THE UNIVERSITY OF ALBERTA

THE RELATIONSHIP BETWEEN WORD RECOGNITION CUES, PHONIC KNOWLEDGE AND READING ACHIEVEMENT

by

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE
STUDIES AND RESEARCH IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF EDUCATION

DEPARTMENT OF ELEMENTARY
EDUCATION

EDMONTON, ALBERTA

SPRING, 1973

ABSTRACT

Though a number of studies have been conducted to determine which cues children use to recognize words, no study was found which analysed the relationship of the word recognition cues used and a child's reading achievement level.

The following investigation was undertaken in an attempt to determine if such a relationship existed and what the nature of that relationship was.

The sample consisted of forty-eight grade one children who were of average IQ at least, with an equal distribution over sex and reading achievement level.

The Keystone Visual Screening Test was administered to each child to ensure an adequate level of visual proficiency. The SRA Primary Mental Abilities Test (K-1) was used as an estimate of IQ, while the Neale Analysis of Reading Ability was administered to assess reading achievement.

The Phonics Test and the Test of Word Recognition Cues were specially constructed for this study. The Phonics Test was designed to measure the ability of children to sound out the initial, medial and final letters in three-letter words. The Test of Word Recognition Cues was designed to discover which cues were most frequently utilized by beginning readers in recognizing a long word and a short word.

Correlations and analysis of variance were used in the statistical analysis of the resulting data. A case study analysis was also made of selected pupils.

This analysis revealed that the initial letter was the cue most often utilized and shape was the cue least often used when children were attempting to recognize words.

High, average and low readers, and boys and girls did not appear to differ much in the cues they used to remember words.

The cues used appeared to show little relationship to the knowledge of phonics and to reading achievement. However, low readers used shape as a cue more frequently than the high and average readers did. An analysis of eight selected pupils showed that the teacher variable may be an important factor in determining which cue the child uses to recognize words and the child's level of reading achievement.

Results of this study would not appear to warrant the teaching of one particular cue for word recognition. Several factors, such as the teacher variable and the length of the word, may be influential in determining the effectiveness of a particular cue. It could also be that children are using cues other than those specified in this particular study.

A need for further research on the topic is evident.

ACKNOWLEDGEMENTS

The writer wishes to express her thanks to all who assisted her in this study, and especially to:

Dr. William T. Fagan, Supervisor, for his invaluable guidance, encouragement and assistance during the preparation of this thesis.

Dr. Jean Robertson and Dr. Geraldine Farmer, members of the Committee, for their helpful suggestions and constructive criticism.

The personnel of the Audio-Visual Division of the University of Alberta, and the principals, teachers and children of the schools used in this project who did so much to help during the gathering of this data.

Miss Beth Blackall, Mr. Brian Twohig and Mr. John Little, graduate students, for their assistance with various aspects of this project.

Mrs. Frances Rowe for her cooperation in the typing of this thesis.

Her son, Brian, for his encouragement and help throughout the period of this study.

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CHAPTER I

INTRODUCTION AND PROBLEM

In formulating a definition of reading, one must keep in mind that there is a distinction between beginning readers (that is, those learning to read) and fluent readers. A beginning reader requires all the word recognition skills available to him.

Chall (1967) states that the most crucial skill in the field of beginning reading is learning to recognize letters and words. This is the first great step forward the child takes on the road to being an able reader. In addition, the child must become aware that the symbols or letters he sees are linked with sounds and that these sounds are synthesized, one with another, to produce the words he uses daily.

According to Fries (1963) it is essential for the beginning reader to develop the ability to recognize the graphic shapes of the letters instantly and automatically.

Other authorities in the field of reading have expressed similar views. Bond and Tinker (1967) state:

> reading involves the recognition of printed or written symbols which serve as stimuli for the recall of meanings built up through the reader's past experience. (p. 22)

Gibson (1966) perhaps best summarizes the total reading process when she says that reading is:

> making discriminative responses to graphic symbols; it is decoding graphic symbols to speech; and it is getting meaning from the printed page. (p. 42).

In order to decode graphic symbols to speech, the reader must use various cues to remember letters or letter combinations seen previously, and also must utilize various phonic skills. Though this process is a relatively rapid one for children, some doubt exists as to the bases on which a child recognizes a word when he sees it on the printed page. The graphemic characteristics of the word undoubtedly provide an important category of cues. Shape, dominant letters, the length of the word, and knowledge of the alphabet are some of the cues used in word recognition. A recent study by Marchbanks and Levin (1965) indicates that the initial letter of a word was used most frequently, and shape or configuration was used the least, when children were asked to recognize words similar to words to which they had been previously exposed.

No research, however, was found which related to cues used by children to recognize words to their phonic knowledge and levels of reading achievement. Two studies were carried out by Levin and Watson (1961a, 1961b) in a related area, but with grade three children and an artificial orthography, in an attempt to establish the source of confusion between common graphic stimuli and common sounds. No effort was made to relate this ability to a reading situation.

It was to discover if any such relationships existed that the present study was planned.

I. PURPOSE

It is the purpose of this study to investigate the word

recognition cues, and knowledge of phonics, of children who have had one year's training in reading. Both of these word identification skills will be related to these children's levels of reading achievement.

II. DEFINITION OF TERMS

Word Recognition Cues. For the purposes of this study, a word recognition cue is the letter (initial, medial, or final in trigram words; or initial, second, third, fourth or fifth in quingram words), or the overall shape of the word, which a child sees and selects as the same or similar to the one he has previously seen and as determined by the administration of the Word Recognition Test.

Phonics. This refers to the association of appropriate speech sounds with letters, or groups of letters, and in this study is measured by the Phonics Test.

Trigram. This refers to a combination of three letters which form a word in English, though it is not an actual word: that is, it has no meaning.

Quingram. This refers to a combination of five letters which form a word in English, though it is not an actual word in the sense that it has no meaning.

Nonsense Words. These are combinations of three or five letters which represent words but which do not have meaning.

Configuration or Shape. This refers to the outline of a word and is determined by the height of the letters and whether or not they extend below the line.

Cue Selection. This refers to the particular characteristics of a word (specific letters or shape) that are used in selecting a word as similar to that previously seen.

III. HYPOTHESES

In the light of the statements in the preceding sections, the following hypotheses have been formulated and are tested in this study.

Research Hypothesis 1

The number of times each cue specified for trigrams is chosen will differ from that expected by chance.

Null Hypothesis

There is no significant difference between the expected proportion (.25) of each trigram cue, and the observed proportion.

Research Hypothesis 2

The number of times each cue specified for quingrams is chosen will differ from that expected by chance.

Null Hypothesis

There is no significant difference between the expected proportion (.166) of each quingram cue, and the observed proportion.

Research Hypothesis 3

High achieving readers will differ from average and low achieving readers in the number of times they choose a particular cue to recognize three-letter and five-letter words.

Null Hypothesis

There is no significant difference between high, average, and

low reading achievement groups in the number of times particular cues are chosen to recognize three-letter and five-letter words.

Research Hypothesis 4

Those pupils who score high on initial letter-sound correspondences will tend to use the initial letter most frequently in recognizing words, while those pupils who score high on medial and final letter-sound correspondences will use medial and final letters, respectively, in recognizing three-letter words. The type of cue chosen will also relate to the level of reading achievement. Those pupils who use a variety of cues will be higher reading achievers than those who tend to rely on a single cue.

Null Hypothesis

There is no significant relationship between the number of times a particular cue is used and

(a) phonic knowledge

(b) reading achievement.

Research Hypothesis 5

Boys and girls in grade one will differ on the number of times they choose particular cues in recognizing words.

Null Hypothesis

There is no significant difference between boys and girls in the number of times they choose particular cues in recognizing words.

Research Hypothesis 6

Grade one children who score highest on a total IQ score and various sub-scores of an IQ test will choose different cues in recognizing

words.

Null Hypothesis

There is no significant relationship between the types of cues chosen for word recognition and IQ score.

Research Hypothesis 7

Grade one children who score highest on a test of phonic knowledge will also be high reading achievers.

Null Hypothesis

There is no significant relationship between scores on a test of phonic knowledge and levels of reading achievement.

The level of significance for rejecting the preceding null hypotheses will be .05.

IV. ASSUMPTIONS

It is assumed that the word recognition cues selected by children in this study are indicative of cues they would select in an actual reading situation.

It is assumed that the reading levels reflect the reading levels of grade one children within the Edmonton Catholic School System and are not biased by any one of the schools used in the study.

It is assumed also that phonics can be measured and that the test chosen does so adequately.

V. LIMITATIONS

The following factors are recognized as limiting the generalizations made from the data collected in this study.

(1) The sample for the current study was selected from three urban schools within the Edmonton Catholic School System in the city of Edmonton, Alberta. Students in other systems using different organizational procedures for instruction, and different curriculum materials, may differ in the particular abilities measured.

(2) Children scoring more than one standard deviation below the mean IQ score were eliminated from the study. Generalizations, therefore, would not necessarily be applicable to children in this category.

(3) The children were tested after seven months in grade one. Consequently, generalizations would be restricted to grade one students who have spent a comparable amount of time in grade one.

VI. SIGNIFICANCE OF THE STUDY

The role of graphic stimuli in the beginning stages of reading has been discussed in the introduction to this chapter. It has also been suggested that phonics may play a role in word recognition.

The present study, which is based primarily on the work done by Marchbanks and Levin (1965), may help to strengthen their finding that shape or configuration plays an insignificant role in word recognition as compared to the role of individual letters.

An analysis of the cues used and their relationship to reading may give directives for teaching reading to beginning readers.

An analysis of word recognition cues and phonic knowledge may also allow statements to be made concerning the possible emphasis that should be placed on certain phonic elements.

VII. OVERVIEW OF THE STUDY

In Chapter II the writer will review the available literature which is considered pertinent to the present study. In doing so, it is hoped to construct a framework in which to consider the present research.

Chapter III will give an outline of the experimental design of the study. Information will be given on the sample, and on the construction and administration of the testing instruments.

In Chapter IV the results of the study will be analyzed and explained.

In Chapter V data on selected individual subjects will be examined. This will be done first on the basis of cues chosen by eight children randomly selected from the total group.

A second series of studies will deal with four children, two of whom are good achievers and two of whom are poor achievers in reading and phonics. The cues chosen by these pupils will be examined.

In the final chapter the summary, conclusion, implications and suggestions for further research will be presented.

CHAPTER II

REVIEW OF THE LITERATURE

It has already been indicated in Chapter I that reading consists of a number of processes—one of these being the ability to recognize, or remember, a word that has been previously seen.

In the literature on reading many studies have been reported which concern the major cues in a word which readers use to recognize words.

Several theories have been advanced as to which specific cues children use to recognize words, but little empirical work has been done to test these theories. The main theories state that the recognition cues children use are (1) the letters of the alphabet, (2) the shape, outline or configuration of the words, (3) certain details, such as ascending or descending letters.

I. THE LETTERS OF THE ALPHABET

Historical research (Smith, 1965) indicates that during the beginning centuries of reading, children were taught to read by the alphabet method, and the only technique used in dealing with an unfamiliar word was simply to spell it. Among the earliest books introduced into schools were the spellers, whose function was to teach spelling and reading, combined with religion and morals. Learning the alphabet was considered the most important first step towards reading. This is often referred to as the ABC method, and though other ways of teaching

reading were being introduced, the ABC method remained popular into the early years of the twentieth century.

A number of studies have been conducted to determine the relationship between letter-name knowledge and success in reading. Samuels (1971) reports that significant and positive correlations between these variables have been found by Barrett, de Hirsch, Jansky and Langford, Bond and Dykstra, and Dykstra. Perhaps the most notable work in this area has been done by Durrell (1958) who found that the correlation between the ability to name lower case letters and rate of learning to read words was higher than the correlation between IQ and the rate of learning to read words.

However, Samuels (1971) reported that whereas correlational studies have produced results indicating a relationship between letter-name knowledge and reading achievement, similar results have not occurred when the experiment has been carried out in a controlled classroom setting. As examples of studies of this type Samuels (1971) cites Ohnmacht and Johnson. In order to produce further information on this problem, Samuels (1971) designed a laboratory controlled experiment to determine which component of letter-name training, if any, facilitated reading acquisition. One hundred first grade students mid-way through the first year of public elementary school were used and were divided into four treatment groups. A transfer task which consisted of the learning of four words was given to all groups at the end of the treatments. An analysis of variance revealed that there were no significant differences between the groups in their ability to learn the four words. That is,

the letter-name group did not differ from the other three groups in this ability. Samuels concluded that "letter-name knowledge does not facilitate learning to read words made up of the same letters (p. 607)."

II. THE "WHOLE WORD" METHOD, OR SHAPE

Between 1840 and 1860 a vigorous protest against the ABC method was launched by educational leaders. At that time Bumstead (1840) and Webb (1856) published readers based on the whole word method, claiming that children could recognize whole words without seeing individual letters. Cattell (1886) supported this theory, believing that a whole word can be recognized (that is, remembered as having been seen previously, and pronounced) as quickly as a single letter. Huey (1912) also agreed that the general form or outline of a word is sufficient for its identification, but his conclusions apply only to fluent readers.

Anderson and Dearborn (1952) report that Erdman and Dodge, as a result of their studies, claimed that a word could be pronounced at a distance at which its individual letters could not be seen. Word shape or outline as a major cue for tachistoscopic word recognition was thereby established.

Petty (1939), as a result of an experimental study, concluded that there are children who learn to read easily because they have the ability to see words as wholes and so pay little or no attention to details.

Smith (1928) supported the whole word theory as the result of an experiment based on a letter-matching task given to 200 first graders.

Each subject was first given a card with a letter on it and asked to match it with one of a number of cards presented on a table. Following this, Smith arranged the letters of the alphabet in order of difficulty --from hardest to easiest to match. Three-letter nonsense words were then constructed, all with the same middle vowel. Three of the words had difficult letters at the beginning and easy letters at the end; three words had easy letters at the beginning and difficult letters at the end; and three words had difficult letters at the beginning and at the end. Smith then gave her subjects a matching task using the nonsense words and found no significant differences in the percentage of errors among these nonsense words. She concluded "that difficulties in matching single letters do not carry over to any appreciable extent in matching words. This conclusion supports the evidence of other investigators to the effect that children do not perceive units by letter, but by certain characteristics of whole words (pp. 560-571)."

Other studies have demonstrated the importance of configuration of words, and the familiarity of the print used in constructing the letters which made up these words. Bell (1939) showed that fewer fixations were made in reading manuscript and typewriting than in reading cursive writing. Tinker and Patterson (1940) found that more fixations were needed to read Old English than modern type face. Gilliland, as reported in Vernon (1954), concluded from various experimental studies that English readers read Gothic type more slowly and with greater difficulty than they read ordinary Roman type. Studies by Wick, on the other hand, as reported by Vernon (1954), showed that German readers had

more difficulty with Roman type, which they read more slowly than they had with Fraktur.

There seems to be little doubt that ability to read rapidly and easily depends upon familiarity with letter and word forms. The above studies, however, were conducted with adult subjects. Children who are beginning to read are still unfamiliar with words and various print types and may not recognize them immediately by outline or shape.

III. DETAILS WITHIN WORDS

Many educators were not prepared to accept the whole word theory, and took the position instead that words are recognized by certain details within them. Studies have been carried out to show that certain letters, especially ascenders and descenders, are more easily recognized than others and so supply major cues in word recognition. Gates and Boekar (1923) studied ten children with a mental age of six years. They used cards with a picture and a word exposed for ten seconds; then, after shuffling the cards, re-presented them with the picture covered. This was done on six consecutive days. The authors found that "words of irregular profile did not appear to be consistently easier to learn than those whose letters were of uniform height (p. 24)." Nevertheless, they felt that children had difficulties and confused words when the ending letters were identical. On the other hand, minute details in a word, such as the dot over the 'i' or the tail of the 'y', were noted by children and aided them to learn words.

