmont's (1965) findings that with an increasing age grade placement there is also an increasing relationship between intelligence and reading achievement. MacGinitie's findings suggest that as individual differences in visual perceptual abilities become less important to reading progress, variation in auditory perceptual abilities and/or the ability to transpose between audition and vision may become more important.

Summary: Language Factors and Reading

The preceding research states that the ability to learn to read is based on the ability to perceive and distinguish auditory stimuli and the ability to comprehend auditory language. The same factors which seem to interfere with the ability to use and comprehend spoken language seem also to interfere with the reading process. Research seems to indicate that spoken language and the visual perception of symbols, reading, are both integral parts of language processing but that reading ability depends highly on oral and aural language ability.

Reading and Listening--Elementary Grades

Lawson and Feder (1940) found superior test performance was demonstrated by reading as compared to listening. They pointed out, however, that this appears to be a function of the level of difficulty of the material used. For a student rated high scholastically, they found that reading ability was superior but reported an overall correlation of .62 between listening and reading. Gates (1940) reported a correlation of .78 between reading and listening using his own test.

Jackson (1966) found a high relationship between listening as measured by the Sequential Tests of Educational Progress--Listening and Reading and reading as measured by the Gates Basic Reading Test in fourth, fifth and sixth graders. Skiffington (1966) conducted a study based on training. As a part of his design he administered STEP-Listening and the Iowa Silent Reading Test in order to obtain a pre-test measure. The correlation between these two measures was .52 for the control group and .56 for the experimental group. Hildreth (1964) reported a correlation of .79 between reading and listening. Condon (1972) found that good readers performed significantly better on the Brown-Carlson Listening Comprehension Test when it was administered to 874 secondary pupils.

McConnell (1968) administered STEP-Listening and the Metropolitan Reading Tests to 409 fourth graders and 168 sixth graders. She found a correlation of .59 between listening and reading at the fourth grade level and .73 at the sixth grade level.

Brown's (1965) contention that listening is more closely related to intelligence than to reading is not supportable. He stated that the higher correlations obtained when testing elementary school children are either artifacts of the tests used or that listening becomes more of a learned ability and less of a native ability with maturity. In a study done with children in the fourth, fifth, and sixth grades, he found correlations between listening and reading were .81, .76, and .77 for the three grades. For sixth graders he reported a partial correlation of .45 between listening and reading with intelligence held constant and a partial correlation of .39 between listening and intelligence with reading held constant. The partial correlation between reading and intelligence with listening held constant was .60. The tests he used were the California Test of Mental Maturity, the Stanford Achievement Test with reading eliminated, and the ETS Test of Listening.

Fourth, fifth and sixth graders served as subjects for a study conducted by Bonner (1960). Utilizing the Stanford Achievement Test, the Pinter General Abilities Test and the STEP-Listening, she obtained correlations of .50, .67, and .57 for the three grades, respectively. The differences between the results of Brown and Bonner may be due to the different instruments used in the two studies. Ross (1964) using fourth graders, obtained a correlation of .74 between reading and listening using the STEP-Listening and STEP-Reading. Fawcett (1965) administered STEP-Listening and the Iowa Basic Skills Test to 639 fourth, fifth and sixth graders. The overall correlation between these listening and reading measures was .58.

Reading and Listening--Secondary and College

Palmer (1968) studied the relationship between listening and reading in high school freshmen. He administered the STEP-Listening and STEP-Reading to 329 pupils. He also administered the Otis Tests of Mental Ability. He reported a correlation of .62 between reading and listening. He divided his population according to mental age and found that the correlation between reading and listening was .33 for the average group, .79 for the high intelligence group, and .54 for the low intelligence group.

Michael and others (1963) studied a college population. Their study attempted to assess three curricular program patterns relative to communication skills. A serendipitous finding was a reported correlation of .70 between reading and listening as measured by the STEP-Listening and STEP-Reading. Karraker (1954), in another study with 329 college students as subjects, found that there was a wide variation between "A" and "C" students in listening skills. However, she reported a correlation of .89 between listening on the STEP-Listening test and reading on the Triggs Test. The large difference between the two correlations reported by Karraker and Michael might be explained by the differences in the instruments used.

The only study that this writer was able to find on methods of teaching speed reading to college students was Braam and Berger's (1968). They tested four methods of increasing speed: tachistiscope, controlled reader, controlled pacing and paperback scanning. For the paperback scanning the reader was required to scan each page under time

pressure for the first two minutes of each exercise; the students were allowed eight seconds per page. For the second two minutes, the students were allowed seven seconds per page. Reading time was reduced in this manner until a two seconds per page rate was reached. The time was then immediately increased to ten seconds per page. This procedure was repeated for a total of 15 minutes. The primary objective of this exercise was to condition the eyes to move rapidly horizontally and vertically. Results of the study were as follows: (1) significant gains were made for all four methods, (2) no significant changes in comprehension level were detected, (3) significant gains in flexibility came from all methods except the tachistiscope, (4) comparison gains in reading rate resulting from the four methods of instruction revealed that there was a significant difference at the .01 level of confidence favoring the paperback scanning method, (5) in rank ordering of the methods, the paperback scanning method showed the greatest gains in flexibility followed by the controlled reader, (6) the paperback scanning method proved to be significantly superior to all other methods in producing increased reading rate on both short and long paragraphs. The authors concluded that the paperback scanning method had the following advantages: (1) it allowed for the greatest amount of actual reading, (2) the training materials were more closely related to materials normally read, (3) the paperback method provided more nearly normal reading, print size, normal distance and complete words rather than excerpts, (4) the paperback method offers a greater flexibility in materials as books can be chosen in terms of timelessness and group

interest as well as difficulty level, (5) the paperback method requires no special facilities or machinery, and (6) the cost is nominal and books last for two-three years of intensive use.

Summary: Reading, Listening and Intelligence

The research done with elementary level students seems to show that with increasing age both intelligence and auditory discrimination abilities seem to be more directly related to reading progress than is visual perception.

Research done with secondary and college level students also supports the findings that listening and intelligence show high positive correlations with reading.

Time-Compressed Speech and Intelligence

Sticht (1969) in three studies of three mental aptitude groups, high, average, and low, tested the difference between reading and listening ability and performance on comprehension and intelligibility using time-compressed speech with 135 army inductees at Fort Ord. The results of all three mental aptitude groups showed that none of the differences between reading and listening within the groups was significant. Reading and listening performance of average aptitude groups was uniformly 20% higher than that of low aptitude men. There was an overall decrease in performance as the difficulty of the material increased, but there was no interaction of mental aptitude with the difficulty of the material. Results of speed and aptitude, both manifests of speech rate and mental aptitude, were significant at

the point .001 level. It is thought that test performance improves when mental aptitude is increased no matter what speech rate is used. With all groups, comprehension was consistent up to 275 words per minute and then declined. Sticht stated that between 275 and 300 words per minute, rate seems to have some significance since speeds in excess of this rate accelerate a decline in comprehension. Performance of high aptitude students with listening time-compressed by 59% (425 wpm) was similar to performance of the medium and low aptitude students with listening compressed by 36% (275 wpm), respectively. In terms of learning efficiency, all students performed more efficiently at 275 words per minute than with the non-compressed rate of 175 words per minute. The results of the study indicated that:

1. Listening was as effective as reading in transmitting information of all three difficulty levels for both average and low aptitude men.
2. Reading and listening performance of the average aptitude groups was uniformly 20% higher than that of the low aptitude group.
3. Individual differences among both the average and the low aptitude men were such that some did better by listening than by reading and vice versa.
4. The results of the studies exploring the use of time-compressed speech to permit listening rates equivalent to silent reading rates indicated that:
    a. For both normal and time-compressed speech, comprehension increased as aptitude increased.

b. Rate of speech did not, under the conditions of these studies, produce differential effects for high and low aptitude men.

c. Men of all aptitude levels got more items correct per minute of listening time when moderate speech compressions 36% (275 wpm) was used, rather than with the normal (175) rate of speech.

d. Listening to compressed selections that were presented twice in the same amount of time required to present the uncompressed message once did not improve the peak comprehension of high or low aptitude men.

e. Lower aptitude men did not discriminate individually presented words as well as did higher aptitude men. Sticht stated that the relatively poor performance of the LMA men on the simple discrimination test with the non-compressed words suggested that at least a part of the reason for their poor performance on the listening and perhaps reading tests of Parts I and II may be due to difficulties in discriminating and/or responding to speech sounds.

If further research should indicate such a viewpoint, then remedial training in speech discrimination should be recommended as an attempt to improve reading and listening performance of the low aptitude personnel.

Foulke and Sticht (1966) using the STEP-Listening Test Form A found a decrease in comprehension of 6% between 225 and 325 words per

minute and a decrease in comprehension of 14% between 325 and 445 words per minute. Comparison of the comprehension test scores of male and female listeners have revealed no sex related differences in comprehension for word rates varying from 175 to 475 words per minute.

Foulke (1967) stated that Fergusen (1954) found no relationship between the IQ of grade school children and their ability to comprehend accelerated listening selections. However, 230 words per minute was the fastest word rate represented in her experiment. (Wood (1965) found no relationship between IQ and the ability to follow instruction communicated by short time-compressed imperative statements.) More definite conclusions were possible in the following studies using adult subjects Fairbanks et al. (1957a) and (1957b), Goldstein (1940) and Nelson (1948) have each found positive relationships between intelligence and the ability to comprehend accelerated speech. The data of Fairbanks et al. and Goldstein concur in showing a positive relationship between the intelligence of the listener and the magnitude of the decline in listening comprehension as word rate is increased. This relationship is undoubtedly due to the fact that intelligent students earn higher scores on the tests of comprehension of listening selections that have been presented at a normal rate in order to provide a basis for comparison, and that scores which they earn on tests of comprehension of listening selections presented at accelerated word rates have a larger range within which to vary. Those students of lower intelligence performed nearer to the chance level with normal rates and could persist with chance levels of performance over a wide range of word rates.