Cattell (1886), though he had supported the whole word theory,

initiated studies to prove that the major cues in word recognition may be the most legible letters within words. Using a tachistoscope he established an order of legibility of the letters of the alphabet. Sanford (1888), using the same method as Cattell, and somewhat more recently, Crosland and Johnson (1928), indicated an order of legibility of letters obtained from their data. In all three studies more ascenders and descenders appeared in the first half of the ordered alphabet. Of the twelve ascenders and descenders in the alphabet, the first half of the order of legibility, as shown by Cattell and Sanford, contains nine, whereas in the Crosland and Johnson study seven appear in the first half. Anderson and Dearborn (1952) report that Zeitler, using a tachistoscope, found fewer errors occurred on reading ascenders and descenders and capital letters. This lead him to conclude that these are the dominating letters in word recognition.

Rickard (1935), working with children of six to nine years of age on the recognition of 119 words that were already a part of their listening vocabularies, concluded that the words most often correctly recognized were those without ascending and descending letters. He introduced another dimension--length. He concluded that longer words presented more difficulty than short ones.

Vernon (1954) reported that Goldsheider and Muller, using a tachistoscope, found most errors occurred when the initial letters, ascenders, descenders and vowels were omitted from words.

The Goldsheider and Muller, and Zeitler experiments, indicate that ascending and descending letters of the alphabet may be considered as relevant cues.

IV. POSITION OF LETTERS WITHIN WORDS

Smith (1971) suggested that words are identified through the recognition of clusters of letters because readers are sensitive to the predictability of letter sequences. He postulated that the reader makes use of critical feature discrimination and sequential redundancy as cues to aid in the recognition of words.

Anderson and Dearborn (1952) reported an experiment done by Wagner in which, using a tachistoscope, he found that the letters at the beginning or end of the word were most often reported correctly. The letters which fell closest to the fixation point, directly in the center of the word, were least often reported correctly.

Wilson and Fleming (1938) found that children aged six and seven tended to confuse words with the same initial letters, or words with unusual letters, such as the 'double o' in look.

Levin & Watson (1961a, 1961b), using an artificial orthography, discovered that words having the same initial letter and sound were most often confused, whereas the next source of confusion was words having the same final letter and sound. Words with no common elements were confused least. In the second experiment Levin & Watson found that the errors were due to common graphic stimuli rather than to common sounds.

A follow-up study by Levin, Watson and Feldman (1961) investigated the importance of writing as pre-training for learning. Four groups of six-year-olds and an artificial orthography were used. One group traced the initial graphemes of eight three-letter words, another

the medial graphemes, and the third the final graphemes. The fourth, the control group, traced from a picture book. This was followed by a learning task on a memory drum and then a recognition test. The order of success was: first the group trained on initial graphemes, then those trained on the final graphemes. The control group scored third, while the group working with the medial graphemes showed the poorest results.

V. SHAPE OF WORDS AND LETTER POSITIONS

Other educators, unwilling to accept theories that are too dogmatic, have suggested that the shape of a word, as well as the position of certain letters, supplies the child with cues that are necessary for word recognition. Diack (1960) cites an interesting experiment, carried out by Schonell, to support his theory that children recognize words by configuration as well as certain details peculiar to the word. He gives as an example, a boy, Malcolm, aged four and a half, who could discriminate between the names

MALCOLM PAT BARRIE

printed on cards in capital letters. Diack (1960) quotes Schonell as stating that Malcolm "does not know the names of more than two or three letters, nor the sounds of any letters." It is "obvious that he is responding primarily to the total visual pattern of the whole word, and it is the marked difference in the visual patterns of the words which enables him to recognize each word . . . For example, his own name starts with M and finishes with M; this gives it a certain

discriminatory characteristic apart from its length (p. 100)."

Vernon (1957) also theorized that children, particularly in the early stages of reading, appeared to examine a word randomly, showing they had difficulty in remembering small details in relation to word structure. They also seemed unaware of the importance of orientation of shape in space, and recognized words by shape or from some of the letters they may have noted.

A study by Goins (1958) indicated that a factor leading to success in reading is the ability to retain a perceptual Gestalt while, at the same time, being aware of its parts.

Vernon (1954) concluded that both the total word form and its distinguishing characteristics are important aids to recognition. She concluded, too, that children in the process of learning to read are influenced more by significant parts of words than are adults with mature reading habits. Others who have investigated perception seem to agree that, in the majority of cases, the general characteristics of a word are the clues by which it is recognized.

In an effort to discover the bases on which children recognize words, Edelman (1964) administered a delayed-recognition task, using nonsense trigrams and quingrams, to fifty kindergarten and fifty first grade children. The kindergarten children had had no reading lessons. The pupils in the first grade classes had been given no phonic instruction, but had had five months of training in the whole word method during which the first letter of a word was brought to their attention.

The task was administered individually. Each subject was shown

a word on a card (the stimulus card) after which the card was withdrawn from sight. Then the subject was asked to pick out the word he had just seen, or the one most like it, from a group of words on a second card (the response card). The two series--trigrams and quingrams--were intermixed and presented in random order.

In the three-letter series, four cues for recognition were systematically examined: shape, first letter, second letter, and third letter. Each item was given twice, in a different form, in order to test reliability of choice. The number of choices the subjects would be faced with on the response card was limited to four, five or six. Less than four was considered to be too few for a young child to choose from. Therefore, in instances where the number of choices was two or three, they were doubled to produce the desired number of choices. There were sixteen items in this series.

The same task was designed for six cues in a five-letter word: shape, and each of the five letters. One hundred and four items were presented in this series.

The original stimulus words were not included on the response cards shown to the subjects because Edelman maintained that a sufficient number of errors would not be made for purposes of analysis.

On the basis of the results of this study Edelman concluded that recognition was based on individual letters, particularly the initial letter, while shape was the least used cue.

In a description of Edelman's test two points need to be mentioned. In every case the stimulus word was of the same shape, that

is, in the trigram words the three letters of the stimulus word were on the line, on the line, and a descender respectively; examples: 'naq', 'vop', 'rip'. In the quingram words the five letters of the stimulus word were: on the line, on the line, a descender, on the line, and an ascender respectively; examples: 'sajuk', 'neyal', 'mapok'.

Secondly, though she stated that nonsense words were used, in fact some of the trigram words are actual words; examples: 'ray', 'nag', 'sly', 'sty'.

Williams, Blumberg & Williams (1970) replicated Edelman's study with a sample of socio-economically disadvantaged urban children, as well as with a group of literate adults to compare 'choice' strategies. In this case pre-training was provided using objects and geometric forms. The adult subjects also filled in a questionnaire about the strategies they used. The principal conclusion reached was that the children showed a strong tendency to match on the basis of first or last letters, and not by shape. The adults' responses varied showing variety and a complex strategy. The studies of both Edelman (1964) and Williams et al (1970), indicate that when children knew the alphabet, first and last letters became the salient cues.

A study by Timko (1970) attempted to derive some consensus from the findings of the Edelman study (1964), other studies replicating the Edelman study, and an earlier study by Davidson (1931). To do so, Timko (1970) included a comparison of the relative association of identical letters and geometric shape chosen by the subjects in the

different studies as well as the main effect of these cues and their interactions on word recognition.

Timko worked with forty randomly selected first grade children during the first few weeks of the school year to minimize the effects of formal reading instruction. There was an equal number of boys and girls in the sample.

Only trigram nonsense words were used in this investigation. The discrimination task included forty matching-to-sample delayed recognition trials. A completely counter-balanced design employing identical letters (initial, terminal and none), and shape (same and different) was used. The response cards were randomly arranged. Each response condition occurred an equal number of times in combination with all others, and each occurred twenty times throughout the forty trials.

In Timko's study the score was the number of choices given to each response type. The results showed no significant variation attributable to sex, word shape, or the interaction of the two. Identical first letters were chosen significantly more often than last letters; last letters were chosen significantly more often than shape. The results obtained by Timko largely support the findings of Marchbanks and Levin (1965).

An interesting study contrasting with the one done by Marchbanks & Levin (1965), is Davidson's (1931) investigation which suggested that geometric shape was the most used cue, though the experimental words included more than one cue at a time. For example, the author stated "When party was confused with pretty the cause was laid to

similar configuration, but not so when party and play were confused (p. 221)." Timko (1970) queries this, saying: "Were the students in that study confusing party and pretty because of similar shape, because of identical first and last two letters, or because of these cues in combination? (p. 68)."

Summary

The results of the various studies reported above are difficult to compare for a number of reasons. Basically there is a lack of agreement on definitions for terms such as "recognition", "identify" and "read." Many of the studies were done with adult subjects, and the trained perception of an adult is, of necessity, different from the perception of a child recently introduced to words. In some of the studies, too, the tachistoscope was used for presenting words. The tachistoscope controls the length of exposure to a word so that only one fixation is possible. Even adults and experienced readers have been known to misread words which would have presented no difficulty in a reading situation. For a beginning reader, therefore, the use of a tachistoscope may not be a desirable technique since the child's ability to fixate, and to absorb what has been fixated in that instant, may not be fully developed.

Of the recent studies on word recognition cues, Edelman's (1964) seems to have been the most thorough, but was not related to reading achievement. Levin & Watson (1961), with whom Edelman worked, related their findings to graphic stimuli and related sounds without reference to reading.

The present study plans to replicate the Edelman study, with some modifications, to determine the cues used by grade one children to recognize words, and to ascertain, if possible, the relationship of these cues with a knowledge of phonics and reading achievement.

PHONICS KNOWLEDGE, WORD RECOGNITION AND READING ACHIEVEMENT

Though it is admitted that phonics knowledge plays an important part in learning to read, controversy still rages over its usefulness in a reading situation. Durkin (1962) sums up the situation with the question: "Where do we stand now with regard to phonics? (p. 10)." She answers:

> Like most debates, this current one basically has two sides. One side sees phonics as the method of teaching reading. The other side sees phonics as providing one possible kind of help in identifying new and unknown words (p. 10).

Russell (1943) presented probably the most balanced and logical view when he summarized the controversy as follows:

> The advantages and disadvantages of the phonic method may be summarized by saying that there is no superiority in the phonics method, when used as the sole or principal method of teaching, over other methods. However, it may have value in combination with other methods, particularly for certain pupils who seem to respond readily to auditory clues. For teachers the important point is not phonics versus no phonics, but the extent to which it should be used, and the methods and materials employed by the pupils in phonetic-analysis activities (p. 276).

Russell makes an important point here when he indicates that phonics is a satisfactory method "particularly for certain pupils who seem to respond to auditory clues (p. 305)." Too often it is forgotten that

there are children who may have auditory losses or who might not be able to discriminate between the sounds of certain letters or letter combinations.

The main purpose of phonics, as Russell and others have pointed out, is to help a pupil decode an unfamiliar word in such a way that he is able to pronounce it. Phonics is not a method of teaching reading. It is a means of helping pupils associate appropriate sounds with printed symbols.

The goal of phonics is very aptly expressed in a publication by the Reading Workshop of the American Book Company (Fagan, 1967):

> Now comes the real test of phonics. . . can your pupils apply their phonic skills to an unknown word? If your children know the phonogram /m/ in my, and /an/ in can, are they able to blend them to make the word 'man'? If your pupils can identify 'man', does it make sense in the sentence? The application of phonic skills and meaning clues, automatically and surely, is the goal of phonics instruction (p. 9).

In recent years many experiments have been conducted to determine to what extent pupils are using their knowledge of phonics in reading. Some researchers have shown the superiority of a phonic method over other methods, while others have maintained that the degree to which phonics is functional depends on the method by which phonics is taught.

PHONIC KNOWLEDGE AND READING ACHIEVEMENT

Considerable research has been carried out to determine the relationship between a knowledge of phonics and success in reading. Typical of these studies is that by Tiffin and McKinnis (1940) who

found a significant correlation between scores on a phonics test and a reading test. They worked with pupils from grades four to eight, and concluded "that a program of reading instruction which does not by direct or indirect means yield a mastery of the principles of phonics, is not accomplishing its full purpose (pp. 190-200)."

Templin (1954) also conducted a study with fourth graders in an attempt to determine if any relationship existed between phonic knowledge and reading and spelling at this grade level. She also attempted to examine the differences that might exist between the phonic knowledge of good and poor readers. She found that there was a high correlation between phonic knowledge, spelling and reading, and that the better readers scored better on all tests. She found that the good readers did better than the poor readers in an unfamiliar test situation, whilst there was no significant difference between the groups on the sections containing familiar words.

Gates (1928) criticized the fact that phonic knowledge was not utilized by children in their reading. Durrell (1958), on the other hand, believed that the amount of phonic knowledge of beginning readers is a predictor of their success in reading. He found a high correlation between phonic knowledge and success in reading. He concluded that:

(1) Most reading difficulties can be prevented by an instructional program which provides early instruction in letter names and sounds, followed by applied phonics and accompanied by meaningful practice in sight vocabulary and aids to attentive

silent reading.

(2) Early instruction in letter names and sounds produces a higher June achievement than does instruction given incidentally during the year (p. 5).

Mulder and Curtin (1955) also found positive correlations between scores on phonic and reading tests. They tested children on their ability to blend sounds in order to make a word. A tape recording was made of one-syllable nouns, spoken with a second's duration between phonic elements; for example, n-$\bar{o}$-z (nose). Each pupil had three pictures with the name of a common consonant or vowel on each. The pupils had to mark the picture denoted by the sound on the tape. The authors concluded that inability to identify the stimulus words was a result of failure to discriminate between speech sounds or of ignorance of sound letter associations.

Rudisill (1957) used a phonics test very similar to the one used by Tiffin & McKinnis. She found a higher correlation between reading, spelling and phonics than between reading and mental age.

Clymer (1962) attempted to discover the utility of phonic generalizations that were being taught to children in the primary grades. He analysed forty-five phonic generalizations and their application to words in four sets of basal readers, and found that only eighteen of these generalizations applied seventy-five per cent of the time. In his conclusions he stated:

> In evaluating this initial venture in testing the utilization of phonic generalizations, it seems quite clear that many generalizations which are commonly

> taught are of limited value. Certainly the study indicates that we should give careful attention to pointing out the many exceptions to most of the generalizations that we teach. Current "extrinsic" phonics programs which present large numbers of generalizations are open to question on the basis of this study (pp. 252-258).

Bailey (1967) and Emans (1967) replicated Clymer's study using the same forty-five generalizations as Clymer did. Bailey used the words from the entire vocabularies of all textbooks of eight basal reading series, grades one to six. A composite list of 5,773 words resulted. Computers were used for the identification of the words in the composite list to which each of the forty-five generalizations applied. The results indicated that the utility of the forty-five generalizations ranged from eleven per cent to a hundred per cent. Bailey concluded that only six generalizations were valid in terms of ease and breadth of application.

Emans (1967) applied Clymer's generalizations to a random sample of 1,994 words beyond the primary level in The Teacher's Word Book of 30,000 Words by Thorndike and Lorge (1944). Emans found that sixteen generalizations met the criteria as compared to Clymer's eighteen. Emans claimed that generalizations other than the forty-five selected by Clymer may be useful, and also suggested the re-wording of certain generalizations.

Salzer, as reported by Fagan (1965), conducted a study to determine the degree to which phonics was functional with children after one and three years instruction in a reading program, emphasizing the sight approach to beginning reading on one hand, and a phonic approach on the other. In his conclusion he stated that there was no proof that

phonics generalizations actually functioned in word recognition.

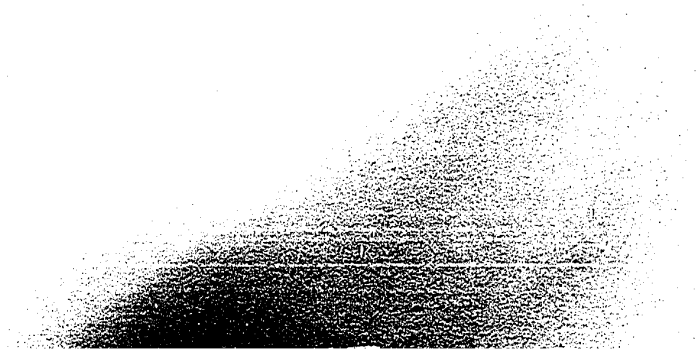
Fagan (1965) attempted to determine the extent to which grade three and grade seven pupils were able to apply their knowledge of phonics in an actual reading situation. Thirty-six pupils from each grade level were divided into equal groups of high, average, and low reading achievers, and were also grouped according to sex.

To determine phonic knowledge a modified Boyd Test of Phonetic Skills was administered. Fagan also designed and administered separate individual oral reading tests. He concluded that grade seven pupils, though they possessed considerable knowledge of phonic principles, did not apply their knowledge to the same extent as did grade three pupils.

Affleck (1967) studied the utility of selected phonic generalizations when applied to a vocabulary for the intermediate grades. As a result of her findings she concluded that, within the stated limitations of the study, percentages of utility for vowel principles, as stated, were generally higher than those reported in previous studies, but no attempt was made to investigate children's ability to use these principles.

Dickson (1970) investigated the ability of fourth grade pupils to recognize and apply vowel phonic generalizations.

She concluded that when children were confronted with new words which they must read silently, their performance was predictable according to their ability to recognize vowel generalizations. This ability, however, was not a predictor of the children's success or failure in coping with oral reading. The pupils were able to pronounce



words regardless of their ability to recognize generalizations. The children did not attend to the different vowel sounds. In most cases the consonants were correctly pronounced but different variations of the vowel sound were given. The nonsense words containing the final 'e' were found to be the most difficult, both in recognition and application.

Burmeister (1969) linguistically examined the vowel-generalization "when a word ends in a vowel-consonant - e, the 'e' is silent, and the vowel has its own long sound." Among the 17,310 words which Hanna et al (1966) considered to be the most common in English, there were 2,715 words which ended with a single vowel-single consonant - e. The grapheme-phoneme correspondences for each vowel in these words were classified. Burmeister (1969) concluded that the generalization examined was more valid for some vowels than it was for others. She recommended that primary-level words which are exceptions to the generalizations should be taught as sight words at the primary level and that groups of exceptions should be taught at a later time as the need arises. She concluded that the rule as stated is satisfactory for use in a phonic program.

Hillerich (1967), in his study, compared the skill of pupils who had had no direct teaching about vowels with those who had been taught vowel generalizations. The subjects were 742 grade one pupils in ten classrooms in two similar suburban districts, comparable in socio-economic level, pupil intelligence, class size and school expenditure per pupil. The task consisted of a thirty-item nonsense syllable

test and a reading achievement test, the results of which were compared. All pupils were administered Level I of Primary Reading Profiles by the classroom teacher. The investigator administered the nonsense test, which included fifteen vowel sounds, to avoid variations in pronunciation. The results indicated that the subjects who had been taught generalizations were significantly superior in performance on the vowel test (t - test, $p<.01$). The subjects who had not received instruction in vowel generalizations were found to be significantly superior on total reading ability as measured by the Primary Reading Profiles (t - test, $p<.25$).

Since phonics is basically concerned with letter-sound correspondences, the main criticism of phonics as a technique for teaching reading is that the English language does not have an alphabet which represents its sounds in a one-to-one correspondence.

In order to meet this criticism, educators have been widening the spelling-to-sound correspondence to include units of sound greater than the single letter.

Gibson et al (1962) hypothesized that spelling-to-sound correlations, or grapheme-phoneme correspondence, is the proper unit of reading, and this unit increases in familiarity as reading skill progresses. For example, in the word "cleats", the grapheme-phoneme correspondences are "cl", "ea", and "ts". Skilled readers become aware of the order of the correspondences, and this is an important step in developing reading skill. If the order of the syllables is reversed, i.e., "tseacl", an unfamiliar paralog is produced. Gibson et al, in two experiments,

tested their hypotheses that the high order of grapheme-phoneme correspondence is the proper unit to develop the reading process. In the first experiment, using a tachistoscope, pseudo-words with a high spelling-to-sound correlation were compared with similar words having a low correlation. The high correlation words were produced more accurately than those of low correlation. In the second experiment the subjects were asked to perform a perceptual matching of the word, exposed tachistoscopically, with a multiple choice list. In a third experiment Gibson (1962) compared first grade and third grade children, at the close of the school year, in their ability to recognize three-letter pronounceable and unpronounceable trigrams, viewed tachistoscopically. All the first grade subjects read the pronounceable trigrams more accurately than the unpronounceable trigrams. The third grade girls resembled adult readers in that they were able to read all the trigrams with accuracy.

Wylie and Durrell (1970) addressed themselves to the question of vowel sounds which they maintained "have long been labeled the unreliables and undependables (p. 787)." They believed that ending phonograms (for example, ack, ink, ip) appeared to stabilize the vowel sounds for the beginning reader. An analysis of Durrell's (1963) list of 286 rhyming phonograms which appear in primary grade words, showed that 272 or 95 per cent have stable vowel sounds.

Wylie and Durrell (1970) conducted a study to investigate various questions regarding first grade children's ability to recognize (pronounce) phonograms. A thirty-two item test of phonogram identification was constructed and administered to 230 grade one children during the

month of May of their grade one year. From the results of their study, the authors concluded that "in learning to read, the child may find greater stability in vowel sounds through ending phonograms (p. 790)." They further maintained that "nearly 1500 primary grade words stem from phonograms which have stable vowel sounds. Whole phonograms are more easily identified by first grade children than the separate vowels, suggesting that the recognition unit is the phonogram rather than the separate vowel (p. 790)."

Summary

Phonics has been advocated by many educators as being a major technique in the teaching of reading and research has shown significant and positive correlations between knowledge of phonics and success in reading. Research findings, however, have not been unequivocal since the results of a number of studies question the extent to which phonics is actually used by pupils in a reading situation. There has also been considerable controversy over whether the generalization or principle governing a particular sound-symbol correspondence is of value in teaching reading.

One point, however, appears certain. That is, a knowledge of sound-symbol correspondences aids a child in the pronunciation of unfamiliar words. No research has been found which investigated the relationship of a knowledge of phonics to the cues a pupil uses in recognizing words, although Levin & Watson (1961) considered the interdependence of the position of a letter in a word and its sound as a source of confusion in word recognition. It may be hypothesized that a child

who scores high on the initial letter of a word (when he is asked to pronounce the word) as opposed to the medial or final letter, would tend to use the initial letter of a word in his attempt to remember or recognize it at a later date. However, it could also be that the cues a child uses to remember or recognize a word might hinder or facilitate his use of a knowledge of letter-sound correspondences.

In this study, the writer plans to investigate the cues which grade one children use in remembering or recognizing words, and the relationship of the cue used to their knowledge of letter-sound correspondences and their level of reading achievement.

CHAPTER III

THE EXPERIMENTAL DESIGN

I. INTRODUCTION

The basic problem with which this study is concerned is the visual recognition of words by beginning readers, and the relationship of the cues used to phonic knowledge and reading achievement. This chapter describes the selection of the sample, the instruments used and the procedures followed in the collection of data. Statistical measures used to analyse the data will also be indicated.

II. SAMPLING PROCEDURE

The sample for this study was selected from a grade one population attending three schools in the Edmonton Catholic School System.

The grade one population was chosen because at this grade level, near the end of the school year, the pupils have been instructed in certain aspects of word recognition skills, and have also had some preliminary training in phonic skills.

The selection of pupils for this study was made by means of stratified random sampling from the schools selected by the Edmonton Catholic School Board.

From the ninety-seven grade one pupils attending these schools, equal numbers of boys and girls, and of high, average and low readers,

for a total sample of forty-eight, were chosen according to the following procedure.

Since visual difficulties contribute to reading problems, a visual screening test was administered to all the pupils. The Keystone Telebinocular was used to check each child's visual efficiency. Three Keystone Visual Survey Tests were used to check lateral posture, fusion and usable vision with both eyes, all at near point. These three basic areas were considered to be essential for unhampered visual functioning while reading. Further, the near point position was used here because all the tests administered required good vision at the child's normal reading distance. On the basis of these tests ten children were eliminated from the sample.

It was also felt that below average IQ may be an important factor in test performance. The SRA Primary Mental Abilities Test K-1 was administered to the total grade one population, except for three children who were absent on the day of administration. Two children, whose scores fell more than one standard deviation below the mean, were considered ineligible for the study.

The remaining eighty-two children were divided into groups of high, average and low readers on the basis of their achievement on The Neale Analysis of Reading Ability (Form A, 1966). From each group eight boys and eight girls were chosen for a total sample of forty-eight. Table I summarizes the chronological ages, IQs, and reading accuracy scores of the sample.

TABLE I

MEAN CHRONOLOGICAL AGE, READING ACCURACY AND IQ SCORES OF THE SAMPLE

Groups (Numbers)		Chronological Age	Reading Accuracy Score	Intelligence Quotient
High (16)	$\bar{X}$	80.81	28.37	115.50
	SD	3.79	8.86	9.21
Average (16)	$\bar{X}$	80.87	17.87	111.25
	SD	3.44	2.68	5.31
Low (16)	$\bar{X}$	81.25	8.56	105.00
	SD	3.21	3.07	9.29
Boys (24)	$\bar{X}$	82.08	18.33	111.20
	SD	2.99	8.94	9.06
Girls (24)	$\bar{X}$	79.87	18.20	109.95
	SD	3.52	10.90	9.27
Total (48)	$\bar{X}$	80.97	18.27	110.58
	SD	3.42	9.86	9.09

III. TEST INSTRUMENTS

Standardized Tests

(1) The Keystone Visual Survey Test.

This visual screening device is produced by the Keystone View Company of Meadville, Pennsylvania, U.S.A. It is an individually administered test which involves the use of the Keystone Telebinocular instrument. This instrument requires the child to look through two glass lenses and respond to the examiner's questions concerning the visually presented stimuli. The total test consists of fourteen card presentations or subtests, nine of which are placed at the far-point position, which is the equivalent of an actual distance of twenty feet. The remaining five card presentations are placed at the near-point which is the equivalent of an actual distance of sixteen inches.

As suggested in the Keystone Instruction Manual (1961) a child experiencing difficulties in lateral posture, fusion, and usable vision at near-point, would also be hampered in reading at near-point. Therefore, considering the nature of the instruments involved in the present study, the near vision sub-tests were used to screen out children experiencing visual deficiencies in these areas.

(2) SRA Primary Mental Abilities Test - K-1 (revised 1963).

This instrument was designed to provide both multifactored and general measures of intelligence. At the K-1 level there are four subtests, each of which measures a primary ability, while the total score provides an estimate of general intelligence. The four primary abilities assessed by the subtests are:

Subtest 1 - Verbal Meaning: The child is required to demonstrate an understanding of orally expressed ideas by marking one of the four possible pictures. There are forty-nine test items, as well as seven practice items.

Subtest 2 - Number Facility: This is comprised of simple quantitative problems requiring the child to count, add and subtract. The child is asked to respond by marking the appropriate number of pictures. There are twenty-seven test items and seven practice items.

Subtest 3 - Perceptual Speed: The child's ability to see likenesses and differences between objects and symbols (pictures and silhouettes) quickly and accurately is measured. This is a matching-to-model task consisting of twenty-eight test items and seven practice items.

Subtest 4 - Spatial Relations: This subtest measures a child's ability to visualize objects and figures rotated in space and the relations between them. The first task requires the child to mark the figure which completes the sample stimulus. The second task involves completing a geometric figure from a shown model. Altogether there are twenty-four test items and ten practice items.

Reviews (Buros, 1972) have indicated test-retest reliability coefficients ranging between .83 and .95. Validity was established by correlating test scores with the results obtained on the SRA Achievement Series: Reading. The test authors, although they did not provide correlation coefficients, maintained that correlations were satisfactory.

(3) The Neale Analysis of Reading Ability (Form A, 1966).

This test was chosen as the measure of reading achievement mainly because it is both easily administered and well-standardized. This oral reading test allows for a measurement of reading accuracy and comprehension ability. Allowance is also made for reading rate. However, this measure was not used as it was not considered pertinent to this study.

The test, which is administered individually, consists of six passages of graded difficulty and increasing length, with controlled variation of vocabulary and sentence structure.

Reliability coefficients for accuracy scores on alternate forms exceed .96. A validity coefficient of .95 was obtained using the pooling square method over the following tests: Ballard One-Minute Test, Vernon Word Reading Test, Holburn Scale, Peel English Test, and the Schonell English Usage Test (Neale 1965).

Tests Constructed for This Study

Phonics Test (Appendix A):

The phonics test used in this study was based on Part I of the Alta-Boyd Test of Phonic Skills, which measures the ability to sound out the initial and final consonants, and short vowel sounds in three-letter words. These same abilities were measured in the first section of the constructed test which consisted of eighteen three-letter words. Where possible, items were chosen from the Alta-Boyd Test, but when items contained letter combinations similar to those on the Test of Word Recognition Cues different letters were substituted. The second

part of the constructed test consisted of twelve three-letter words, but these words were arranged in vowel, consonant, consonant order.

Validity

The purpose of this test was to measure a child's ability to sound out the initial, medial, and final parts of three-letter words. In order to achieve this purpose, the writer relied on content validity for this test.

The items chosen were based on the Alta-Boyd Test of Phonic Skills. This test is widely used in the University of Alberta Reading and Language Center and has been successful in identifying children with difficulties in sounding out initial, medial, and final parts of words.

Three-letter words only were used, so the child was exposed to a single initial, medial and final symbol. It had been planned to use five-letter words also, but a pilot study showed that such words were too difficult for grade one children.

In order to overcome the possibility of the subjects developing a psychological set for test words using only a pattern of consonant-vowel-consonant combination, part of the test contained three-letter words of a vowel-consonant-consonant combination.

In order to test sound-symbol association ability, nonsense words only were used. This eliminated the possibility that the children might recognize the words as sight words.

Finally, although each alphabet letter used in the Test of

Word Recognition Cues (to be discussed later) was used in the Phonics Test, no combination of letters on the former test appeared as a total unit (a three-letter word) on the Phonics Test.

Reliability

In order to establish reliability for the Phonics Test, a split-half reliability coefficient was calculated by means of the KR-20 formula. The resulting correlation coefficient was .94, and when corrected by the Spearman-Brown formula for length, the coefficient increased to .97. It was thus felt that the Phonics Test was highly reliable.

Test of Word Recognition Cues (Appendices B,C,D):

A delayed-recognition task was designed using three-letter and five-letter nonsense words similar to those used by Edelman (1964). Edelman's list was not used because some of the words in that list (trigrams) are actual words and, because of the manner in which she held cues constant, the subjects had unequal chances for choosing a specific cue. For example, they had more opportunities to choose the first letter than they had to choose shape.

Below is a description of the procedure used to construct this test. The test consisted of both trigrams and quingrams, and each of these sections will be dealt with separately.

Trigrams: The following principles were used as guides for constructing these items of the Test of Word Recognition Cues.

1. The possible cues to be used by the subjects in selecting the word nearest in form to the stimulus item shown them were the shape of the word, the first, second and final letters.

2. There were sixteen items (the same number as Edelman used). Although actual words from the Edelman test were not used, the sixteen stimulus words were modelled on her items. Whereas Edelman had all stimulus words with the same shape or configuration, the author of the present test varied the arrangement of ascending and descending letters.

3. There were twelve choices for choosing each of the cues indicated in number 1.

4. In order to provide equal chances for the choice of cues, each cue was held constant in four items (randomized in the test) and in each set a particular cue was held constant. This was achieved by using a grid as in Figure 1. Using the three-letter nonsense word "ste" as an example, the choices for determining which cues the subjects used to remember the stimulus word were constructed as follows.