Summary: Time-Compressed Speech and Intelligence

The research appears contradictory on the role that intelligence plays in the child's ability to understand time-compressed speech. However, the research done with adults shows high positive correlations between intelligence and the ability to comprehend time-compressed speech.

Reading Rate Comprehension and Time-Compressed Speech

Those perceptual and cognitive factors, whatever they may be, that are responsible for individual differences in reading rate may also be responsible for individual differences in the ability to comprehend accelerated speech. If this is true, fast readers should be able to comprehend speech at a faster rate than slow readers. Goldharber (1970) stated that this hypothesis has been tested by Goldstein (1940) and Orr, Friedman and Williams (1964). In both experiments a significant positive correlation was found between reading rate and the ability to comprehend accelerated speech. In both experiments it was found that practice in listening to accelerated speech resulted in the improvement of reading rate. These findings add further support to the hypothesis that the two performances in question may be related, at least in part, by the same underlying factors. Overhann (1966) stated that Nelson (1948) found no correlation between reading rate and the ability to comprehend accelerated speech. In both experiments it was also found that practice in listening to accelerated speech resulted in the improvement of reading rate. These findings add further support

to the hypothesis that the two performances in question may be related, at least in part, by the same underlying factors. However, his measures of reading rate were taken from college entrance examination data, several of which were collected some time prior to his study, whereas Goldstein (1940) and Orr (1964) et al. obtained their measure of reading rate during their investigations.

Goldstein (1940) and Jester and Traverse (1965) compared the comprehension scores resulting from listening to selections presented at several word rates with the comprehension scores resulting from reading at the same rates as those selections presented auditorally. In both studies comprehension declined as word rate increased. Listening comprehension was superior to reading comprehension up to approximately 200 words per minute. Above 200 words per minute reading comprehension was superior. Simultaneous reading and listening at 350 words per minute resulted in better comprehension than could be demonstrated by either mode of presentation alone. This further emphasizes the compatibility of the two processes.

Fairbanks, Guttman and Miron (1957a) found little difference in the comprehension of messages presented at 141, 201, and 282 words per minute. These studies seem to indicate that although there is a slight loss in comprehension with the increase in rate of presentation, the loss is insignificant up to 280 words per minute. However, comprehension declined from 58% of the test items correctly answered at 282 words per minute to 26% at 470 words per minute. Since the tests used were of the multiple choice type, a mean score of 26% would not be significantly different from chance performance.

Orr and Friedman (1967) conducted a study of listening comprehension with three groups of college students matched by comprehension scores at a normal speed of 175 words per minute. The hypothesis was that high rates of presentation and a loss in comprehension of compressed speech by an untrained listener results from his lack of time to understand and to integrate what he hears. One way to reduce the time needed to process the input would be to reduce the number of alternatives with which the listener must deal. By providing him with a summary of the message or a key list of words from the passage, it was felt that the time needed to identify and process the speech sounds accurately would be reduced.

The procedure used was to give the groups a series of five daily practice listening sessions of approximately one hour each. The practice material consisted of a passage from the novel Run Silent, Run Deep presented at an average rate of 375 words per minute. At the end of each practice session, the subjects received one of the equated series of passages and comprehension tests drawn from a book on college English or colonial history. Prior to each test passage, one group was allowed to study an excerpt of the passage for 2½ minutes. The second group was allowed to examine lists of about 130 key words drawn from the passage and a third group, the control, was given no listening aids during the experiment. Contrary to expectations, the two types of listening aids employed did not affect comprehension of time-compressed speech compared to the performance of the control group. Mean performance at 375 words per minute did improve with practice,

however, to a point where it was not statistically different from the mean performance at 175 words per minute. Thus the efficiency of even a small amount of practice, about five hours, as a means of improving comprehension speeded materials was reconfirmed.

George (1970) stated that studies done by Bixler, Foulke, Amster, and Nolan (1962) at word rates varying from 175-325 words per minute and by Goldharber (1967) and Reid (1968) found that comprehension decreased as rate increased, and simplified material was better comprehended than more difficult material.

Time-Compression and Grammatical Complexity

In order to investigate the rate of presentation on the comprehension of materials that differ in their grammatical complexity, an experiment was designed by Reid (1968) in which the comprehension tests portion of Form A and Form B of the Nelson-Denny Reading Tests were rewritten in an attempt to reduce grammatical complexity so as to make two difficulty levels available. The variables were arranged in a multifactor independent group design: (1) two levels of grammatical complexity were used, high or low; (2) four rates of presentation were used, 175, 275, 325, and 375 words per minute; and (3) two forms of material were used, Form A and Form B. The following effects were statistically significant: (a) the grammatically simplified versions of both forms of the material resulted in greater average comprehension than the original versions; (b) generally, comprehension remained at approximately the same level as the rate of presentation increased from

175 to 325 words per minute, but from 325 to 375 words per minute comprehension dropped off sharply; (c) Form B of the material resulted in greater average comprehension than Form A; (d) the form of the material by level as a function of the grammatical complexity and comprehension varied as a function of the grammatical complexity when Form A of the test was used but did not vary when Form B was used. This test was given to 160 subjects from Indiana University and 80 subjects from the University of Louisville. Subjects were male and female freshmen and sophomores enrolled in undergraduate classes in PSYCH. The SAT scores were obtained from the registrar's office. The range of verbal SAT scores in the study was 290 to 680 with a mean of 493. Comprehension tests portion of Form A and Form B of the Nelson-Denny Reading Test were rewritten in an attempt to reduce the grammatical complexity by the following rules: (1) delete the unnecessary words; (2) use the active voice; (3) put because, if and when clauses at the beginning; (4) keep the sentences short. Instructions to the students were recorded. Students were randomly assigned in equal numbers to sixteen combinations of values of difficulty, rate and form variables, participating in groups of five. The adjusted mean number of correct responses of Form A was 21.05 and the adjusted mean for Form B was 23.15; thus, Form B of the test resulted in greater average comprehension than Form A. In the simplified versions, Form A resulted in higher comprehension, whereas Form B had no effect on comprehension. Reid discovered that at 325 words per minute, comprehension was approximately at the same level as it was at 175 words per minute although the lack of

interaction between retained grammatical complexity suggested that the decrease of comprehension with higher rates was invariant with the level of grammatical complexity. At higher rates this relationship appeared not to hold; between the two highest rates comprehension dropped off considerably more when grammatical complexity was high. This suggested that an interaction of these variables may occur at high rates of presentation.

Time-Compression and Retention

Friedman et al. (1966) did three studies on retention using speeds of 175, 325, 425, and 475 words per minute. These studies had an immediate post-test and a post-test after 30 days. The authors concluded that in all three studies, material which is learned by listening to compressed speech is as well retained as that by listening to normal speech tapes. They used the eight listening selections in the Nelson-Denny Reading Test, Form A, rewritten by Reid along the given guidelines to produce a simplified version. The results of the evaluation of rewriting suggest that the simplified version of Form A was at the third grade level, whereas the original version was at the college level. The task of the subjects was to listen to the recording and answer the 36 multiple choice questions. At the completion of the test, the booklets were collected. The rate of presentation variable was found to be the only significant main effect. The fact that more forgetting occurred at the lowest rate than at the three highest rates is similar to results reported by Foulke (1966) and Friedman et al. (1966) in their retention studies. Since more was comprehended at

the lowest rate, there was potentially more forgetting at this rate than at other rates. However, it should be recalled that there was no evidence that the percentage of material originally comprehended and subsequently forgotten was differentially affected by the rate of presentation. This result is also consistent with the results of Foulke and Friedman.

Contrary to research by Orr and Friedman cited above, Rossiter (1972), in a study using time compression at 175, 233, and 265 words per minute, found a significant decline in scores for all tests at the rate of 233 words per minute. The students were given 14 informative messages each about a minute and a half long. Six multiple choice items were constructed for each of the 14 messages. The results of overall effect for the type of information was due to markedly lower test scores on both 175 and 233 word per minute rates. The fact that these three test means differed significantly at the base rate of 175 words per minute seriously limits the interpretation of significance for interruption between the variables. The mean scores for the Fact and Idea Tests were nearly equal at the normal speed, and declined at almost the identical rates as speed of presentation was increased. A result of the study was that the comprehension of compressed speech declines significantly at rates slower than 275 words per minute.

Woodcock and Clarke (1969) conducted a study to evaluate differences in comprehension among elementary school children. The children listened to a narrative passage presented at different rates of expansion or compression in increments of 50 words per minute ranging

from 78 words per minute to 428 words per minute. One hundred sixty-two school children ranked by three levels of intelligence comprised the sample. All subjects had mental ages in the 94 to 113 range. Multiple choice tests were given covering the passage's contents. Subjects with lower IQ's performed better at rates that were slower than the most efficient rates for higher IQ students. Further observation showed that performance curves obtained in this study displayed a secondary peak just prior to the final drop in performance at very high listening rates. Results of the study indicated that listening rates of 228-328 words per minute are more efficient for learning and retention than the normal rate of 178 words per minute. The high IQ group's retention curve dropped to a low at 278 words per minute. At this point an interesting phenomenon occurred. There was an increase in performance across the rates of 328 and 378 words per minute before the final dropping off at 428 words per minute to a level of performance comparable to the test only group.

Time-Compressed Speech and Practice

Orr (1968) studied the effect of training upon listening and comprehension of compressed speech and reported that with 8-10 hours of training, substantially higher speeds of 426 to 475 words per minute were possible for presentation of material. The messages used in the study were 600 words long and were recorded at 145 words per minute. Messages were presented at rates of 165 words per minute and 330 words per minute. Achievement was measured by a 20 item multiple choice test with a reliability of .94 in the Kuder-Richardson Formula 21. Mean

scores produced on this test by 40 comparable students who did not hear the message, were 3.8 and 4.14 items, respectively. This suggested that the students to be used in the study did not possess a significant background of information on the subject matter of the message. The mean test score for the experimental group at 165 words per minute was 10.43 items correct, and the mean test score for 330 words per minute group was 7.91 items correct. This indicated that whatever learning took place at 165 words per minute was significantly greater than at 330 words per minute. At 330 words per minute the subjects recalled about 75% of the factual contents that they recalled at 165 words per minute. The results of the overall interaction between rate and academic level were not significant.