Assuming that "ste" was the first item to be constructed, shape was held constant. Thus the plan for construction was: ste - sha itu ofe. When the child was shown the stimulus word "ste" and given the three choices

sha

itu

ofe

he could not use word-shape as his cue to choose the one most like the stimulus word since it was held constant. Each of the other choices

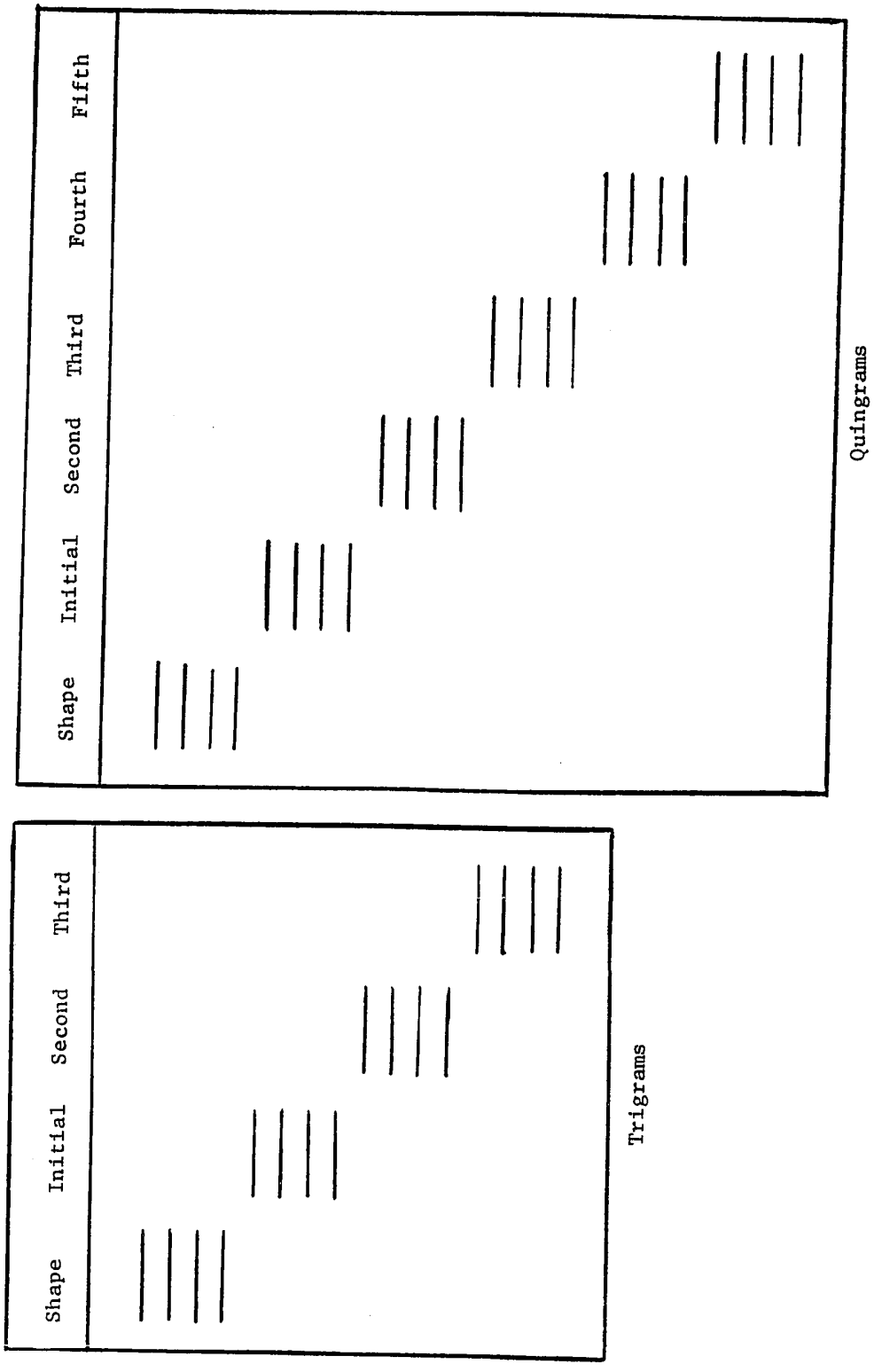


Figure 1. Model Grid for Setting up the Four Sets of Trigram and Quingram Items.

contained a single letter from the stimulus word. Thus if he chose "sha" it was assumed he was using the initial letter as his recognition cue.

Edelman has shown that three choices were too few to choose from and, consequently, the number was increased to six. Thus the subject would now have two chances of selecting each cue. In final form the stimulus word "ste" and the six choices were as follows:

ste	sla
	slo
	itu
	atu
	ofe
	obe

Shape was held constant so there were two opportunities to choose either the initial, medial or final letters as the cue in remembering what "ste" looked like. The order for all items for choice was randomized.

A similar procedure was used for constructing the other three items where shape was held constant, and the three sets of four items where the first, second and third letters were held constant.

Quingrams: The principles for constructing these items of the Test of Word Recognition Cues were:

1. The number of possible cues to be used for selecting the items most like the stimulus words was six - shape, and first, second, third, fourth and fifth letters.

2. Because there were six possible choices, the test consisted of twenty-four items. An attempt was made to vary the frequency of the letters selected. Consequently the one stimulus word was used with two sets of responses.

3. There were twenty chances for choosing each of the cues indicated in number 1.

4. In order to provide equal chances for the choice of cues, each cue was held constant in four items. Thus there were four sets of four items (randomized in the test) and in each set a particular cue was held constant. This was achieved by using a grid as shown in Figure 1.

Assuming that "moleg" was the first item to be constructed, the initial letter was held constant, and the plan of construction was

moleg	makiy
	moyut
	milat
	mater
	mayug

When the child was shown the stimulus word "moleg" and given each of the choices, he could not choose the initial letter as his distinguishing cue since it was common to all items. In each choice, one of the other letters, plus shape was included. Thus on the basis of the choice selected, the cue used to recognize the stimulus word could be assumed.

Since there were five choices for the quingrams, this was felt to be sufficient.

Arrangement of Trigrams and Quingrams for Presentation

Each stimulus word was typed on a five by eight card on which

was a neutral picture (that is, a picture without specific meaning and based on Berko's (1958) morphology test where she used such pictures, as for example, one illustrating a "wug"). The pictures used in this study were sketched by personnel in the Audio Visual Media Center (Graphics Division) at the University of Alberta.

Each card was shown to the child for a certain number of seconds (three seconds for trigrams and five seconds for quingrams). The specific directions were: "I am going to show you a word for a few seconds. On it there is a picture with a word printed below it. You are to look at the word carefully. When I take it away I will give you another card with five or six words on it. You are to choose the word most like the one you saw with the picture and draw a ring around it."

Two children were tested at one sitting.

Validity

Content validity was established for the Test of Word Recognition Cues, keeping in mind that for the purposes of this study, word recognition was defined as selecting a word which was most like a word shown for a certain number of seconds and then withdrawn. The stimulus word was not used as one of the choices because a previous study (Gibson et al, 1962) showed that children in most cases chose this word, and thousands of words had to be sampled before a sufficient number of errors were made for the purposes of analysis.

Pictures were used so that some semblance of meaning would be given to the task. Pictures are frequently used for the purposes of

teaching word recognition in a classroom situation.

As has been indicated, careful attention was given to the construction of the test so that equal numbers of chances were given for the selection of each cue.

All sets of items of the test and all choices within the sets were randomized so that the selection of a particular cue would not be biased by the format of the test.

Reliability

Since the items for the Test of the Word Recognition Cues could be grouped into sets of four (depending on which cue was held constant) an attempt was made to determine how consistent the subjects were in choosing particular cues in these sets of items. Consistency was defined as choosing the same cue three or four times out of the possible four choices. The percentage of consistency for the trigrams and quingrams according to the cue held constant in the various sets of items is given in Tables II and III.

The results from Table II indicate that when shape, second, and third letters were held constant for trigrams, subjects were fairly consistent in terms of selecting the same cue in that particular set of four items. The percentage of consistency when the first letter was held constant was low. This may have been so because the first letter was chosen most often by all subjects, and when it was held constant their selection of a cue was random rather than consistent.

The results from Table III indicate that the percentage of consistency for choosing cues in sets of items with a particular cue

TABLE II

CONSISTENCY OF RESPONSES TO SETS OF TRIGRAMS

Cues held constant	shape	first	second	third
Percentage of consistency	60.4	31.2	70.8	62.5

TABLE III

CONSISTENCY OF RESPONSES TO SETS OF QUINGRAMS

Cues held constant	shape	first	second	third	fourth	fifth
Percentage of consistency	39.5	31.2	31.2	39.5	47.9	39.5

held constant was much lower for quingrams than for trigrams. This may have been so because, in the case of quingrams there was a much wider range of cues to choose from (five) as opposed to Trigrams (three).

A second method of analysing consistency for the Test of Word Recognition Cues was also used. Those items for which shape and the other cues were held constant were examined but, instead of noting how consistent subjects were in choosing a cue in a set of four items, an analysis was made to determine which cue was chosen most often by the forty-eight subjects. Thus with forty-eight subjects and four items in each group, the possible number of times a cue could be chosen was 192. The number of times a cue was chosen was expressed as a percentage. The results are shown in Table IV.

TABLE IV

PERCENTAGE OF TIMES A PARTICULAR CUE WAS CHOSEN WHEN VARIOUS CUES WERE HELD CONSTANT

Cue held constant	Cue and Percentage Chosen			
	Trigrams		Quingrams	
Shape	(first)	64.0	(first)	50.0
First	(second)	41.0	(second)	41.0
	(third)	41.0		
Second	(first)	64.0	(first)	50.0
Third	(first)	52.0	(first)	55.0
Fourth		-	(first)	55.0
Fifth		-	(first)	55.0

The results of Table IV indicate that subjects were fairly consistent in choosing the initial letter in the quingrams when each cue (except first letter) was held constant. When they could not choose the initial letter, they tended to choose the second letter of the five letter word.

A similar consistency was evident when the first letter of trigram cues was chosen. The percentages were relatively higher when shape and the second letter were held constant. When the first letter was held constant the pupils chose the second and third letter an equal number of times.

IV. PILOT STUDY

A pilot study for the purpose of testing the materials used in this project was conducted in an Edmonton Catholic School approximately one month prior to the final data collection. Sixteen children were used, divided into high, average and low reading groups on the basis of teacher judgement.

The main reasons for giving the pilot study were: (a) to assess the time each test presentation would take; (b) to try various procedures in administering the Test of Word Recognition Cues so that it would resemble the teaching of word recognition in the classroom as closely as possible; (c) to test the feasibility of the Phonics Test.

Since the pupils reacted much more favorably to words presented in conjunction with pictures than to words presented alone (as in the Edelman study), it was decided to use neutral pictures in conjunction

with the words for the complete presentation of the test. In order to lessen the time necessary for administration it seemed feasible to work the subjects in pairs.

The Phonics Test presented only one difficulty. It was found that the grade one level pupils were unable to cope with five-letter nonsense words, which in fact required them to be able to syllabicate. This part of the phonics test was, therefore, eliminated from the final study.

Four syllables of the vowel-consonant-consonant combination were also changed as they appeared to cause the subjects difficulty. The words were 'urb', 'ept', 'ift' and 'arf'. They were replaced by 'url', 'est', 'ilt', and 'arp'.

V. COLLECTION OF DATA

All the visual screening tests were administered individually by a co-researcher working on a related study. This screening process lasted approximately from three to five minutes per subject. The Neale Analysis of Reading Ability was also administered individually. The co-researcher mentioned above administered approximately half the tests, while the other half were administered by the experimenter. Each subject was involved in the testing for five to fifteen minutes, depending upon the number of passages read.

The Test of Word Recognition Cues was administered by the experimenter to a group of two subjects at a sitting. Examples were given and, after the subjects understood the procedure, the total test

was administered. The subjects were shown a card with the picture and printed word on it, and after three or five seconds (for the trigrams and quingrams respectively) it was removed, and from a sheet on which the response words were listed, they selected the word most like the word shown on the card. The total time taken for administration of the test was from eight to ten minutes.

The Phonics Test was administered individually after the Test of Word Recognition Cues to prevent the subjects from developing a set for pronouncing the words on the Test of Word Recognition Cues. The words of the Phonics Test were typed in primer type on sheets of paper. The examiner had a similar sheet and wrote down the word phonetically as the child pronounced it.

The following instructions were given: "I want you to pronounce some words for me. These are not real words. That is, they don't mean anything. I just want you to say them as you think they would sound."

VI. SCORING THE TESTS

The Phonics Test

All the phonic tests were scored by the examiner. One mark was allotted for each correct initial sound, medial sound and final sound. A total score was also computed. The results of these tests thus yielded four scores for each child.

The Test for Word Recognition Cues

All the tests for word recognition cues were scored by the

examiner. For both, the trigram test and the quingram test, a record was constructed indicating the number of times each subject made the choice of a particular cue; a record was also constructed indicating the total number of times each cue was selected by all the subjects. These scores were then analysed to permit a comparison to be made between the various cues chosen.

VII. STATISTICAL TREATMENT OF THE DATA

Pearson Product Moment Correlations were used to determine the statistical relationship between the specific variables measured in the study:

1. The number of times specific word recognition cues (shape, first, second, third, fourth, fifth letter) were chosen.
2. Phonic knowledge, as indicated by pupils' scores obtained in sounding out initial, medial and final parts of words.
3. Reading accuracy and reading comprehension scores as measured by the Neale Analysis of Reading Ability.
4. Total IQ scores and scores of specific mental abilities as measured by the SRA Primary Mental Abilities Test, and chronological age.

A One Way Analysis of Variance (ANOV 15) was used to determine if differences were significant between high, average and low reading groups on the number of times specific word recognition cues were chosen. The same statistical procedure was used to determine if boys and girls differed on the number of times various word recognition

cues were selected.

A Test of Significance of Difference Between Proportions (Ferguson 1966) was used to examine the proportional differences between the types of cues chosen by each group on the Word Recognition Test.

Summary

In this chapter the selection of the sample, test instruments used, the pilot study, collection and analyses of the data, were described.

The findings of the study are presented in the following chapter.

CHAPTER IV

ANALYSIS OF DATA

The data obtained from testing forty-eight grade one children at the end of the 1971-1972 school year in three schools of the Edmonton Catholic School System are presented in this chapter. The statistical data are shown in table form and then analysed and explained.

I. READING ACHIEVEMENT AND PHONICS KNOWLEDGE TESTS RAW SCORES

Table V shows there was a consistency between the scores of the boys and girls, and the total group on reading accuracy and in the ability of the subjects to sound the initial and final parts of words.

The girls scored slightly higher than the boys in their ability to sound the medial part of a word, and consequently in the total phonics score, while the boys were slightly superior in reading comprehension. When the different reading groups were considered, however, a notable difference in the performance of low readers and high readers in both phonics and reading achievement was apparent. The high readers scored well above the means in each of the two phases of reading achievement, that is, accuracy and comprehension, and on all parts of the Phonics Test. In phonics the high readers showed marked superiority in their knowledge of final consonant sounds. The medial sound was associated with the lowest scores, no matter how the subjects were grouped. Except for the high readers, knowledge of the first and last phonic sounds appeared to be nearly equal. It would seem, therefore, that as expected, the high

TABLE V

MEANS AND STANDARD DEVIATIONS FOR PERFORMANCE ON READING ACHIEVEMENT AND PHONICS KNOWLEDGE FOR TOTAL GROUPS AND SUBGROUPS

		Reading Accuracy	Reading Comprehension	Phonics Initial	Phonics Medial	Phonics Final	Phonics Total
Total Group	$\bar{X}$	18.27	5.02	22.08	17.89	22.14	62.12
	SD	9.86	3.07	6.31	8.53	8.03	21.70
Boys	$\bar{X}$	18.33	5.66	21.66	16.50	21.54	59.70
	SD	8.94	3.13	7.79	9.00	9.01	24.67
Girls	$\bar{X}$	18.20	4.37	22.50	19.29	22.75	64.54
	SD	10.90	2.93	4.51	7.99	7.06	18.49
High Readers	$\bar{X}$	28.37	6.81	26.12	25.31	38.37	79.81
	SD	8.86	3.33	2.80	4.01	2.21	7.82
Average Readers	$\bar{X}$	17.87	5.50	23.06	16.93	22.31	62.31
	SD	2.68	2.25	4.43	6.36	5.68	14.68
Low Readers	$\bar{X}$	8.56	2.75	17.06	11.43	15.75	44.25
	SD	3.07	2.04	7.21	8.22	8.93	22.91

readers scored highest on all aspects of phonics tested, while the low readers scored lowest. Grade one students (high, average and low readers) tended to have more difficulty with medial than with initial or final sounds of words.