Summary: Reading Rate, Comprehension, Retention, Practice and Time-Compressed Speech

The research appears to have shown that in both reading and listening to time-compressed speech, comprehension dropped as both speed and difficulty of material increased. It also has shown that with the use of time-compressed speech as the listening modality forgetting does not increase. The research has also shown that practice with time-compressed speech increased the amount of comprehension at rapid rates of listening.

Conclusion

Reading and listening show high positive correlations throughout the range of academic levels. Comprehension of time-compressed speech and comprehension of reading at rates up to 475 words per minute also show high positive correlations. Thus comprehension of reading and comprehension of speech seem to be integral parts of language processing.

If it is true that the mind "chunks" material to be processed in set amounts at set rates, then it should also be true that if one can process spoken language rapidly by the chunking process, then one should be able to process visual material rapidly by the chunking process. If this is in fact true, then the mind may have the ability to group chunks of data for interpretation and comprehension.

If it is true that comprehension of speech through the aural mode is highly correlated to the comprehension of material through the visual mode, then listening comprehension of time-compressed speech may show a relationship to gains made in speeded reading rates and comprehension.

CHAPTER III

METHODOLOGY

Sample

This study was carried out with first year junior college students enrolled in two speed reading courses taught on campus during the regular term. Enrollment in these classes was strictly voluntary and open to any student reading at grade level. Because of enrollment practices at this institution, students assigned themselves to the 12 speed reading sections that were available. Sixty students were enrolled in the two sections used for this investigation. After screening for visual and hearing impairments and initial reading levels, the remaining students became the sample for this study.

Measurement Instrument

The evaluation techniques utilized consisted of paragraphs II, III, IV, V, and VI of the Nelson-Denny Reading Test, Form B (1960) for the comprehension of time-compressed speech as the standardized test instrument for the pre-test and post-tests. The Nelson-Denny Reading Test, Form A (1960) was used to determine both pre- and post-reading speed and comprehension levels. Table 5, "Percentile Rank of Scores for Grade 13," of the Examiner's Manual of the Nelson-Denny Reading Test (1960), was used to compute the pre-test percentile for speed,

comprehension, and vocabulary. The total vocabulary-comprehension percentile was used as an initial screening scale to eliminate students who were functioning in reading more than two years below grade level.

Administration and Testing

Sixty students enrolled in two sections of speed reading were given the Nelson-Denny Reading Test, Form A (1960) the second day of the term. Students scoring below the 11th grade level or 55 percentile of this test were excluded from the course. The remaining 55 students were given a pure-tone audiometer test using the ANSI calibration as a measuring standard and those students showing a decibel loss in excess of 20 db, indicating a hearing loss severe enough to interfere in normal communication, were excluded from the study. Students who showed a corrected visual deficit of more than 20/30 as measured by the Keystone Telebinocular Test were also eliminated.

The remaining 54 students were given five selected paragraphs, one at 0%, one at 30%, one at 40%, one at 50% and one at 60% time-compression of the Nelson-Denny Reading Test, Form B (1960). These were followed immediately by the multiple choice questions of the test for each paragraph. Comprehension scores were recorded for each student on each rate. Paragraphs II-VI of the Nelson-Denny Reading Test, Form B (1960) were chosen because each paragraph was of the same length and had the same number of multiple choice questions.

Instruction in speeded reading using the following paperback novels as the texts began on the sixth day of the class: Runway Zero-eight, by A. Hailey and J. Castle; Fahrenheit 451, by R. Bradbury; Fear Is The Key, A. MacLean; and Topaz by L. Uris. The classes met for 50 minutes daily for four days weekly during the remaining nine weeks of the term. In addition to the two class periods spent weekly on speed reading instruction, one class period was devoted to the use of the SRA Reading Laboratory IV (1957) and one class period was devoted to teaching the students study skills.

At the end of the term a post-test Nelson-Denny Reading Test, Form A (1960) was given to all students in the sample. Comprehension and rate scores on the post-test Nelson-Denny Reading Test, Form A (1960) were compared to the listening comprehension scores of time-compressed speech at rates of 0%, 30%, 40%, 50%, and 60% time-compression as measured by the Nelson-Denny Reading Test, Form B (1960) administered at the beginning of the term. In addition, a post-test of listening comprehension of time-compressed speech at the rates of 0%, 30%, 40%, 50% and 60% time-compression using the Nelson-Denny Reading Test, Form B (1960) was administered to determine whether the instruction in speeded reading increased the comprehension rate of time-compressed speech. Studies previously cited by Fairbanks (1957a) and (1957b), Goldstein (1940), Nelson (1948), Orr, Friedman and Williams (1964) have established the time-compression rates of 0% (base rate), 30%, 40%, 50% and 60% and that the changes at 10% and 20% compression were negligible compared to the base rate. Thus, for

best utilization of time and personnel, the rates of 10% and 20% compression were omitted from this study. The research further revealed that major changes began at 30% time-compression with comprehension the same or almost the same as at 0% compression and then rapidly dropping off at time-compression in excess of 40%.

Intelligence as measured by IQ tests was not considered as a variable in this study since all previously surveyed and quoted research indicates high positive correlation between intelligence and reading and listening skills.

Attendance records were strictly kept during the duration of this study.

Students in both sections were required to keep a daily log of the amount of time spent in daily practice outside speed reading class.

Procedures for Teaching

Speed reading, for the purpose of this study, is a course which is designed not only to teach speeded reading but also to improve study skills, vocabulary and comprehension. The course is divided into four separate 50 minute class meetings per week. After the initial screening and testing the course was set in the following manner: Mondays were devoted to teaching study skills; Tuesdays and Thursdays were devoted to speed reading instruction and practice; and Wednesdays were devoted to general reading improvement using the SRA Reading Laboratory IV (1957).

During the first class meeting the content of the course was discussed with the students and the requirement of one hour of daily speed reading practice outside of class was given. No tests were

administered the first day as the student enrollment is generally not complete until the second class meeting.

The second class meeting was used to administer the Nelson-Denny Reading Test, Form A (1960) to all students. These tests were scored so that on the third day of class the examiner could discuss the test results with the students and counsel out any student falling below the 50th percentile.

During the third class meeting the Nelson-Denny Reading Test, Form A (1960) was discussed individually with the students and the SRA Reading Laboratory IV Placement Test (1960) was administered. Students score this test; and the teacher then assigns the students to the appropriate starting places, determined by their test scores, in the SRA Reading Laboratory Kit IV (1957).

The fourth class meeting was devoted to administering the listening test of time-compressed speech using paragraphs II through VI of the Nelson-Denny Reading Test, Form B (1960). The six paragraphs of the Nelson-Denny Reading Test, Form B (1960) had been pre-recorded by a male reader, compressed on the Lexicon Varispeech I time-compressor and played for testing through a Wollensak tape recorder. This test was administered in the following manner. The Nelson-Denny Reading Test, Form B (1960) student copy was passed out to the students. Each reading selection for paragraphs II through VI had been covered with a blank sheet of paper so that only the questions for comprehension appeared. The students were then told to listen carefully to the selection on the tape recorder and were told that they would answer the four questions

after hearing the selection. The questions were turned face down during the listening exercise. The students were told that at the end of the selection they were to turn the booklets over, answer the four questions in the proper blanks on the answer sheet, and then turn the booklet face down again as soon as the questions had been answered. They were specifically told not to read the next set of questions. There was no time limit on answering the multiple choice questions.

When all students understood the directions, the tape was turned on and paragraph II was played at 0% time-compression (175 words per minute). This paragraph was used as the base for listening comprehension ability. When all students had answered the four questions, paragraph III was presented at 30% time-compression (250 words per minute). This pattern continued with paragraph IV at 40% time-compression (292 words per minute), paragraph V at 50% time-compression (350 words per minute), and paragraph VI at 60% time-compression (437 words per minute). At the end of the test, all test booklets and answer blanks were immediately collected.

During the fifth class meeting the students were given the pure-tome audiometer screening for groups. The test was administered in a large conference room of the library where the noise level had been measured by the county audiologist and found satisfactory for such testing. The floors were carpeted, and there were no outside noises heard during the audiology testing. The test was administered and scored by the county audiologist. Any student who showed a loss of 20 db or more on the ANSI callibration at 400, 500, 1,000, 2,000 or

4,000 Herz was eliminated from the sample. The students were told that this was a routine screening to detect any hearing loss great enough to interfere with their college work.

During the sixth class meeting the students were shown how to use the SRA Reading Laboratory IV (1957). They were told that they were required to complete at least one SRA Power Builder at their level per week and were to use any time left over to work for speed on the rate builders included within the kit. Students were also told that as soon as they had completed any two booklets with scores of 92% or more within their level, they could start the next more difficult level within the kit and repeat the process. This allowed students to proceed at their own rate through the kit. While the students were working on the SRA Reading Laboratory IV (1957), this examiner began administering the Keystone Telebinocular Visual Screening Test to individual students. This procedure was continued on each Wednesday until all students had had the visual screening. All students who showed visual deficits of more than 20/30 corrected were deleted from the sample.

The first six days of the course completed the necessary screening. The remaining nine weeks of the class were devoted to reading instruction and practice.

Since the study skills and general reading improvement section of this course were ancillary to this study, the remaining portion of this chapter will discuss the instruction given in speed reading.

Second Week of Class

Tuesday was devoted to discussing the philosophy behind speeded reading, showing the students how to break the spine of their paperback books so that the book would open out flat without losing pages and administering a timed three minute reading to establish a base speed for that type of reading.

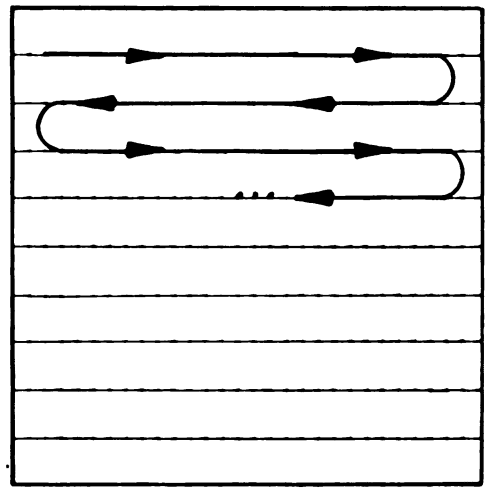
On Thursday, the students were told that they were beginning speed reading instruction. The teacher explained how to turn the pages of the book and why they needed to place their finger under the line on which they were reading and continue using their finger, both as a marker and as a pacer, under the words for the entire line of print.

Students were told that they were to move their finger across the line as rapidly as they were able to recognize words and not to stop for any specific word. This act alone has been found to stop regression patterns. The students were then given a three minute reading and this speed was compared to their base reading speed so they could realize the rate improvement which occurs without regressions. The students were then told that they were to cover visually (using their finger as a pacer) as much of a line of print as possible for each tap of the pencil but that they must begin a new line every time the pencil was tapped. The pencil taps began slowly so that the students could get the feel of the exercise and then increased in speed until it was almost impossible for the students to keep up. This exercise was used to demonstrate why normal reading speed, because of the motor capabilities of the eye under normal reading conditions, is limited to about 1,500 words a minute.

Students were then told that they were to begin the first pattern by reading the first line forward and the second line rapidly backward (the mind orders the information into proper thought sequence) and that they could add one-third to their reading rate because they could now omit the return sweep. See Diagram I.

Diagram I

One Forward-One Backward



The first line forward, the second line backward.

The remaining minutes of the period were devoted to three minute time reading exercises so that the students would know how to use the forward and backward pattern to practice at home. Students were taught how to compute their reading speed (see Appendix A). Students were told not to worry about reading for comprehension but to practice this visual exercise as rapidly as possible and that with practice, comprehension would return.

Third and Fourth Week

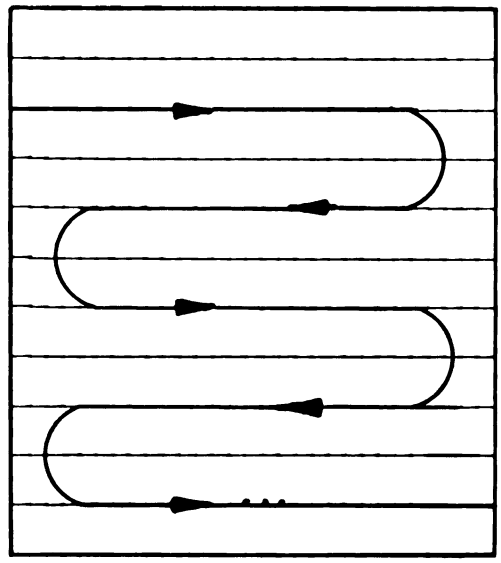
The first day of the third week the book, Runway Zero-eight was issued. The students were then given 10 minutes to read the first 20 pages. At the end of the timing, students were then asked to calculate their speed. They were then given six minutes to reread the first 20 pages trying to go further than they had the first time. They again computed their speed. They were immediately given a third reading of four minutes, again trying to better their own speed. At the end of the third reading the examiner read 20 multiple choice questions covering the material they had just read. The top speed achieved and the comprehension percentage were recorded on the students' rate and comprehension sheet.

Students were then shown how to read two lines forward and two lines backward (see Diagram II). Once they understood the pattern, they were given three readings of ten, six, and four minutes, respectively, over the next 20 pages of Runway Zero-eight. At the end of the third reading, the students were again tested for comprehension with multiple choice questions. At the end of the period the books were collected.

The next three class meetings (devoted to improving speed in the third and fourth week) were spent with the same pattern of three readings at ten, six, and four minutes, respectively, over 20 page sets in Runway Zero-eight followed by multiple choice questions over the material covered. At the end of each class period the books were collected. The students practiced at home in other books of their choice.

Diagram II

Two Forward-Two Backward



Two lines together forward (the eye actually develops a soft focus which allows vision of both lines at once) and following two lines backwards.

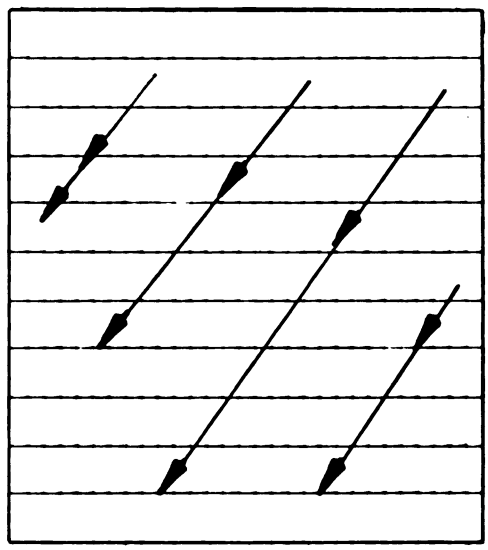
Fifth and Sixth Week

During the fifth and sixth week of class the All-Back pattern was taught and practiced (see Diagram III). This pattern requires that the student's eye movements are down and backwards. This is the most difficult of the patterns to learn and the students need reassurance that they will be able to comprehend after practice. At this time the book Farenheit 451 was issued to the students. Instead of 20 page units the students were told that they would begin to read 40 page units and were given the same three timings at ten, six, and four minutes with the comprehension quiz at the end of each multiple reading. The students have generally displayed large gains in their reading rate with this

pattern but have had little comprehension until the end of the sixth week of class. During the sixth week of class, Fear Is The Key was issued to the classes.

Diagram III

All-Back



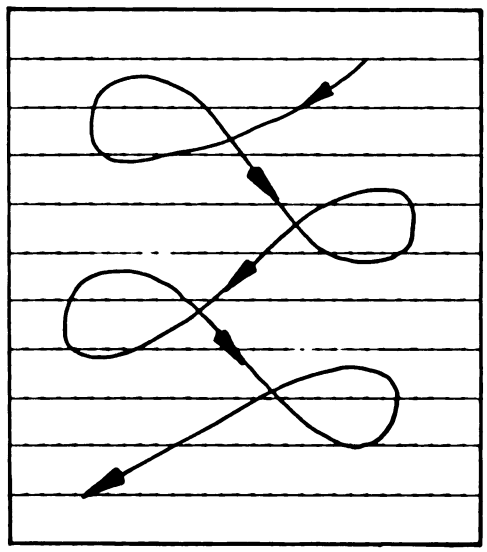
Eye sees blocks of words on each down step to the left of the finger. Note: No sentences are complete, the mind orders ideas.

Seventh Through Ninth Week

The remaining three weeks of class were devoted to learning and practicing the last pattern to be mastered. The Lazy L pattern (see Diagram IV) requires reading forward and down and backwards and down, reversing direction a minimum of twice on each page.

Diagram IV

Lazy L



Eye sweeps over blocks of words above finger.
Note: No sentences are complete, the mind orders ideas.

Students were given 60 page units to cover in three timed readings of ten, six, and four minutes, respectively, and told to cover the material as frequently as possible in each timed reading, always trying to better their own speed. At the end of each set of timings, the students were given multiple choice questions over the material covered. Topaz was issued to the students during this period.

The keys to this approach to speed reading are as follows: (1) multiple readings of the same material, (2) the shortening of the time for each successive reading, and (3) the student's constant attempt to better his own rate. By the end of the eighth week of class, the

students' comprehension of material had reached the 50 to 60% range and they were delighted with their success. During the remaining four meetings, both their speed and comprehension improved.

Throughout the entire course, it was impressed upon the students that the advantage of speed reading is total flexibility of rate to meet the purpose and difficulty of the material being read and that different types of material of varying levels of difficulty must indeed be read at different speeds. It was further impressed upon the students that one does not always speed read; there are some things for which speeded reading cannot be used such as in the initial learning of poetry, advanced mathematics, philosophy, law, and similar subjects unless one has already mastered the material to be read and is simply reviewing or searching for specific new material. Speeded reading is learned as a tool to be used where applicable.

Students were shown that for study purposes they (1) speed read the material to be learned for an overview, (2) read the material carefully and regularly the second time using whatever study aids they need to master the material, and (3) speed read the material for a third reading to review and understand the material, and (4) periodically speed read for further review of the material throughout the learning period. When speeded reading was used in this manner, the students found that it was a very useful tool both to save time and also to better master any type of material to be learned. They were also shown that it was an invaluable aid for reading material in the library and for reading professional journals, reviews, or similar materials.

At no time during the course were the students given any instruction in, or further exposed in any way to, time-compressed speech.

Post-Testing

During the last three class meetings, students were administered the post-test of listening comprehension of time-compressed speech using the same paragraphs II through VI of the Nelson-Denny Reading Test, Form B (1960) and the reading rate and comprehension test using the rate and comprehension section of the Nelson-Denny Reading Test, Form A (1960).

The timing of the Nelson-Denny Reading Test, Form A (1960) is done slightly differently on the post-test because of the rates the students have achieved. The students were told to note on their answer sheets the number of times they read the selection and what line they stopped on for the one minute reading. Students were also told that they must not look back at the selection when answering the eight questions for selection I. The remaining portion of the test is timed in a manner stated in the examiner's manual. It was found, however, that no student needed the full 19 minutes allowed to complete the rate and comprehension section of the Nelson-Denny Reading Test, Form A (1960). As a further check on the rate score, students were given 10 minutes to read the last 60 pages of Topaz (using multiple readings of the 60 pages) and to answer a 20 question multiple choice test. Students were asked to record their rates on the top of the multiple choice answer sheet. In every case, it was found that the students read the novel at more rapid rates than they did the Nelson-Denny Reading Test,

Form A (1960) with equal or greater comprehension. This discrepancy in rate scores is probably due to the differences in the difficulty level of the two types of material and to the length of material to be read, i.e., book versus paragraph.