II. WORD RECOGNITION

1. Cues Used

This study was undertaken to explore which cues children used to recognize words visually. When a child attempts to pronounce a word, regardless of whether phonics, or the "look and say" method has been stressed, he must remember some salient cue in the word which will enable him to recall it when he meets it again and attempts its pronunciation.

Table VI shows the choice of cues made by the subjects when working with three-letter nonsense words (trigrams). Table VII gives similar information in relation to the five-letter nonsense words (quingrams).

The results of the trigram series show that the first letter was the most frequently used by all groups, while shape was the least used cue. This supports Edelman's (1964) main findings. However, Edelman found that the third letter was second most important for all groups, except for the first-grade girls, for whom the second letter was next most important. This was not the case in the present study. All subjects, and particularly the high readers, showed a slight preference for the second (or middle) letter over the third. The low group, however, chose shape as a cue more often than any other group.

TABLE VI

MEANS AND STANDARD DEVIATIONS FOR CHOICE OF CUES FOR TRIGRAMS

		Shape	First	Second	Third
Total	$\bar{X}$	1.56	7.37	3.83	3.22
	SD	1.44	3.00	1.91	1.78
Boys	$\bar{X}$	1.58	7.25	3.79	3.37
	SD	1.66	3.16	1.71	1.86
Girls	$\bar{X}$	1.54	7.50	3.87	3.08
	SD	1.21	2.88	2.13	1.74
High	$\bar{X}$	1.50	7.12	4.06	3.31
	SD	1.96	3.77	1.94	1.74
Average	$\bar{X}$	1.56	7.31	3.75	3.37
	SD	1.26	3.15	2.11	2.15
Low	$\bar{X}$	1.62	7.68	3.68	3.00
	SD	1.02	1.95	1.77	1.50

TABLE VII

MEANS AND STANDARD DEVIATIONS FOR CHOICE OF CUES FOR QUINGRAMS

		Shape	First	Second	Third	Fourth	Fifth
Total	$\bar{X}$	1.60	10.62	3.47	2.72	2.62	3.00
	SD	1.37	5.13	1.91	1.99	2.09	2.15
Boys	$\bar{X}$	1.83	9.45	3.54	3.29	2.75	3.16
	SD	1.40	5.06	2.04	1.92	2.23	2.47
Girls	$\bar{X}$	1.37	11.79	3.41	2.16	2.50	2.83
	SD	1.34	5.04	1.81	1.94	1.99	1.80
High	$\bar{X}$	1.43	10.75	3.43	2.68	2.56	3.18
	SD	1.31	5.99	1.63	2.05	2.18	2.31
Average	$\bar{X}$	1.06	10.87	3.81	2.50	2.87	3.00
	SD	1.12	3.98	2.37	1.41	1.99	1.71
Low	$\bar{X}$	2.31	10.25	3.18	3.00	2.43	2.81
	SD	1.44	5.54	1.72	2.47	2.22	2.48

In the five-letter series, again the first letter appeared as the most important cue for all groups, while shape was the weakest cue. This finding is similar to the results of Edelman's study. On the other hand, she found that the second strongest cue was the fifth or final letter for all groups, except first-grade girls, whose second strongest cue was the second letter. This finding is not confirmed by the present study in which all groups showed a slight tendency to choose the second letter in preference to the third, fourth, or fifth letters. In no instance was the fifth letter the second strongest cue chosen. The fifth letter, however, was favored more than the third and fourth, except by boys and low readers who showed preference for the third or middle letter. Again the group of low readers showed a preference for shape as a cue more than did any of the other groups.

The number of times each cue was chosen is given in Tables XVII and XVIII (Appendix E). The order of cues from most important to least important in the three-letter series is presented and compared with Edelman's findings in Table VIII.

TABLE VIII

THE ORDER OF CUE IMPORTANCE IN TRIGRAMS FOR BOYS AND GIRLS

	Girls	Boys
Present study	1 2 3 Sh	1 2 3 Sh
Edelman's study	1 2 3 Sh	1 3 2 Sh

The order of cues chosen from most important to least important in the five-letter series is compared with Edelman's findings in Table IX.

TABLE IX

THE ORDER OF CUE IMPORTANCE IN QUINGRAMS FOR GIRLS AND BOYS

			Girls			
Present study	1	2	5	4	3	Sh
Edelman's study	1	2	5	3	4	Sh
			Boys			
Present study	1	2	3	5	4	Sh
Edelman's study	1	5	3	2	4	Sh

It is apparent from the data of Tables VIII and IX that the results of Edelman's study and the present study are the same with regard to the strength of choice of initial letter and shape as cues in recognizing words.

There were some differences in the number of times the other cues were chosen, particularly the second and the fifth letters of the quingrams for boys. This was, perhaps, the greatest difference with respect to cue choice in the findings of both studies.

In the present study, when the first letter was held constant, the pupils seemed to experience difficulty in selecting an alternate cue. This confusion is reflected in the lack of a consistent response

pattern. Edelman, on the other hand, found that when the first letter was held constant, the last letter was used most frequently, except by the girls who used the second letter.

It must be remembered, however, in comparing the present study with Edelman's study that the design, the instruments, and the mode of instruction of the pupils who had learned to read were different. Edelman claimed that the children she studied were taught primarily by the whole word method. In the three Edmonton schools in which the present study was carried out all the subjects had been introduced to phonics. All the teachers concerned maintained that they stressed the use of the first letter as a word recognition skill.

In view of these differences it seems interesting to note that, with all the subjects, the first letter was the strongest cue and shape the weakest, regardless of the method used and in spite of the differences in study designs.

The effect of the children's knowledge of phonics was noted in the tendency of many of the subjects to vocalize the letters of the stimulus words. Two other tendencies were noted by the examiner. After the first few presentations many of the children tended to look automatically for the first letter, and when the first letter was held constant these children tended to choose other cues at random. Thus the question might be raised as to whether the initial letter is emphasized too much in the teaching of word analysis skills.

It was noticed, too, that when a pair of letters familiar to the children appeared in the stimulus word, as well as on the response

card, that pair seemed to guide the choice of cues.

In order to determine whether the number of times a particular cue was chosen differed from the number of times its choice would be expected by chance, a test for significant differences between proportions was carried out. Graphs representing the proportion of cues selected to the possible number of choices are presented in Figures 2, 3, 4 and 5.

Results from the test of significant differences between proportions indicated that for trigrams all groups (total, boys, girls; high, average, and low reading achievers) chose shape and first letter significantly more often ($p<.05$) than expected. Shape was chosen significantly less often and the first letter more often than was expected by chance alone. At no point did the choice of the second letter differ from chance expectancy, whereas the total group, the girls and the low readers chose the third letter less frequently than was expected.

The results of the test for significant differences between proportions for choice of quingram cues indicated that all groups chose shape significantly less often than was expected and the first letter significantly more often than was expected. The choice of the third, fourth, and fifth letters was also significantly less frequent than expected. The choice of the second letter as a word recognition cue did not differ from chance expectancy, except for the total group and the low readers who chose this letter less often than expected.

The differences between proportions of trigrams and quingrams observed and expected are given in Tables XIX and XX (Appendix F).

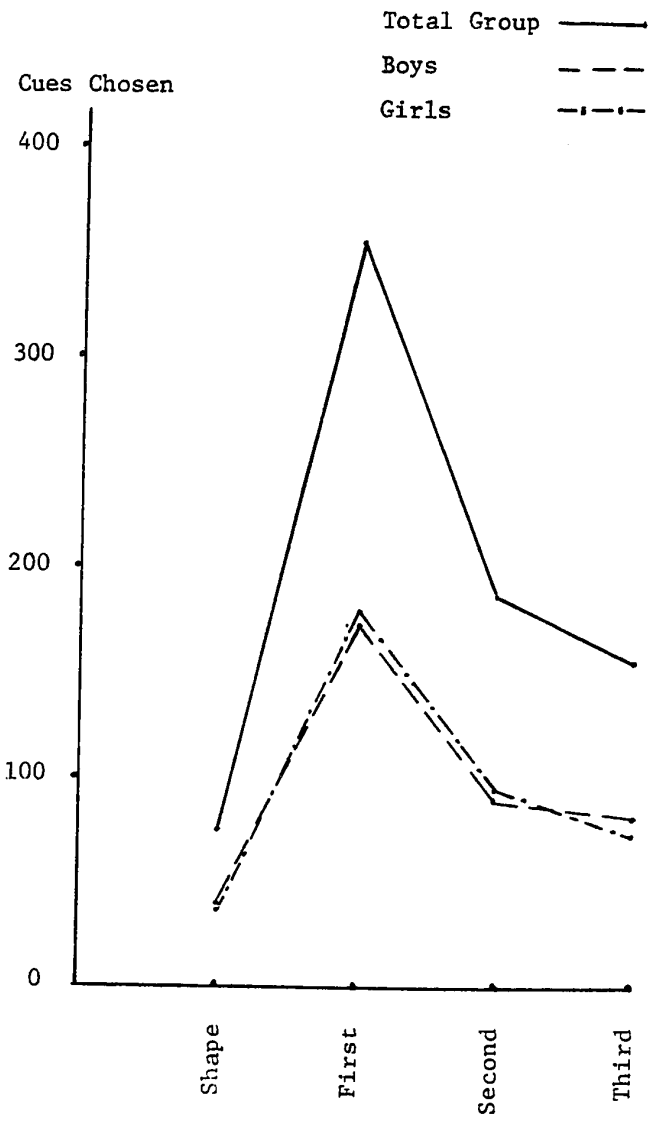


Figure 2. Proportion of Cues Selected to the Possible Number of Choices in the Trigram Series by the Total Group, Boys and Girls

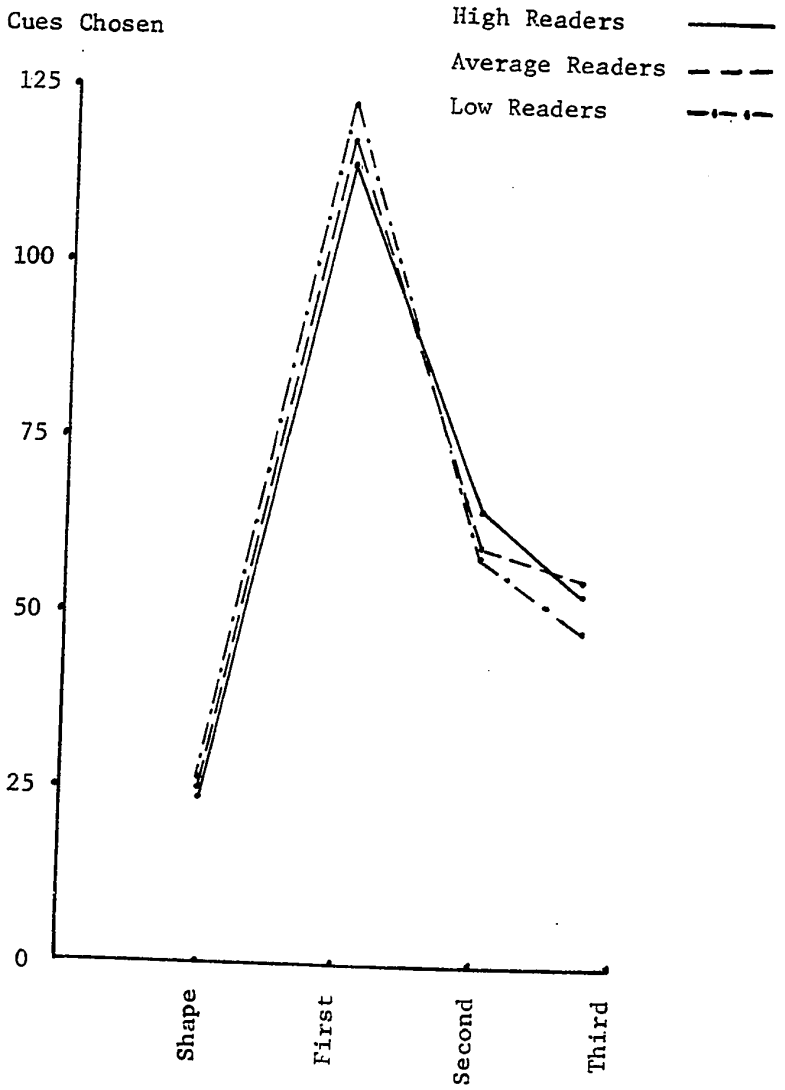


Figure 3. Proportion of Cues Selected to the Possible Number of Choices in the Trigram Series by High, Average and Low Readers

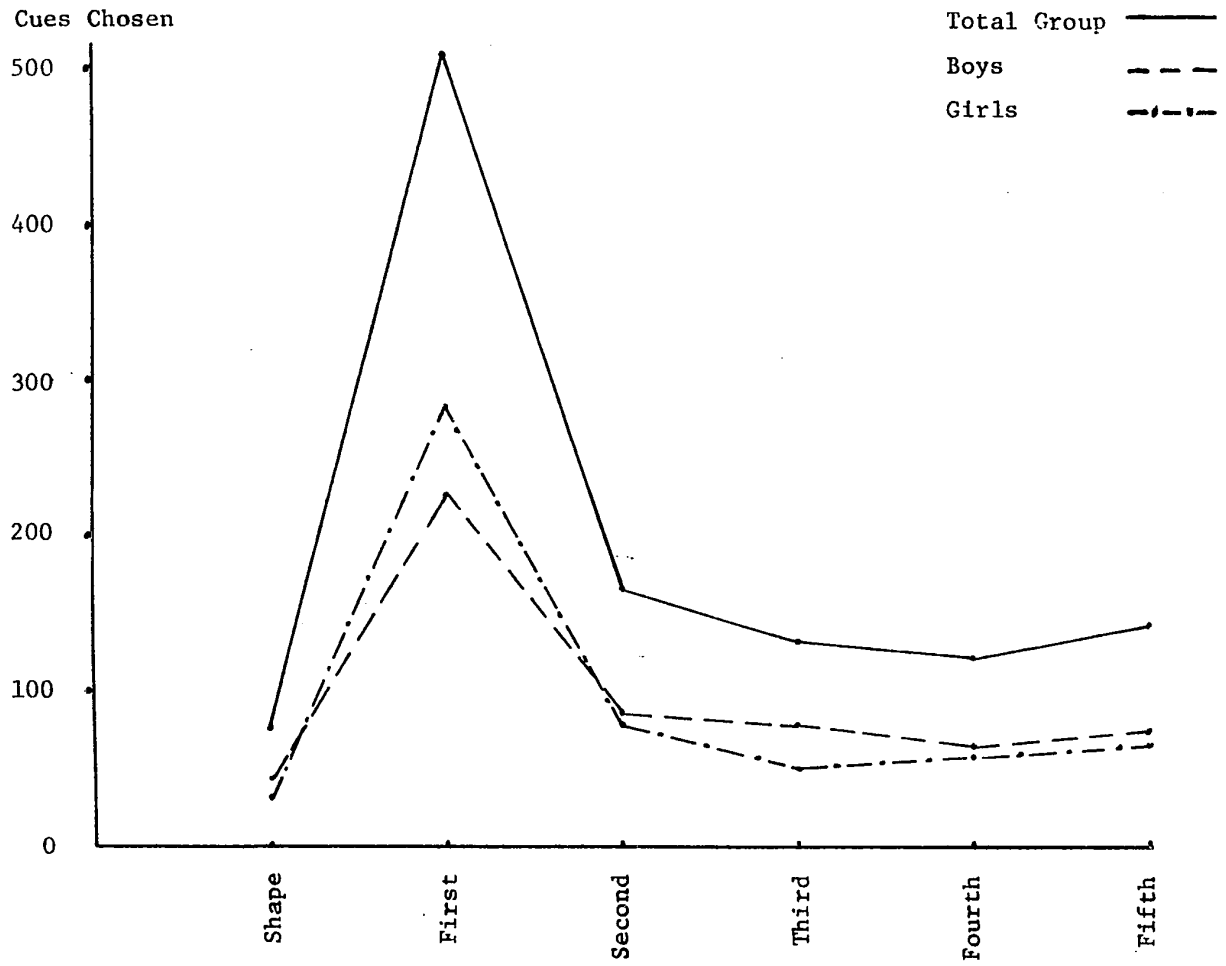


Figure 4. Proportion of Cues Selected to the Possible Number of Choices in the Quingram Series by the Total Groups, Boys, Girls