Hypothesis To Be Tested

1. There is no relationship between the mean scores of listening comprehension using time-compressed speech at 0% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gains in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000; and 15,000 words per minute and above as measured by the Nelson-Denny Reading Test, Form A (1960).

2. There is no relationship between the mean scores of listening comprehension using time-compressed speech at 30% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gains in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000; and 15,000 words per minute and above as measured by the Nelson-Denny Reading Test, Form A (1960).

3. There is no relationship between mean scores of listening comprehension using time-compressed speech at 40% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gains in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000; and 15,000 wpm and above as measured by the Nelson-Denny Reading Test, Form A (1960).

4. There is no relationship between mean scores of listening comprehension using time-compressed speech at 50% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gains in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000; and 15,000 wpm and above as measured by the Nelson-Denny Reading Test, Form A (1960).

5. There is no relationship between mean scores of listening comprehension using time-compressed speech at 60% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gains in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000; and 15,000 wpm and above as measured by the Nelson-Denny Reading Test, Form A (1960).

6. There is no relationship between the mean scores of listening comprehension using time-compressed speech at 0% compression, 30% compression, 40% compression, 50% compression, and 60% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and the ungrouped mean gain in reading speed using speeded reading as measured by the Nelson-Denny Reading Test, Form A (1960).

7. A student's initial scores in listening comprehension of time-compressed speech as measured by the Nelson-Denny Reading Test, Form B (1960) are not a predictor of a student's ability to gain in reading speed as measured by the Nelson-Denny Reading Test, Form A (1960) in a program of speeded reading instruction.

8. A student's initial scores in listening comprehension of time-compressed speech as measured by the Nelson-Denny Reading Test, Form B (1960) are not a predictor of the amount of gain in reading speed as measured by the Nelson-Denny Reading Test, Form A (1960) that a student may make in a program of speeded reading instruction.

CHAPTER IV

PRESENTATION OF FINDINGS

The hypotheses of no relationship between listening comprehension of time-compressed speech and gains in reading speed using speeded reading were tested by examining the influences of selected variables on pre-test and post-test measures.

The Univariate and Multivariate Analysis of Variance, Covariance and Regression Program of the Michigan State University SISI program was used to process the data at the Computer Center at Michigan State University. The raw scores, keypunched for computer analysis, are listed in Appendix C.

The data analyses were made according to the null hypothesis stated at the end of Chapter III. Since no research was found that directly related to the hypotheses for this study, the .10 level of significance was accepted to reject the null hypothesis to give a beginning place for further research.

Treatment of Data

The First Hypothesis

The first hypothesis states that there is no relationship between the mean scores of listening comprehension using time-compressed speech at 0% compression as measured by the Nelson-Denny Reading Test,

Form B (1960) and gain in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000; 15,000 words per minute and above as measured by the Nelson-Denny Reading Test, Form A (1960). The mean scores for the 18 subjects whose gains in reading speed were 900 to less than 5,000 words per minute yielded a correlation coefficient of .451 for listening comprehension of time-compressed speech at 0% compression versus gain in reading speed. This correlation coefficient was significant at the .10 level. The mean scores for the 19 subjects whose gains in reading speed were 5,000 to less than 10,000 words per minute yielded a correlation coefficient of .267 for listening comprehension of time compressed speech at 0% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the 11 subjects whose gains in reading speed were 10,000 to less than 15,000 words per minute yielded a correlation coefficient of -.173 for listening comprehension of time-compressed speech at 0% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the six subjects whose gains in reading speed were 15,000 words per minute and above yielded a correlation coefficient of .734 for listening comprehension of time-compressed speech at 0% compression versus gain in reading speed. This correlation coefficient was significant at the .10 level.

The Second Hypothesis

The second hypothesis states that there is no relationship between the mean scores of listening comprehension using time-compressed speech at 30% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gain in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000: 10,000 to less than 15,000; and 15,000 words per minute and above as measured by the Nelson-Denny Reading Test, Form A (1960). The mean scores for the 18 subjects whose gains in reading speed were 900 to less than 5,000 words per minute yielded a correlation coefficient of .629 for listening comprehension of time-compressed speech at 30% compression versus gain in reading speed. This correlation coefficient was significant at the .01 level. The mean scores for the 19 subjects whose gains in reading speed were 5,000 to less than 10,000 words per minute yielded a correlation coefficient of .345 for listening comprehension of time-compressed speech at 30% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the 11 subjects whose gains in reading speed were 10,000 to less than 15,000 words per minute yielded a correlation coefficient of -.375 for listening comprehension of time-compressed speech at 30% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the six subjects whose gains in reading speed were 15,000 words per minute and above yielded a correlation coefficient of .734 for listening comprehension of time-compressed speech at 30% compression versus gain in reading speed. This correlation coefficient was significant at the .10 level.

The Third Hypothesis

The third hypothesis states that there is no relationship between the mean scores of listening comprehension using time-compressed speech at 40% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gain in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000 and 15,000 words per minute and above as measured by the Nelson-Denny Reading Test, Form A (1960). The mean scores for the 18 subjects whose gains in reading speed were 900 to less than 5,000 words per minute yielded a correlation coefficient of .297 for listening comprehension of time-compressed speech at 40% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the 19 subjects whose gains in reading speed were 5,000 to less than 10,000 words per minute yielded a correlation coefficient of .511 for listening comprehension on time-compressed speech at 40% compression versus gain in reading speed. This correlation coefficient was significant at the .05 level. The mean scores for the 11 subjects whose gains in reading speed were 10,000 to less than 15,000 words per minute yielded a correlation coefficient of -.130 for listening comprehension of time-compressed speech at 40% comprehension versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the six subjects whose gains in reading speed were 15,000 words per minute and above yielded a correlation coefficient of .479 for listening comprehension of time-compressed speech versus gain in reading speed. This correlation coefficient was not significant.

The mean scores for the six subjects whose gains in reading speed were 15,000 words per minute and above yielded a correlation coefficient of .479 for listening comprehension of time-compressed speech versus gain in reading speed. This correlation coefficient was not significant.

The Fourth Hypothesis

The fourth hypothesis states that there is no relationship between the mean scores of listening comprehension using time-compressed speech at 50% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gain in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000; and 15,000 words per minute and above as measured by the Nelson-Denny Reading Test, Form A (1960). The mean scores for the 18 subjects whose gains in reading speed were 900 to less than 5,000 words per minute yielded a correlation coefficient of .063 for listening comprehension of time-compressed speech at 50% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the 19 subjects whose gains in reading speed were 5,000 to less than 10,000 words per minute yielded a correlation coefficient of .543 for listening comprehension of time-compressed speech at 50% compression versus gain in reading speed. This correlation coefficient was significant at the .02 level. The mean scores for the 11 subjects whose gains in reading speed were 10,000 to less than 15,000 words per minute yielded a correlation coefficient of .149 for listening comprehension of time-compressed speech at 50% compression versus gain

in reading speed. This correlation coefficient was not significant. The mean scores for the six subjects whose gains in reading speed were 15,000 words per minute and above yielded a correlation coefficient of .937 for listening comprehension of time-compressed speech at 50% compression versus gain in reading speed. This correlation coefficient was significant at the .01 level.

The Fifth Hypothesis

The fifth hypothesis states that there is no relationship between the mean scores of listening comprehension using time-compressed speech at 60% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and gain in reading speed using speeded reading at reading speed gains of 900 to less than 5,000; 5,000 to less than 10,000; 10,000 to less than 15,000 and 15,000 words per minute and above as measured by the Nelson-Denny Reading Test, Form A (1960). The mean scores for the 18 subjects whose gains in reading speed were less than 5,000 words per minute yielded a correlation coefficient of -.043 for listening comprehension of time-compressed speech at 60% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the 19 subjects whose gains in reading speed were 5,000 to less than 10,000 words per minute yielded a correlation coefficient of .501 for listening comprehension of time-compressed speech at 60% compression versus gain in reading speed. This correlation coefficient was significant at the .05 level. The mean scores for the 11 subjects whose gains in reading speed were 10,000 to less than 15,000 words per minute yielded a correlation coefficient of -.368 for listening

comprehension of time-compressed speech at 60% compression versus gain in reading speed. This correlation coefficient was not significant. The mean scores for the six subjects whose gains in reading speed were 15,000 words per minute and above yielded a correlation coefficient of .865 for listening comprehension of time-compressed speech at 60% compression versus gain in reading speed. This correlation coefficient was significant at the .05 level.

Analysis of Correlations

Concerning the first hypothesis, the mean scores for the subjects whose gains in reading speeds were 900 to less than 5,000 words per minute and the subjects whose gains in reading speed were above 15,000 words per minute both yielded significant correlation coefficients at the .10 level of significance when compared to their listening comprehension of 0% time-compression. In each of these cases the researcher would be justified in rejecting the null hypothesis of no relationship. However, the two center groups at reading speed gains of 5,000 to less than 10,000, and 10,000 to less than 15,000 words per minute did not exhibit correlation coefficients sufficient to reject the null hypothesis.

Concerning the second hypothesis, the mean scores for the subjects whose gains in reading speeds were 900 to less than 5,000, and 15,000 words per minute and above both yielded significant correlation coefficients at the .01 levels of significance when compared to their listening comprehension at 30% time-compression. In each of these cases the researcher would be justified in rejecting the null hypothesis

of no relationship. However, the two center groups at reading speed gains of 5,000 to less than 10,000, and 10,000 to less than 15,000 words per minute did not exhibit correlation coefficients sufficient to reject the null hypothesis.

Concerning the third hypothesis, the mean scores for subjects whose gains in reading speeds were 5,000 to less than 10,000 words per minute yielded a significant correlation coefficient at the .05 level of significance when compared to their listening comprehension at 40% time-compression. The other three groups at reading speed gains of 900 to less than 5,000, 10,000 to less than 15,000, and 15,000 words per minute and above did not exhibit correlation coefficients sufficient to reject the null hypothesis.

Concerning the fourth hypothesis, the mean scores for the subjects whose gains in reading speeds were 5,000 to less than 10,000, and 15,000 words per minute and above both yielded significant correlation coefficients at the .02 and .01 levels of significance, respectively, when compared to their listening comprehension at 50% time-compression. In each of these cases the researcher would be justified in rejecting the null hypothesis of no relationship. However, the other two groups at reading speed gains of 900 to less than 5,000 and 10,000 to less than 15,000 words per minute did not exhibit correlation coefficients sufficient to reject the null hypothesis.

Concerning the fifth hypothesis, the mean scores for the subjects whose gains in reading speeds were 5,000 to less than 10,000 and 15,000 words per minute and above both yielded significant

correlation coefficients at the .05 level of significance when compared to their listening comprehension at 60% time-compression. In each of these cases the researcher would be justified in rejecting the null hypothesis. However, the other two groups at reading speed gains of 900 to less than 5,000, and 10,000 to less than 15,000 words per minute did not exhibit correlation coefficients sufficient to reject the null hypothesis.

In none of these hypotheses was there a total rejection in all four groups at 0%, 30%, 40%, 50%, and 60% time-compression. At 0%, 30%, 50%, and 60% compression the group whose gains in reading speeds were 15,000 words per minute and above showed significance at the .10 level or beyond. At 40%, 50% and 60% compression the 5,000 to less than 10,000 words per minute group showed significance at the .05 level or beyond. At 0% and 30% compression the 900 to less than 5,000 words per minute group showed significance at the .10 level and beyond. This trend of varying groups exhibiting correlation coefficients sufficient to reject the null hypothesis spanning all five levels of their listening comprehension at 0%, 30%, 40%, 50% and 60% compression yet never totally rejecting all four parts of any of the five major hypotheses led this researcher to further analyze the available data.

The sixth hypothesis states that there is no relationship between the mean scores of listening comprehension using time-compressed speech at 0% compression, 30% compression, 40% compression, 50% compression and 60% compression as measured by the Nelson-Denny Reading Test, Form B (1960) and the ungrouped mean gain in reading speed using speeded

reading as measured by the Nelson-Denny Reading Test, Form A (1960). The results of the correlations run in this study were as follows:

For all 54 subjects, the correlation coefficient between listening comprehension of time-compressed speech at 0% compression versus the ungrouped mean gain in reading speed was .587. This correlation coefficient is significant at the .001 level. For all 54 subjects, the correlation coefficient between listening comprehension of time-compressed speech at 30% compression versus the ungrouped mean gain in reading speed was .587. This correlation coefficient is significant at the .001 level. For all 54 subjects, the correlation coefficient between listening comprehension of time-compressed speech at 40% compression versus the ungrouped mean gain in reading speed was .670. This correlation coefficient is significant at the .001 level. For all 54 subjects, the correlation coefficient between listening comprehension of time-compressed speech at 50% compression versus the ungrouped mean gain in reading speed was .717. This correlation coefficient is significant at the .001 level. For all 54 subjects, the correlation coefficient between listening comprehension of time-compressed speech at 60% compression versus the ungrouped mean gain in reading speed was .619. This correlation coefficient is significant at the .001 level.

The correlation for gains in reading speed related to comprehension of time-compressed speech are all summarized in Table 1.

TABLE 1

CORRELATIONS FOR GAIN IN READING SPEED RELATED TO COMPREHENSION OF TIME-COMPRESSED SPEECH

Percent of Compression	Gain in Reading Speed									
	900-5,000 (wpm)	Sig	5,000-10,000 (wpm)	Sig	10,000-15,000 (wpm)	Sig	15,000+ (wpm)	Sig	All	Sig
S's	18		19		11		6		54	
0%	.451	.10	.267	---	.173	---	.734	.10	.587	.001
30%	.629	.01	.345	---	.375	---	.734	.10	.587	.001
40%	.297	---	.511	.05	-.130	---	.479	---	.670	.001
50%	.063	---	.543	.02	-.149	---	.937	.01	.717	.001
60%	-.043	---	.501	.05	-.368	---	.865	.05	.619	.001

There is one inexplicable deviation, that is, those subjects whose mean gain in reading speed was from 10,000 to less than 15,000 words per minute when correlated to listening comprehension of time-compressed speech at 0%, 30%, 40%, 50%, and 60% compression all showed negative correlations. Nine of the twenty correlations were significant at the .10 level of significance or beyond. The five correlations which related the ungrouped mean gain in reading speed versus the listening comprehension of time-compressed speech at each of the five studied levels of compression, were found to be significant at the .001 level.

Multiple Regression Analysis

If, in fact, there is a relationship between a student's ability to profit from instruction in speeded reading and a student's ability to comprehend time-compressed speech, then, first, is the comprehension of time-compressed speech a sufficient predictor of a student's ability to make gains in reading speed in a program of speeded reading instruction? And, second, is the comprehension of time compressed speech a sufficient predictor to determine the level of gain in reading speed that a student may make in a program of speeded reading instruction? The analysis of these data was obtained from the Univariate and Multivariate Analysis of Variance, Covariance and Regression Program used to obtain the sample correlation matrices.

To test the second research question, the seventh hypothesis was proposed: A student's initial scores in listening comprehension as measured by the Nelson-Denny Reading Test, Form B (1960) are not a predictor of a student's ability to gain in reading speed as measured

by the Nelson-Denny Reading Test, Form A (1960) in a program of speeded reading instruction. To test the third research question, the eighth hypothesis was proposed: A student's initial scores in listening comprehension of time-compressed speech as measured by the Nelson-Denny Reading Test, Form B (1960) are not a predictor of the amount of gain in reading speed as measured by the Nelson-Denny Reading Test, Form A (1960) that a student may make in a program of speeded reading instruction.

Concerning the seventh hypothesis, a regression analysis with five covariates was used to compare the ungrouped mean gain in reading speed versus the covariates; listening comprehension of time-compressed speech at 0% compression, listening comprehension of time-compressed speech at 30% compression, listening comprehension of time-compressed speech at 40% compression, listening comprehension of time-compressed speech at 50% compression, and listening comprehension of time-compressed speech at 60% compression. The multiple R for gain in reading versus the five covariates for all 54 subjects was .7537. This is significant at the .0001 level.

Concerning the eighth hypothesis, using data from the grouped mean reading gains, subjects in the 900 to 5,000 word per minute group showed a multiple R for gain in reading speed versus the five covariates of .7811. This was significant at the .06 level. For the subjects in the 5,000 to less than 10,000 word per minute group the multiple R for gain in reading versus the five covariates was found to be .6297. This was significant at the .32 level. For the subjects in the 10,000 to

less than 15,000 group the multiple R for gain in reading versus the five covariates was found to be .6361. This was significant at the .82 level. The N of only six subjects for the 15,000 words per minute and above was too small for a satisfactory multiple R to be run. A summary of this data is shown in Table 2.

TABLE 2

REGRESSION ANALYSIS WITH FIVE COVARIATES FOR GAIN IN READING SPEED

Reading Speed Gain	Multiple R Square	Multiple R	F	N	Level of Significance
Ungrouped	.5680	.7537	10.3007	54	.0001
900-5,000 words/minute	.6101	.7811	2,8692	18	.06
5,000-10,000 words/minute	.3965	.6297	1.3142	19	.32
10,000-15,000 words/minute	.4046	.6361	.4530	11	.82
15,000 and over words/minute[a]	--	--	--	--	--

[a]No statistic was obtained because of the small value of N.

The data obtained from the regression analysis for ungrouped mean reading speed gain versus listening comprehension of time-compressed speech yields a multiple R significant at the .0001 level. This is definitely sufficient to reject a hypothesis of no relationship between listening comprehension of time-compressed speech at 0%, 30%, 40%, 50%, and 60% compression and gain in reading speed using speeded reading. These data would indicate that the listening comprehension of time-compressed speech is in fact a sufficient predictor of a student's ability to profit from instruction in speeded reading.

However, the levels of significance obtained from the scores for grouped mean reading speed gains versus the covariates of listening comprehension of time-compressed speech are not sufficient to reject a hypothesis of no relationship.

CHAPTER V

SUMMARY AND CONCLUSIONS

Research has indicated a strong positive correlation between listening comprehension and reading from elementary school through high school. Considering the data found in this research, it appears that the trend continues into the realm of higher education for listening comprehension of time-compressed speech and gains made in reading speed using speeded reading. The correlation for all 54 subjects of listening comprehension of time-compressed speech at 0%, 30%, 40%, 50%, and 60% compression versus gains made in reading speed at all levels of gain were significant at the .001 level. This means that listening comprehension of time-compressed speech indicates a relationship to the student's ability to profit from instruction in speeded reading. At 0% compression the correlation coefficient for all 54 subjects was .587; at 30% compression .587; at 40% compression .670; at 50% compression .717; and at 60% compression .619. This indicates that comprehension of time-compressed speech at any compression speed up to 60% can be used to correlate with a student's ability to profit from instruction in speeded reading.

The two subgroups whose gains in reading speed were from 900 to less than 5,000 words per minute and those whose gains were 15,000 words per minute and above when compared with their listening comprehension

at 0% compression had significant correlation coefficients both at the .10 level of significance. At 30% compression the same two subgroups showed a significant correlation coefficient at the .01 level of significance between their listening comprehension of time-compressed speech and their gains in speeded reading.