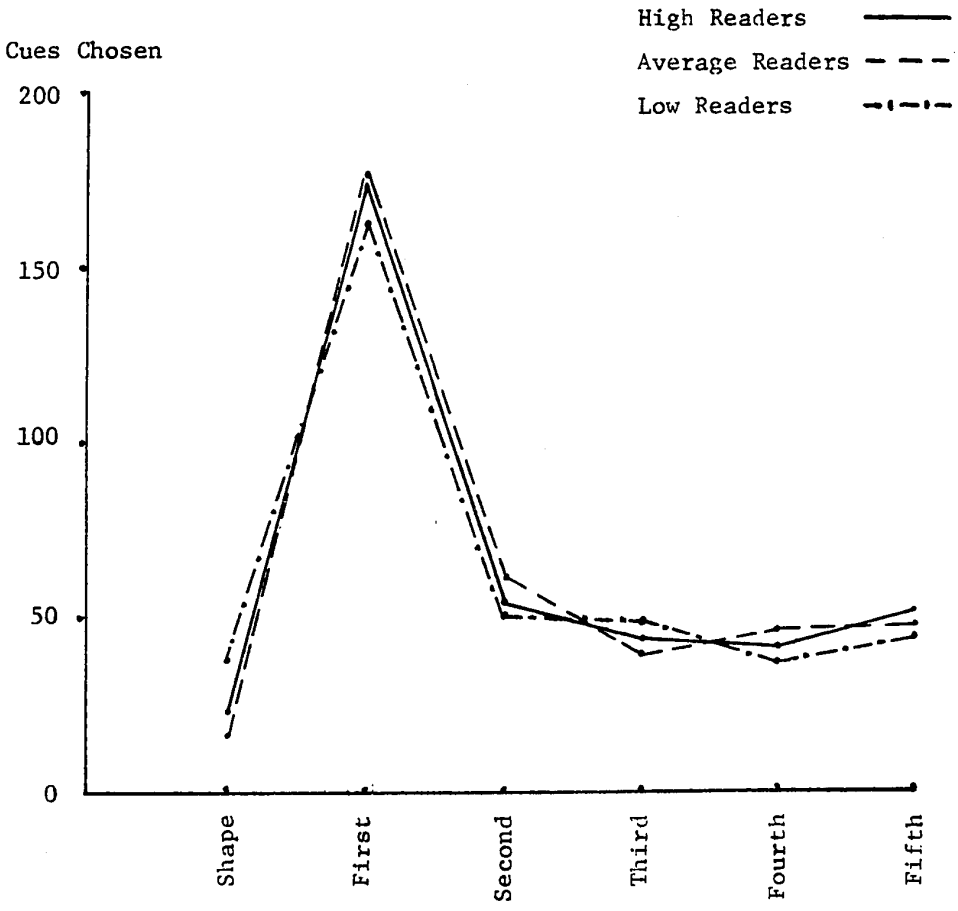


Figure 5. Proportion of Cues Selected to the Possible Number of Choices in the Quingram Series by High, Average and Low Readers

III. DIFFERENCES AMONG READING GROUPS ON CUES USED

In order to determine if high, average, and low readers differed in terms of the cues they selected a one-way analysis of variance was carried out. The results shown in Tables XXI and XXII (Appendix G) indicate that there was no difference between the groups of readers in their choice of cues used in recognizing trigrams. An analysis of the differences between cues used to recognize quingrams, however, showed that a significant difference ($p<.05$) existed between the reading groups for shape.

A Scheffé comparison of means (Table X) showed that differences occurred between the average and low readers with the latter group choosing shape more frequently. The high readers scored mid-way between the other two reading groups in the number of times they chose shape, but they did not differ from either of the other two groups at the statistical level of significance set for the study ($p<.05$). The significant difference between the groups in their choice of shape as a cue for quingrams supports the findings shown in Table VII. The low readers tended to choose shape more often than the other groups did.

TABLE X

SCHEFFÉ COMPARISON OF MEANS FOR SHAPE ON QUINGRAMS

1 - 2	1 - 3	2 - 3
N.S.	N.S.	.05

1 = High
2 = Average
3 = Low

N.S. = non significant

IV. RELATIONSHIP OF CUES USED TO KNOWLEDGE OF PHONICS AND READING ACHIEVEMENT

Trigrams

Correlation data between the number of times cues were selected to recognize three-letter words, and scores on the Phonics Test and Neale Analysis of Reading Ability (reading achievement) may be found in Appendix G. The date pertinent to significant relationships (including significance with $p<.10$)* between these variables are reported in Table XI.

An analysis of the data of this table shows negative but significant correlations between shape as a cue and the scores of average readers on medial and final sounds and the total phonics score ($p<.10$). For the low achieving readers a relationship significant at the .05 level occurred between shape and knowledge of sound-symbol correspondence for the initial letter of a word. These data would appear to suggest that those pupils who are scoring low on a knowledge of phonics tend to select shape as a cue in recognizing words. Although a causal relationship cannot be inferred from correlational data, the conjecture may be raised that perhaps pupils who have little awareness of sound-symbol correspondences may not have learned to analyse words into their component parts (letters) and consequently shape may appear as the dominant cue.

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*Whereas the level of statistical significance set for the study was $p<.05$, differences with $p<.10$ were also reported. This was a post hoc decision on the basis of the analysed data when it was noted that a number of differences, though not reaching the .05 level of significance, did become significant when a level of .10 was accepted.

TABLE XI

CORRELATIONS BETWEEN FREQUENCY OF TRIGRAM CUES, PHONIC SCORES AND READING ACHIEVEMENT

	TRIGRAM CUES			
	Shape	First	Second	Third
Average Readers				
Phonics Medial	-0.47*	-0.17	0.45*	0.09
Phonics Final	-0.46*	-0.26	0.48**	0.18
Phonics Total	-0.47*	-0.29	0.50**	0.21
Low Readers				
Phonics Initial	-0.54**	0.39	0.34	-0.54**

* = p<.10
** = p<.05
*** = p<.01

A positive and significant correlation occurred between the use of the middle letter as a cue in recognizing words and sound-symbol correspondence scores of the middle ($p<.10$) and final letters of a three-letter word, and the total phonics score for average readers. It may be that those pupils who are using the medial cue for word recognition are attempting to sound the medial and final letters which may be considered a spelling pattern as suggested in the studies by Gibson (1962) and Wylie and Durrell (1970), reported in Chapter II. The only significant correlation between the use of the final letter as a word recognition cue and phonic knowledge occurred for low achieving readers. The negative relationship between the use of the final letter as a word recognition cue and a knowledge of sound-symbol correspondence of the initial letter may be anticipated since one would not expect that pupils who tend to sound the first letter of a three-letter word would use the final letter for word recognition purposes.

It is interesting that there were no significant correlations between the use of the first letter as a word recognition cue and a knowledge of phonics for any of the groups in the sample. Since the initial letter was the cue used most frequently by all groups in recognizing words, one can only conclude that the relationship between a knowledge of phonics and use of various cues for recognizing words is tenuous. There were also no significant correlations between cues used and reading achievement scores.

Quingrams

The correlation data between the number of times cues were

selected to recognize five-letter words, and scores on the Phonics Test and Neale Analysis of Reading Ability (reading achievement) may be found in Appendix G. Significant correlations between these variables are reported in Table XII.

An analysis of the data of this table shows a negative but significant correlation between shape as a cue and the scores of the total group on initial sounds, the total phonics score, and the score for reading accuracy. A similar relationship ($p < .05$) occurred between the choice of the second cue and the final phonics score of the high readers. A similar negative correlation appears between the choice of the first cue and reading accuracy, for the average readers. These data would appear to suggest, once again, that those pupils who score low on a knowledge of phonics and reading accuracy tend to select shape as a cue in recognizing words. Since a statistically significant relationship occurred between phonics scores and reading accuracy scores, one might conclude that children who choose shape as a cue tend to be low reading achievers.

For high readers a positive and significant correlation at the .10 level of probability occurred between the first letter as a cue in recognizing words and the sound-symbol correspondence scores of the first letter of a five-letter word. This would appear to indicate that these readers are, in fact, attempting to use the phonic skills taught them to recognize words. The same group also showed a positive correlation ($p < .10$) between the choice of the fifth letter of the quingram and reading comprehension.

TABLE XII

CORRELATION BETWEEN FREQUENCY OF QUINGRAM CUES, PHONICS SCORES AND READING ACHIEVEMENT

	QUINGRAM CUES					
	Shape	First	Second	Third	Fourth	Fifth
TOTAL GROUP						
Phonics Initial	-0.32**	0.23	-0.03	-0.12	-0.01	-0.17
Phonics Total	-0.26**	0.16	-0.11	-0.03	0.02	-0.08
Reading Accuracy	-0.30**	0.04	-0.03	-0.13	0.05	0.18
HIGH READERS						
Phonics Initial	-0.20	0.44*	-0.21**	-0.15	-0.40	-0.31
Phonics Final	-0.12	0.38	-0.54**	-0.09	-0.33	-0.11*
Reading Comprehension	-0.15	0.03	-0.35	-0.06	-0.14	0.41*
AVERAGE READERS						
Phonics Initial	0.11	-0.38	0.04	0.31	0.44*	-0.03*
Phonics Final	0.36	-0.03**	-0.02	0.12**	0.19*	-0.42*
Reading Accuracy	0.27	-0.52**	0.06	0.51**	0.41*	0.01
Reading Comprehension	0.23	-0.34	0.02	0.53**	0.20	-0.12
LOW READERS						
Phonics Initial	-0.34	0.48*	-0.19	-0.22	-0.17	-0.37

* = p<.10
** = p<.05
*** = p<.01

The average readers showed a positive correlation between the choice of the fourth letter of a five-letter word and the initial sound-symbol correspondence ($p<.10$), as well as with reading accuracy ($p<.10$). They also showed a strong correlation ($p<.05$) between reading accuracy, reading comprehension and the choice of the third letter of a quingram. The same group showed a negative correlation between the fifth letter of a quingram and the final phonics sound ($p<.10$). This type of finding leads one to question still further the nature of the relationship between phonics scores and cues used in recognizing words.

The low readers showed a positive correlation between the initial phonics sound and the first letter of a five-letter word ($p<.10$). This may be because these children are relying heavily on the instructions given them stressing the use of the initial letter.

V. THE RELATIONSHIP OF CUES USED TO OTHER VARIABLES

An analysis of variance presented in Tables XXXI and XXXII (Appendix G) showed no significant difference between the choices made by boys and girls in the trigram series, whereas in the quingram series boys and girls differed significantly on the number of times the middle letter of five-letter words was chosen. The boys chose this cue more frequently than the girls.

Except for the choice of the middle letter in quingrams, boys and girls appeared to show no differences in the choice of the cues they used for word recognition.

All correlations between total IQ, sub-scores and various cues used in recognizing trigrams and quingrams were low. The highest correlation, .34, was found between number facility and shape in the quingram series. This was a negative correlation at .01 level of significance. These data are shown in Tables XIII and XIV.

For the trigram series there was a negative correlation between number facility and shape, significant at .09 level of confidence. No other correlation between IQ scores and the trigram series reached the level of significance.

For the quingram series, verbal meaning and total IQ, in addition to number facility, also showed a significant correlation with the choice of shape ($p<.05$). These were negative correlations suggesting that those who are low in IQ use shape as a cue to word recognition.

There were also significant positive correlations between verbal meaning and the fourth letter of the quingrams, and between perceptual speed and the fifth letter ($p<.05$). This may indicate that those who chose the fifth letter tended to scan words quickly. Edelman (1964) suggests that those who chose the fifth cue may have done so because of a tendency to remember the last cue seen after scanning the original word from left to right.

On the whole, however, there appear to be very few significant relationships between the cues chosen for word recognition and IQ scores.

TABLE XIII

CORRELATIONS BETWEEN IQ AND TRIGRAM CUES FOR TOTAL GROUP

	IQ				
Cues	Verbal Meaning	Perception Speed	Number Facility	Spatial Relations	Total IQ
Shape	-0.13	-0.03	-.24*	-0.00	-0.11
First	0.03	-0.08	-0.01	-0.02	-0.05
Second	0.01	0.06	0.11	-0.05	0.06
Third	0.02	0.10	0.08	0.09	0.11

* = p<.10
** = p<.05
*** = p<.01

TABLE XIV

CORRELATIONS BETWEEN IQ AND QUINGRAM CUES FOR TOTAL GROUP

	IQ				
Cues	Verbal Meaning	Perception Speed	Number Facility	Spatial Relations	Total IQ
Shape	-0.29**	-0.08	-0.34***	-0.11	-0.29**
First	-0.11	-0.00	0.06	-0.01	-0.07
Second	-0.09	-0.17	0.01	0.00	-0.05
Third	0.14	-0.02	-0.00	-0.01	0.05
Fourth	0.29**	-0.04	-0.01	0.09	0.17
Fifth	0.13	0.27**	0.07	0.04	0.19

* = p<.10
** = p<.05
*** = p<.01

VI. CORRELATIONS BETWEEN PHONIC KNOWLEDGE AND READING ACHIEVEMENT

The correlation data between phonic knowledge and reading accuracy are listed in Table XV. An analysis of the data shows that a positive correlation, significant at the .01 level, occurred for the total group of readers, and for the boys and girls between reading accuracy scores and all parts of the phonics test, that is, first, medial and final letters and total phonics score. This seems to indicate that all pupils who score high on phonics also score high on accuracy in reading.

The high readers showed a positive correlation between the choice of the initial phonic sound and reading accuracy. It was only for this group that such a relationship occurred. Though this indicates that the children may be relying on initial sounds and letters, it is possible that they are also using other cues to aid in word recognition when they read.

The average readers showed a positive correlation between the choice of final phonic sound and reading accuracy ($p < .10$).

The low readers showed a greater number of correlations than the other two groups between phonic knowledge and reading accuracy. Their scores were significant at .05 level in the choice of medial and final sounds, and in total scores. This suggests that a knowledge of phonics appears to aid low readers in pronouncing words. However, the low readers scored low on the phonics test, as the data in Table V shows, and therefore they are at a disadvantage in a reading situation.

TABLE XV

CORRELATIONS BETWEEN PHONICS KNOWLEDGE AND READING ACCURACY

	PHONICS			
Reading	First	Medial	Final	Total
Total Groups	0.60***	0.64***	0.63***	0.66***
Boys	0.70***	0.76***	0.81***	0.79***
Girls	0.52***	0.53***	0.46**	0.53***
High Readers	0.47*	0.25	0.30	0.39
Average Readers	0.32	0.07	0.43*	0.29
Low Readers	0.37	0.55**	0.51**	0.51**

* = p<.10
** = p<.05
*** = p<.01

Few significant correlations occurred between phonic scores and reading comprehension scores (Table XVI). The scores were significant at .01 level for the boys and the total group, but it appears that the scores obtained by the boys influenced the total scores.

Since the boys scored high on both reading accuracy and reading comprehension it is possible that for boys comprehension is dependent on accuracy in reading. Girls, on the other hand, may use other strategies to assist them in comprehending what they read.

An analysis of variance, presented in Table XXXI (Appendix G) shows no significant difference between the choices made by boys and girls in the trigram series. In the quingram series boys and girls differed significantly on the number of times the middle letter was chosen (Table XXXII [Appendix G]).

It appears that, on the whole, there is a significant relationship between scores on a test of phonic knowledge and levels of reading achievement.