At 40% compression the subjects whose gains in reading speed were 5,000 to less than 10,000 words per minute yielded a significant correlation coefficient at the .05 level of significance when compared to their listening comprehension of time-compressed speech. At 50% compression the two subgroups whose gain in reading speeds were 5,000 to less than 10,000 and 15,000 words per minute and above exhibited a correlation coefficient of .02 and .01 levels of significance, respectively. At 60% time-compression, the two subgroups whose gain in reading speeds were 5,000 to less than 10,000 and 15,000 words per minute and above both yielded significant correlation coefficients at the .05 level of significance when compared to their listening comprehension of time-compressed speech.

The subgroup which seemed the most sensitive to the instruments used was that subgroup whose gains in reading speed were 15,000 words per minute and above. This group showed significance at four of the five levels of compression at the .10 level or beyond. The second most sensitive group was that group whose gains in reading speed were from 5,000 to less than 10,000 words per minute when compared to their listening comprehension of time-compressed speech at 40%, 50%, and 60% compression were significant at the .05 level or beyond. The least

sensitive group was that subgroup whose gains in reading speed were from 10,000 to less than 15,000 words per minute when compared to their listening comprehension of time-compressed speech showed negative correlations at all levels of time compression.

Using regression analysis with six covariates on all 54 subjects to predict gains in reading speed from comprehension scores of listening comprehension of time-compressed speech the multiple R was .7537 which was significant at the .0001 level. This indicated that listening comprehension of time-compressed speech can be used as a predictor of a student's ability to profit from speeded reading instruction.

When the multiple regression was used to attempt to establish whether or not the listening comprehension of time-compressed speech could be used to predict what level of gain in reading speed a student might be expected to make during instruction in speeded reading, the regression coefficients indicated a declining accuracy of prediction as the level of reading speed gains increased.

Thus, the listening comprehension of time-compressed speech may predict whether a student will be able to profit from the instruction in speeded reading, but it cannot accurately predict the level of reading speed gains that a student may acquire.

Implications for Further Research

Because the sample of students used in this study was not large and was limited to a junior college population, this study needs to be replicated with a larger group of students in junior college, senior high school and college to see whether the results are specific only

for a junior college population or whether they can be applied to all mature readers. The subgroups within this study were small. This is especially true of the two groups whose gain in reading speeds were from 10,000 to less than 15,000 and from 15,000 words per minute and above. This study needs to be replicated with a larger group of students whose reading speed gains fall within this range in order to determine whether the data found in this study are indeed a trend or whether with a larger group of students, these data are found not applicable to the mature reader population.

More research is needed in the areas of the skills needed in order to process and comprehend time-compressed speech and also speeded reading. If the factors which create the relationship between these two skills could be isolated, then one could use these factors to better aid development and prediction in both of these highly demanding skills.

Much research is needed in the areas of cognitive development and the functioning of the human mind through the visual and auditory channels. Research needs to be done to discover how the mind processes stimuli through senses other than visual and auditory. How does man perceive the sense of smell, taste, and touch, and convert them into comprehension of the world around him? Does a person convert these perceptions directly into thought or must he go through the auditory and/or visual channels before he can perceive what he smells, tastes and touches? Perhaps when man discovers the answers to these questions and many others having to do with the processing of thought, we will be better able to aid people to fully develop their mental abilities and

to make the most of their auditory and visual channels to develop comprehension.

Implications for Education

The literature states that there is a positive correlation between listening skills and reading ability beginning in the primary grades in elementary school and continuing throughout reading instruction in high school. This study has indicated that there is a high positive correlation between listening comprehension of time-compressed speech and reading gains using speeded reading with junior college students. Thus, it may be that the relationship of the skills of listening and reading are related throughout life and throughout the proficiency levels attained in these skills. (If this is the case, then time-compressed speech could be used as a tool or vehicle to increase and enhance reading ability.)

Time-compressed speech, especially at 30% and 40% compression, could be used to increase a child's auditory and verbal ability not only before formal reading instruction is begun but also in conjunction with reading instruction to increase the verbal knowledge and usage of early elementary school children. It may be that if the child hears his language used in the types of material he will be reading, then he will better associate the verbal skills using hearing and speaking with the visual skill of reading. Time-compressed speech could also be used to widen and enrich his vocabulary.

Since the skills of auditory comprehension and reading are closely related, time-compressed speech when used along with visual

material might improve a child's reading proficiency and speed. Practice simultaneously in the two modalities might decrease the reading problems of word calling, regressions, and stumbling found in early elementary school children and in retarded readers of all ages.

If the mind does have the ability to "chunk" as is indicated in the literature, then the use of time-compressed speech begun at 20% compression and slowly increased after practice to 30% and 40% compression could aid the child to develop the "chunking" ability. This should aid his reading ability in that phrases, clauses, and indeed whole sentences could learn to be chunked for comprehension. This could aid in the development of better comprehension skills both in the auditory and reading areas.

Many children and adults hear but do not listen to the words spoken all around them. Television may in part be responsible for this lack of listening because a person can attend to the visual representation and receive enough comprehension from it to pass over or not attend to all of the auditory stimuli. If this is the case, then practice throughout elementary school and throughout all the years of formal schooling with time-compressed speech could help a child learn to listen attentively to the speech being used around him and to increase his general vocabulary. This writer and colleagues have found that high school and junior college students appear to be severely deficient in broad generalized vocabulary. Therefore, even when a word is unlocked in the reading process, the student still does not comprehend because he does not know the meaning of the general vocabulary word. Much practice

with time-compressed speech in diversified topics could aid in overcoming this problem as more and more words could become familiar to the students.

The application of time-compressed speech before and during the teaching of reading to the student learning English as a second language could accomplish many things. First, the student could become familiar with the intonations, rhythm and pitch of the English language. Second, they could readily associate the sound of the words with the visual stimuli for that word. Third, spoken and reading vocabulary could rapidly be increased as they listened to and read more and more selections. Fourth, as they were learning to listen to and read English their own accents and intonation and rhythm patterns could more closely approach that of the native speaker because of extensive and rapid practice with the language. This approach could also be used in foreign language classes at all levels.

Lastly, the extensive use of time-compressed speech before the teaching of speeded reading might increase the student's ability to profit from speeded reading instruction. If he can learn to process and comprehend material rapidly verbally, he may be able to process material more rapidly visually as he will have had practice in processing material much faster than he is used to. From this training with time-compressed speech the person should be able to comprehend much larger chunks of material and therefore improve his total comprehension of material rather than only comprehending small bits of material and having trouble associating those parts into the synergism. In the

opinion of this researcher, the use of time-compressed speech as an adjunct to and as a predecessor of the reading process has unlimited possibilities within the scope of today's educational system. The creative teacher will undoubtedly find many more uses for this combined approach than have been mentioned by this researcher.

Theoretical Implications

A review of the research in Chapter 2 indicated some theoretical bases for an association between the rate of language processing in auditory and visual modalities. Reflecting at the conclusion of the study on the relationships of these findings to the development of some of the theories, it would appear that two areas in particular seem to be intriguing. The first is Miller's (1956) theory of chunking information. There is a possibility that one can process chunks over a total selection as well as process chunks within a sentence. Such chunking may contribute to a gestalt. The second area that seems to have potential would be that of short term memory. Perhaps at the higher rate levels one must attend to the selection more closely and must not permit the mind to consider other associations. This might create the possibility for less decay of short term memory.

At this point one hesitates to generate hypotheses based on connections between this study and the aforementioned theories. One should first replicate the study with larger numbers. Then, assuming similar findings, one could begin to generate hypotheses with respect to some of the theories. For example, could sub-vocalizing occur up to a particular level of rate and then no longer be significant as a factor?

Or, is it possible that knowledge of material and the ability to generate many verbal associations could inhibit someone from going beyond a certain rate of processing? Is there a range within the continuum at which this occurs, and then yet another point beyond which it does not because of the need to attend to the central thought?

All of these speculations are made with caution. The purpose of sharing the impressions at the conclusion of the study is to stimulate the creation of further research projects.

APPENDIX A

UNADJUSTED STUDENT SCORES

APPENDIX A

UNADJUSTED STUDENT SCORES

Student No.	Rate Pre	Rate Post	Comprehension Pre	Comprehension Post	0% Comp. Pre	0% Comp. Post	30% Pre	30% Post	40% Pre	40% Post	50% Pre	50% Post	60% Pre	60% Post	Group Coding
01	295	05,436	27	36	3	3	3	2	2	2	1	1	0	0	2
02	318	34,440	23	28	4	3	4	2	4	3	3	0	2	1	4
03	235	05,358	32	35	2	3	3	3	3	3	1	3	0	1	2
04	417	11,360	32	36	4	4	4	4	4	4	4	4	3	3	3
05	238	01,425	31	24	3	3	2	2	3	2	1	1	0	0	1
06	275	02,164	22	35	2	3	2	3	2	3	2	1	0	0	1
07	195	01,191	26	32	3	3	3	3	2	2	1	1	0	1	1
08	262	02,135	21	25	2	2	2	2	2	1	0	0	1	0	1
09	161	01,114	25	28	1	1	1	1	1	2	0	0	0	0	1
10	161	01,429	25	29	2	2	2	1	1	1	0	0	0	0	1
11	262	02,340	34	32	3	3	3	4	2	3	1	1	0	0	1
12	238	12,300	26	24	4	3	3	3	3	3	2	3	2	2	3
13	226	04,920	25	24	3	3	3	3	2	3	1	2	1	1	1
14	226	01,315	25	28	1	2	1	2	1	0	0	1	0	0	1
15	128	01,176	22	32	2	2	2	2	2	2	1	0	0	0	1
16	250	02,044	27	32	3	2	3	3	3	1	2	2	1	1	1
17	262	07,058	27	34	4	4	4	4	3	4	2	3	1	0	2
18	338	05,270	32	34	4	1	4	4	3	2	2	2	0	1	2
19	413	09,225	22	29	4	4	4	4	3	4	2	3	2	1	2
20	396	32,595	31	33	4	4	4	4	4	4	4	3	3	2	4
21	216	11,070	23	29	4	4	4	4	4	4	3	4	2	2	3
22	287	06,203	27	29	3	4	3	3	3	3	2	3	1	1	2
23	128	08,313	18	27	3	4	4	4	4	3	2	3	2	1	2
24	262	08,190	18	26	4	3	3	2	3	3	2	2	1	1	2
25	195	11,685	23	29	4	3	3	4	3	4	3	2	2	2	3
26	207	07,074	22	27	3	4	3	3	3	4	2	2	0	0	2
27	250	20,705	27	28	4	3	4	4	3	4	3	3	1	2	4
28	275	11,685	22	30	4	4	4	3	4	4	3	3	2	2	3
29	207	06,610	27	33	4	3	3	4	3	3	2	1	1	0	2
30	468	09,225	21	32	4	4	4	3	3	4	2	2	1	1	2
31	174	05,288	23	29	3	4	3	2	2	2	1	0	0	0	2
32	407	03,660	26	32	2	3	3	2	3	2	1	1	0	1	1
33	238	09,555	30	34	4	4	4	4	4	4	3	2	1	2	2
34	207	08,100	32	32	3	3	3	3	3	2	2	1	0	0	2
35	309	02,760	22	28	3	2	2	3	3	2	0	1	0	0	1
36	338	14,418	21	24	3	3	3	4	3	3	2	2	2	2	3
37	250	16,220	22	28	4	4	4	4	4	4	3	4	2	1	4
38	161	08,100	25	32	4	4	3	4	2	2	1	2	1	1	2
39	226	16,996	23	25	4	4	4	4	4	4	3	2	1	2	4
40	207	03,418	31	36	2	3	3	2	2	2	0	0	0	0	1
41	171	12,915	21	28	4	4	4	4	4	3	3	3	1	2	3
42	226	18,757	31	29	4	4	4	4	4	4	3	3	1	1	4
43	226	04,820	21	23	4	4	4	3	2	3	1	2	0	0	1
44	262	11,314	27	24	4	3	3	4	4	4	2	2	2	2	3
45	163	10,660	21	23	3	4	3	4	3	3	2	3	1	2	3
46	207	09,840	25	25	4	4	4	4	3	4	2	3	1	1	2
47	174	07,380	22	33	4	3	3	4	3	2	1	2	0	1	2
48	338	02,460	23	36	3	3	3	3	2	3	2	2	1	0	1
49	309	14,660	22	28	4	4	3	4	4	4	3	2	1	1	3
50	338	01,278	31	36	3	3	3	4	2	3	2	2	2	0	1
51	250	10,642	34	33	4	3	4	4	4	4	3	4	2	2	3
52	298	08,094	33	28	4	4	4	3	3	3	2	1	0	0	2
53	238	03,323	22	27	3	2	3	3	3	2	2	1	0	0	1
54	287	07668	23	32	3	3	3	3	3	3	1	2	1	0	2

18 Group I 19 Group II 11 Group III 6 Group IV

APPENDIX B

SAMPLE COMPREHENSION QUESTIONS

APPENDIX B

RUNWAY 08

1. Spencer tells Trelaven that (1) he has flown often, (2) that he has flown multi-engine planes, (3) that he hasn't flown in 13 years, (4) that he hasn't flown in two years.

2. Janet's job is to (1) take care of the passengers, (2) relay messages, (3) watch the speed gauge, (4) help fly the plane.

3. The weather around the plane was (1) clear and calm, (2) turbulent, (3) threatening storm, (4) fog.

4. George was told to practice (1) steep turns, (2) reducing speed and then accelerating, (3) auto pilot, (4) landing procedures.

5. Spencer has great difficulty trying to (1) practice landing, (2) control speed, (3) control pitch, (4) use radio communications.

6. Spencer describes the planes responses as (1) like a tank, (2) like a wet sponge, (3) slow, (4) over-reacting.

7. As Spencer adjusted the flaps, the plane (1) went into a spin, (2) had a bad stall, (3) made a steep elevation, (4) lunged sideways.

8. A passenger (1) opened the cockpit door, (2) fell out of his seat, (3) argued with Baird, (4) collapsed.

9. The airport issued to the press news about (1) the emergency evacuation of homes, (2) the food poisoning, (3) the passenger's plight, (4) the whole story.

10. What terrifying discovery did Trevalen make (1) the weather conditions, (2) the automatic pilot control, (3) the lack of radio contact, (4) that Spencer was ill.

APPENDIX C

APPENDIX C

VARIANCE, STANDARD DEVIATION, AND MEANS OF MEASURED AND TRANSFORMED VARIABLES

Variable	Variance	Standard Deviation	Mean
1 PREREA	5636.732704	75.0782	255.278
2 POSREA	48192498.869673	6942.0817	8486.870
3 PRECOM	18.100629	4.2545	25.444
4 POSCOM	14.808176	3.8481	29.722
5 PRE00	.703005	.8385	3.296
6 POS00	.573026	.7570	3.259
7 PRE30	.606569	.7788	3.185
8 POS30	.769043	.8770	3.204
9 PRE40	.727114	.8527	2.907
10 POS40	.991265	.9956	2.907
11 PRE50	1.047170	1.0233	1.833
12 POS50	1.293152	1.1372	1.907
13 PRE60	.764850	.8746	.907
14 POS60	.732355	.8558	.852
15 GROUPS	.991265	.9956	2.093
16 GAINRE	47956856.321455	6925.0889	8231.593
17 GAINCM	18.015723	4.2445	4.278
18 GAIN00	.413697	.6432	-.037
19 GAIN30	.471349	.6865	.019
20 GAIN40	.566038	.7524	0.000
21 GAIN50	.560447	.7486	.074
22 GAIN60	.468553	.6845	-.056

N = 54

D.F. = 53.

ERROR TERM FOR ANALYSIS OF VARIANCE WITHIN CELLS

SAMPLE CORRELATION MATRIX FOR ALL SUBJECTS UNGROUPED WITH RESPECT TO READING SPEED

		1 PREREA	2 POSREA	3 PRECOM	4 POSCOM	5 PRE00	6 POS00	7 PRE30	8 POS30	9 PRE40	10 POS40
1	PREREA	1.000000									
2	POSREA	.231466	1.000000								
3	PRECOM	.170494	-.009533	1.000000							
4	POSCOM	.267704	-.171872	.454838	1.000000						
5	PRE00	.212676	.588128	.020569	-.096814	1.000000					
6	POS00	.191262	.432528	.022132	-.007197	.679328	1.000000				
7	PRE30	.279543	.588649	.117249	.067852	.813097	.781122	1.000000			
8	POS30	.143557	.473951	.076418	.011493	.737510	.601083	.661987	1.000000		
9	PRE40	.225575	.670351	.027160	-.099987	.698853	.564040	.708165	.631261	1.000000	
10	POS40	.274474	.570808	.018807	-.046237	.688948	.658320	.703844	.648699	.678664	1.000000
11	PRE50	.289176	.717360	.091010	.050310	.718358	.592693	.726009	.690328	.803652	.762371
12	POS50	.232795	.593812	-.057632	-.118093	.702137	.598296	.701451	.719315	.691480	.675549
13	PRE60	.334021	.621207	-.049583	-.069457	.527009	.350448	.496567	.566289	.595507	.596703
14	POS60	.181255	.576943	.013243	-.161698	.509357	.380791	.523191	.518656	.678961	.559357
15	GROUPS	.067297	.732873	.079188	-.116277	.554172	.518311	.561453	.518239	.699242	.655975
16	GAINRE	.221192	.999944	-.011405	-.175196	.587265	.431516	.587073	.473557	.669550	.569233
17	GAINCM	.071813	-.146266	-.589989	.450710	-.108391	-.028709	-.055808	-.066179	-.117874	-.060771
18	GAIN00	-.052140	-.257622	-.000766	.117735	-.504069	.291359	-.136712	-.253979	-.247184	-.123311
19	GAIN30	-.132611	-.062374	-.035169	-.062292	.023066	-.118327	-.288829	.526370	.002984	.030159
20	GAIN40	.107558	-.004393	-.005895	.052136	.119642	.231906	.128802	.142987	-.235283	.554152
21	GAIN50	-.041653	-.079390	-.211945	-.248152	.084611	.098650	.073111	.149020	-.048166	-.015938
22	GAIN60	-.200152	-.072381	.079906	-.113414	-.036528	.028321	.019662	-.075087	.087997	-.063061

		11 PRE50	12 POS50	13 PRE60	14 POS60	15 GROUPS	16 GAINRE	17 GAINCM	18 GAIN00	19 GAIN30	20 GAIN40
11	PRE50	1.000000									
12	POS50	.764762	1.000000								
13	PRE60	.599245	.750094	1.000000							
14	POS60	.703817	.664227	.687210	1.000000						
15	GROUPS	.709541	.574324	.551760	.702687	1.000000					
16	GAINRE	.716587	.592746	.619110	.576393	.733938	1.000000				
17	GAINCM	-.045612	-.049298	-.013272	-.159873	-.184794	-.147404	1.000000			
18	GAIN00	-.239887	-.211148	-.274551	-.215828	-.112399	-.257689	.107508	1.000000		
19	GAIN30	.058188	.123074	.160031	.068985	.025047	-.061093	-.021223	-.169329	1.000000	
20	GAIN40	.099329	.110267	.114703	-.029305	.075566	-.005570	.053176	.116972	.036528	1.000000
21	GAIN50	-.205242	.473635	.183583	.046903	-.085318	-.079133	-.012536	.005805	.107411	.033499
22	GAIN60	-.013468	-.127930	-.418487	.372198	.173802	-.070389	-.182917	.080949	-.118216	-.183186

		21 GAIN50	22 GAIN60
21	GAIN50	1.000000	
22	GAIN60	-.175915	1.000000

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