Summary

An analysis of the statistical data showed that the scores of the total group, the boys, and the girls, on reading accuracy, and in their ability to sound out initial and final parts of words were fairly consistent. However, there was a notable difference in the performance of low readers and high readers in both phonics and reading achievement. All students tended to have difficulty with the medial sounds of words.

An analysis of the cues chosen showed that in the trigram series the first letter was the most favoured choice while shape was used least.

TABLE XVI

CORRELATIONS BETWEEN PHONIC KNOWLEDGE AND READING COMPREHENSION

	PHONICS			
	First	Medial	Final	Total
Total Groups	0.43***	0.41***	0.47***	0.46***
Boys	0.56***	0.58***	0.61***	0.61***
Girls	0.26	0.30	0.32	0.31
High Readers	0.35	0.08	0.30	0.25
Average Readers	0.29	0.03	0.23	0.19
Low Readers	0.02	0.21	0.20	0.14

* = $p<.10$
** = $p<.05$
*** = $p<.01$

All subjects showed a slight preference for the second letter over the third. In the quingram series the first letter also appeared as the most important cue for all groups, while shape was the weakest cue. All groups showed a slight tendency to choose the second letter in preference to the third, fourth and fifth letters. In both the trigram and quingram series the low readers showed a preference for shape as a cue more often than did the other groups. Generally, however, boys and girls, and high, average, and low readers tended to prefer similar cues.

There were few significant correlations between the choice of word recognition cues and a knowledge of phonics for any of the groups in the sample. It appears that the relationship between a knowledge of phonics and use of various cues for recognizing words is tenuous. There were also no correlations between cues used and reading achievement scores. There appear to be, too, very few significant relationships between the cues chosen for word recognition and IQ score. On the other hand a significant relationship was found between scores on a test of phonic knowledge and levels of reading achievement.

CHAPTER V

CASE STUDIES

Analysis of Selected Subjects by Cue Choice

Though analysis of the research done for this study showed that when children were tested for word recognition skills, the first letter of the word was the cue most often chosen and shape was the cue least often chosen, there were few significant correlations between the cue chosen and phonics knowledge and reading achievement. This raised the question of the nature of the relationship between a particular cue a child used to remember a word and his success in reading.

To examine this relationship more closely, and to determine if a pattern could be established with reference to it, eight individual students were selected for specific study, and a series of graphs were compiled to present the information obtained.

Trigram Series

Eight students were chosen according to the cues they had selected. Of these, two students had selected most often the initial letter of the stimulus word presented, and two had selected the final letter most often. Two students were then chosen because their choice of cues from the response words was so spread over all three letters and shape as to show no marked preference for any one cue. As has already been reported, shape was the cue chosen least often in this study. It was therefore difficult to find two children who had shown a marked

preference for this cue. One child only had selected shape more often than any other cue. A second child was then chosen who, compared to the remainder of the sample, had chosen shape next most frequently. However, this child had not chosen shape most often relative to the other cues. Whereas shape was chosen five times by this child, the first letter was chosen six times. No other student in the sample had chosen shape as many as five times.

Comparisons were made among these eight students, based on Reading Accuracy, Age and Phonics achievement, and the results are presented in Figures 6 and 7.

Figure 6 depicts the choice of cues as compared with the reading age of the pupils. The two students who chose the initial letter most often had a reading age of 6 years 9 months, and 6 years 10 1/2 months respectively. These two pupils had the lowest reading age of the group under study, except for one other child whose reading age was 6 years 3 months. It should also be noted that the reading ages of the two pupils who chose the initial letter most frequently were below their chronological ages. The two students who chose shape most frequently had achieved a reading age of 8 years 6 months and 8 years respectively, the highest reading ages achieved in this group of eight students. The two pupils who chose the last cue most often had achieved a reading age of 7 years 2 months and 7 years 10 months respectively, putting them into the middle bracket when reading ages were compared. The two children whose choice of cues was equally spread showed the greatest discrepancy in reading ages. One was reading at 6 years 3

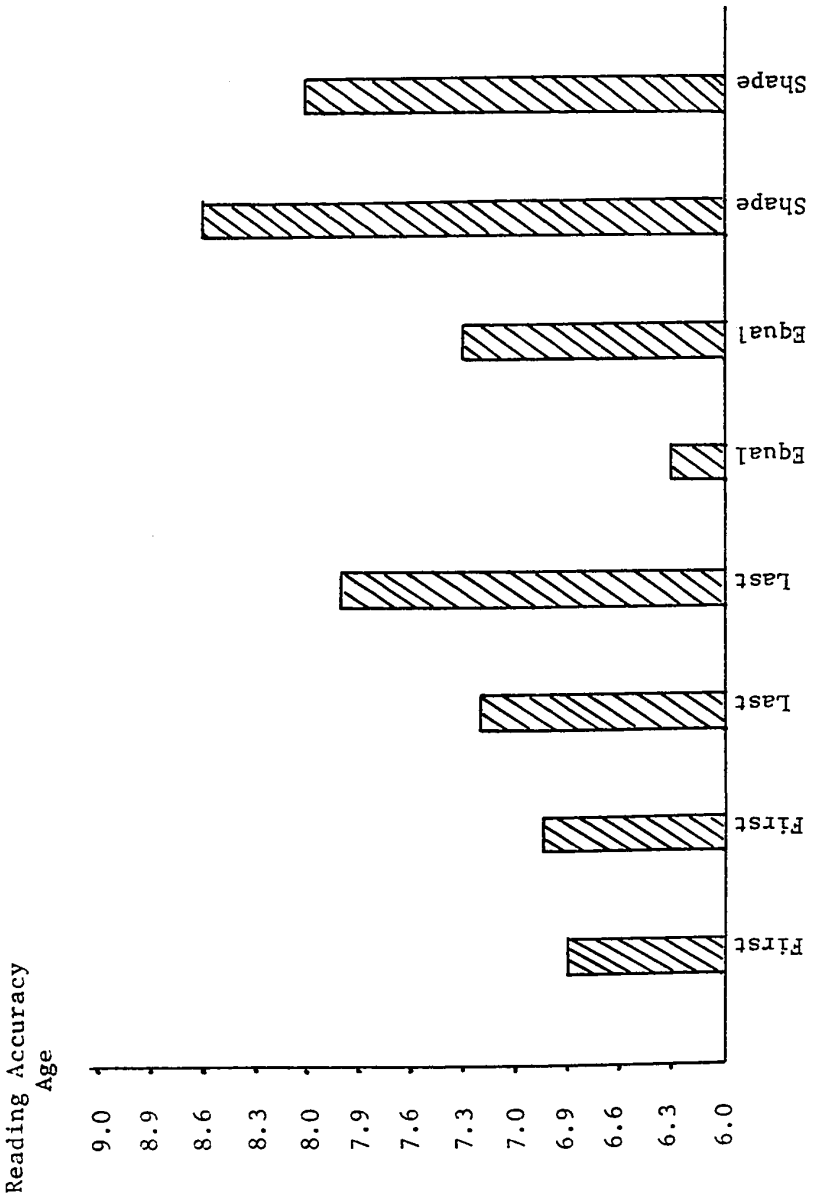

Figure 6. Reading Accuracy Ages of Pupils Selected on the Basis of Their Choice of Trigram Cues

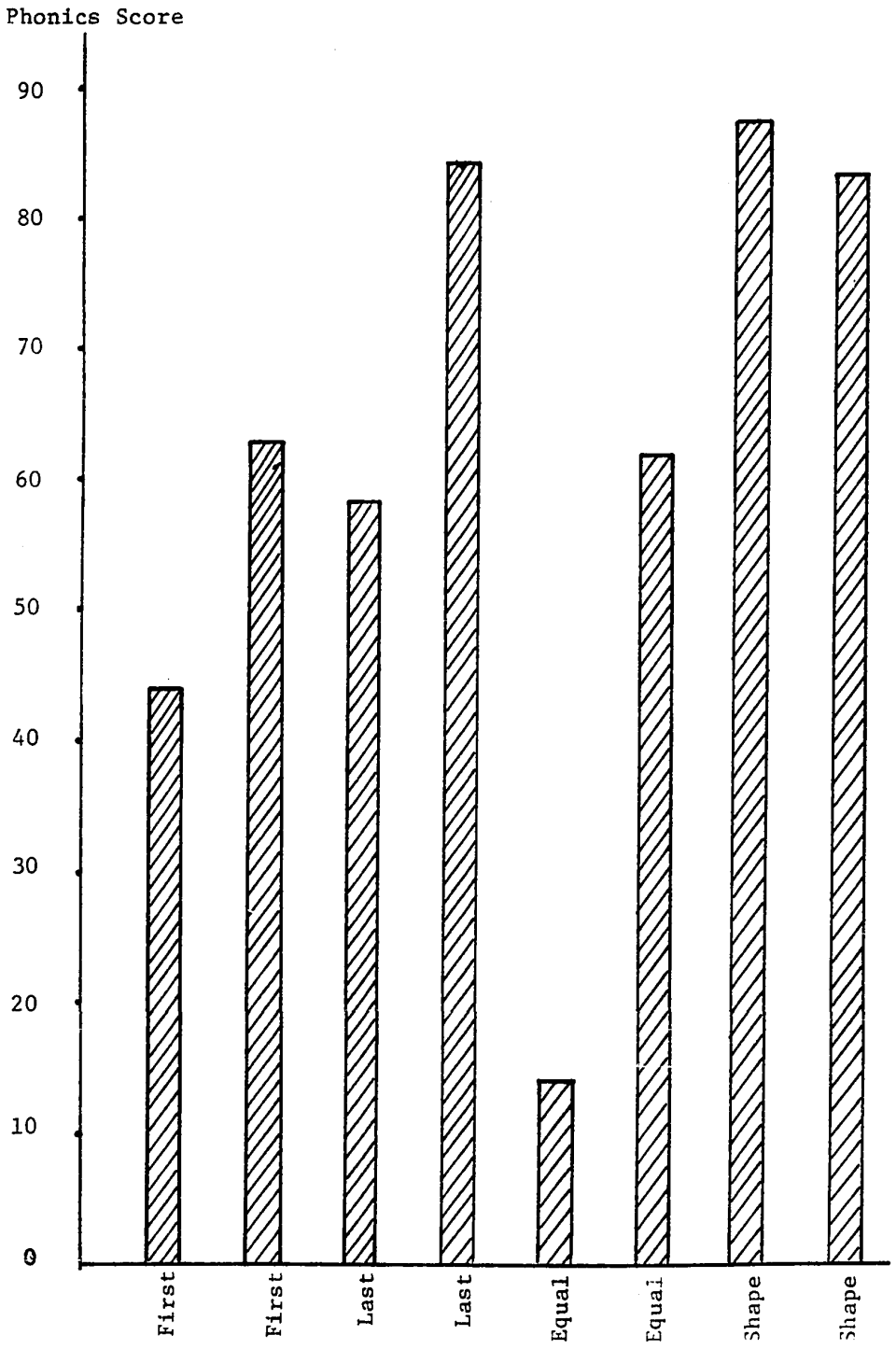

Figure 7. Phonics Scores of Pupils Selected on the Basis of Their Choice of Trigram Cues

months while the other was reading at 7 years 3 months.

An analysis of the IQ scores of these eight pupils indicated even more variation than when reading age was considered. There was a wide range between the scores of those children who chose shape as a cue most frequently. One had an IQ of 122 and the other had an IQ of only 98. The two children who showed preference for the last letter as a cue each had a high IQ--120 and 122 respectively. The two children who chose the first letter most frequently ranged in IQ from 108 to 118. The two children whose choice of cues was equally spread showed a discrepancy in IQ ranging from 101 to 122.

When phonics achievement was the basis of comparison, the results as shown in Figure 7 were similar in trend to that reported for reading ages. The two pupils who chose shape the most frequently showed superior phonics ability. This, however, is in direct contrast to the results obtained from the general study and reported in Chapter IV. The data from the general study appeared to suggest that those pupils who were scoring low on a knowledge of phonics tended to select shape as a cue in recognizing words. An analysis of the pairs of pupils preferring first letter, last letter and without a particular cue preference showed that one pupil of the pair possessed good or fairly good phonic ability, while the other pupil was considerably poorer in phonics. This discrepancy was most strongly marked between the pair whose choice of cues was spread evenly. One child of this pair had practically no phonics ability, while the other could be considered to be of at least average ability in phonics.

As these eight pupils were chosen according to the cues they had selected, the schools they attended were not considered as a significant variable in determining which pupils were chosen. After completion of the graphs, however, the teacher variable was examined. Some very interesting results were noted. Only one pair of the pupils selected came from the same classroom. These two pupils favoured shape most often, and were both in the high reading age bracket (8 years to 8 1/2 years) and showed almost equally high phonic ability. However, one of them had a high IQ (122) while the other had an IQ of 98.

When the other three pairs of pupils were investigated, it was found that the better reader of the pair choosing the final letter, and the better reader of the pair without a strong cue preference came from the same classroom.

Summary

An analysis of the scores of specific pupils indicated that pupils who chose the initial letter as a cue in word recognition scored low in reading and phonics, whereas those who chose shape scored highest in these areas. This pattern was different from that which seemed to emerge in Chapter IV. However, further analysis by IQ and teacher variable seems to indicate that the cue chosen for word recognition and its relationship to reading achievement and phonics knowledge may be dependent more on the teacher than on any other factor.

It must be remembered, however, that these statements are made on the basis of the analysis of results of four pairs of pupils and thus must be interpreted with caution.

Quingram Series

As for the trigram series, eight students were chosen for this section of the study, according to the cues they had selected. Of these, two students had selected the initial letter of the stimulus word most often, and two had selected the final letter most often. Two students were then chosen because their choice of cues from the stimulus word was so spread over all five letters and shape as to show no marked preference for any one cue. As in the trigram series, shape was the cue least often chosen in this study. As a matter of fact no child had shown a marked preference for this cue over every other cue in the quingram series. Both children who were selected because of their preference for shape as a cue had chosen shape more often than every other cue except the first letter. One child, who chose shape five times, had chosen the first letter seven times. The other child, who had chosen shape four times had chosen the first letter fourteen times. Two children, besides the one selected for the sample, had chosen shape four times, but one had chosen the third and fourth letters six times, and the other had chosen the third and fourth letter seven times, which would make them similar to the pair without a strong preference for a particular cue.

Again comparisons were made among these eight students based on Reading Age and Phonics achievement and the results are presented in Figures 8 and 9.

Figure 8 depicts the choice of cues as compared with the reading age of the pupils. Each pair of pupils showed the same pattern,

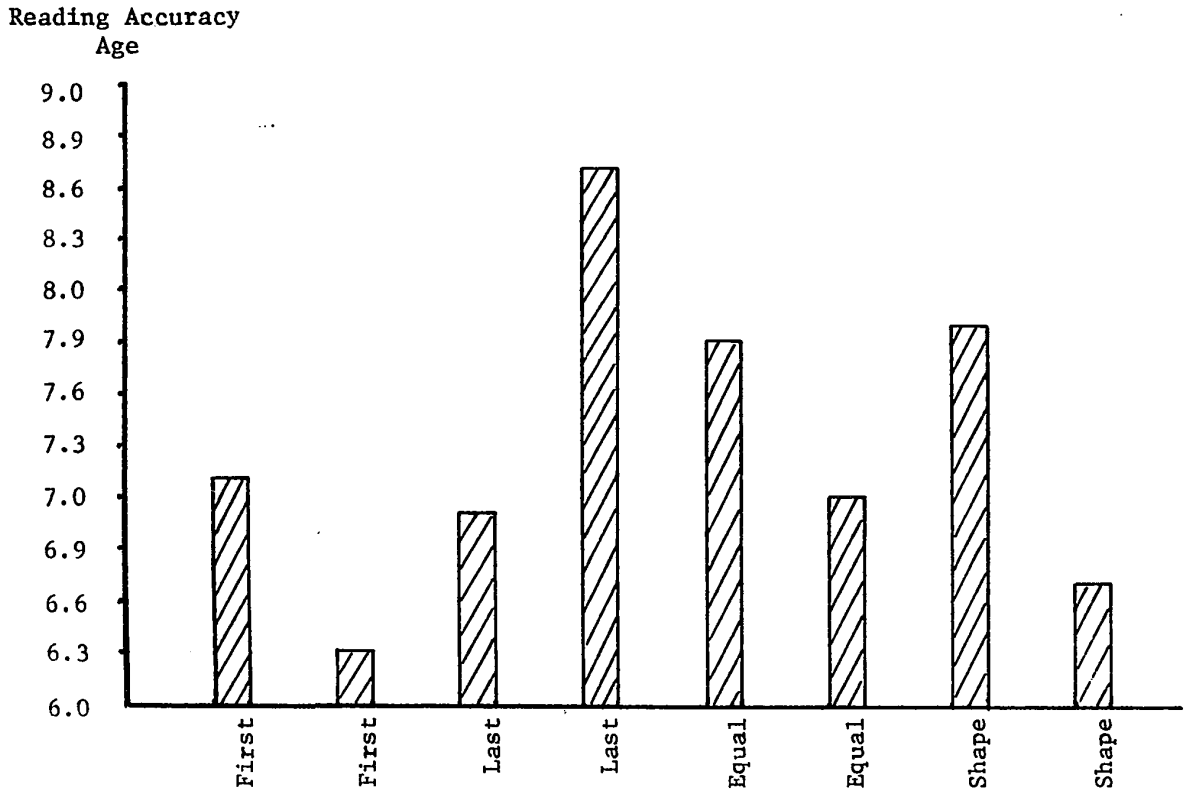

Figure 8. Reading Accuracy Ages of Pupils Selected on the Basis of Their Choice of Quingram Cues.

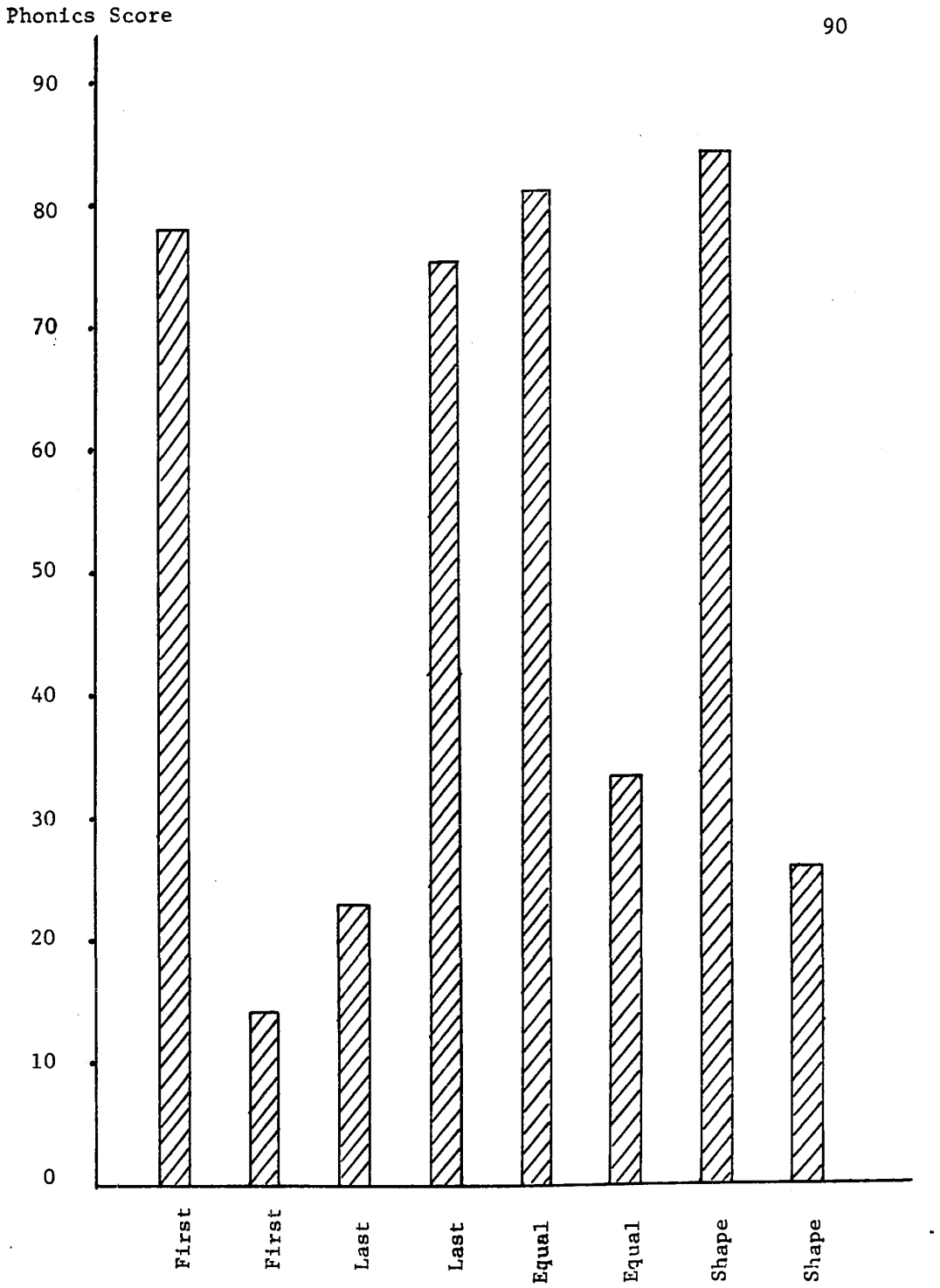

Figure 9. Phonics Scores of Pupils Selected on the Basis of Their Choice of Quingram Cues

i.e., one was at a considerably higher reading age level than the other, even though both had shown preference for the same cue. The child at the higher reading level also had a higher IQ score. This was particularly marked between the two children who had been selected as showing preference for shape. One had an IQ of 122, while the other had an IQ of 90. The two children whose choice of cues was spread equally over all cues showed the smallest IQ span ranging from 107 to 110. With each pair of children, too, the reading age of one child was higher than the chronological age, while the other child had a reading age lower than or equal to his chronological age.

When the choice of cues was based on phonics ability the same pattern emerged, and this is presented in Figure 9. In all the cases chosen, one child of the pair showed good phonics ability while the other had achieved a score that must be considered poor.

The teacher variable for these pairs of pupils was examined. In the case of all pairs, no pair of pupils was taught by the same teacher. Examining the overall achievement of the eight pupils, it was found that only two of the high achievers, out of four, were from the same classroom, and two of the high achievers in the trigram series were also from this classroom. The pupil from this group who had the highest reading age was from the same classroom as the two children who showed the highest phonics scores and reached the highest reading age in the trigram series though the cue choice differed. The majority of the low achievers in this group, regardless of the cue preferred, were from one classroom. However, it must be pointed out that in this

school there were two grade one classes, one of which was especially geared to cater for children who were considered to be poor readers in one way or another. This is reflected in the low achievement found in the results.

Summary

An analysis of the quingram cues selected by pupils did not indicate a similar pattern to that which was found from an analysis of trigram cue preference. Neither pair of children choosing a particular cue scored either high or low in reading or phonics. Rather, a single pupil of each pair scored high or low in reading and phonics. It is possible that the teacher variable was important in influencing the results as noted.

Analysis of Selected Subjects by Reading and Phonic Scores

Another method of analysis to indicate the relationship between cues chosen for word recognition and reading age and phonics knowledge consisted of selecting pupils who were high or low reading achievers, and who had high or low phonic scores. The cues selected by each of these sets of four students were noted and graphs were prepared to present the information obtained. This was done separately for the trigram and quingram series.

Trigram Series

Figure 10 shows the choice of cues made by two pupils with a high reading age and two pupils with a low reading age. Though shape

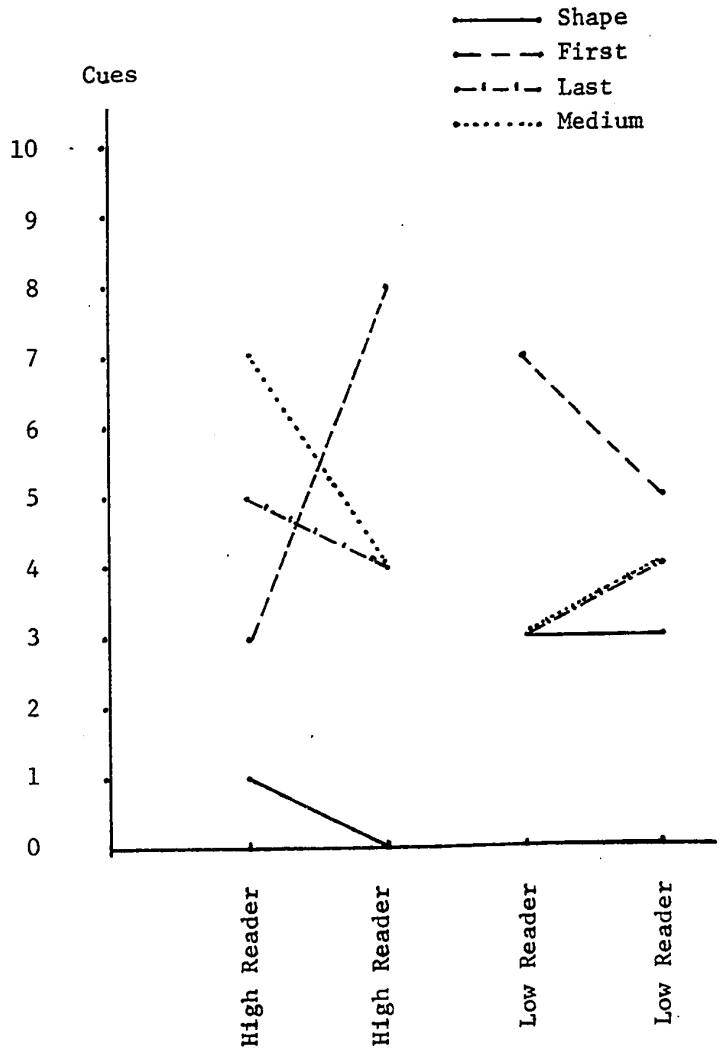

Figure 10. Trigram Cues of Selected High and Low Readers

was chosen least often by all four children the low readers chose it more often than the high readers. The high readers also showed extremes in the choice of the other cues. That is, the low readers chose shape least and the initial letter most, and their choice of the medial and last letters fell in between. There was a much greater discrepancy among the high readers in that no cue except shape appeared to be consistently chosen most or least often. Even the initial letter does not appear as the favorite choice for both these pupils. This suggests that the high readers may be more flexible in their approach to recognizing words, and may use a variety of cues and strategies depending on the word to be remembered. This may also explain why no significant correlations between cue preference and reading achievement were obtained in Chapter IV.

When the comparison was made on the basis of phonics the pattern was similar to the one that appeared when reading age was the basis of comparison. This is shown in Figure 11. All four children chose shape least often, but the high phonics scorers chose it less than did the low phonics scorers. Those scoring high in phonics also showed extremes in their choice of cues. That is, those scoring low in phonics chose shape least and the initial letter most and their choice of the last letter fell in between. Furthermore the last letter was the second most favored cue for these low phonics scorers who were both boys. The medial letter alone showed a variation in that one child chose it less often than shape. The high phonics scorers showed a much greater discrepancy than did those scoring low in phonics.

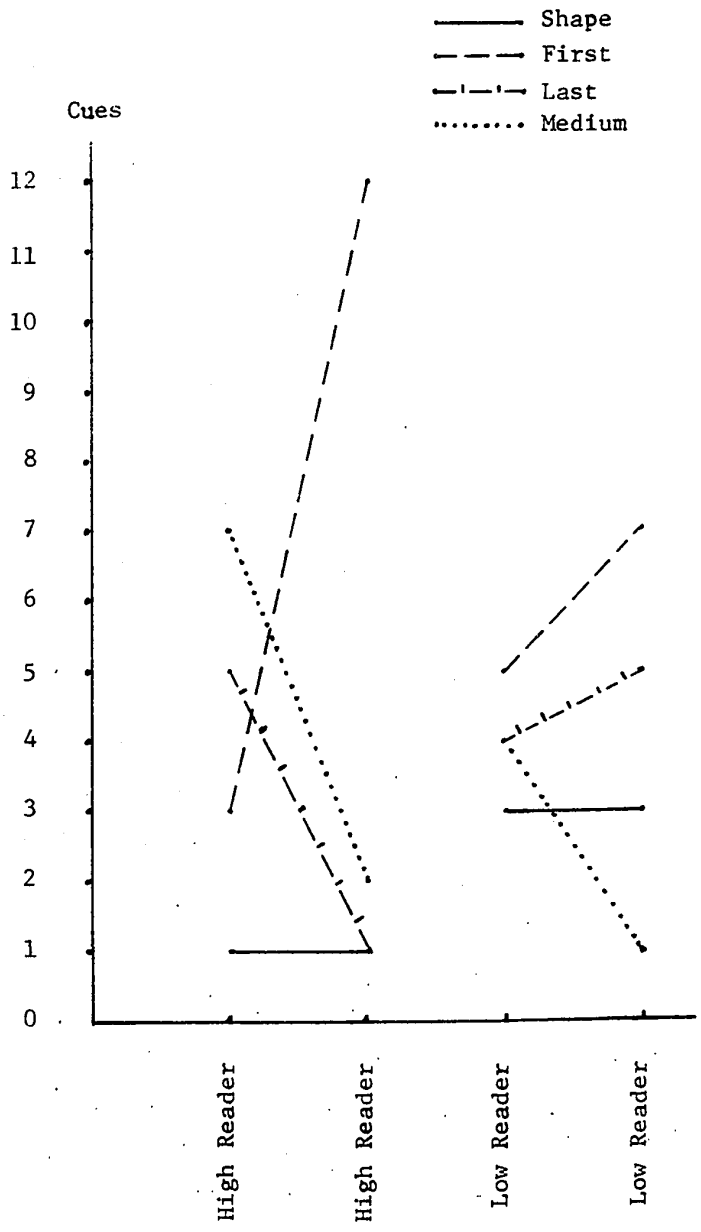

Figure 11. Trigram Cues of Selected Pupils Scoring High and Low on Phonics Knowledge

Even the initial letter does not appear as the favorite choice for both these pupils. However, in neither case was any cue chosen less often than shape.

When the teacher variable was examined for these pupils it was found that the four low pupils came from the same classroom. This classroom was the one especially organized in one school to cater for those pupils who were thought to be poor readers for one reason or another.

Summary

These studies confirm the results reported in Chapter IV with regard to the choice of cue. The first letter was the most used cue and shape was the least chosen. One variation occurred. Whereas the main findings as reported in Chapter IV did not confirm Edelman's (1964) point that the last letter was the second most important cue for boys, this section of the present study confirms this for the low readers.

The extreme variations that occurred in the choice of cues made by the high readers suggest that these readers may use a variety of cues and strategies in their approach to recognizing words and this may explain, in part at least, why no significant correlations between cue preference and reading achievement were obtained in Chapter IV.

Quingram Series

The choice of cues in the quingram series made by two pupils with a high reading age and by two pupils with a low reading age is

shown in Figure 12. There is a change of pattern here as compared with the trigram series. In the quingram series the low readers showed extremes in the choice of cues while the high readers maintained a more stable pattern. Both pairs of pupils, however, showed a wide spread when the first letter was chosen, which was also the most important cue for three of the four pupils. Shape was not chosen by the high readers at all, and the medial letter was chosen only once by both. The final letter appeared as the second most important cue for these two readers, which is similar to the findings in Edelman's study. These patterns seem to suggest that, when longer words are being used, the high readers are more sure of their cues, while the low readers are making a more randomized choice. This may be one of the reasons for few significant correlations between the choice of cue and reading achievement as reported in Chapter IV.

When the comparison was made on the basis of phonics (Figure 13) extremes in the choice of cues were shown by both pairs of pupils. The most noticeable point is the wide spread that occurred in the choice of the initial letter for both pairs of pupils, even though that cue was only favoured by three out of the four readers. Those scoring high in phonics chose the final letter as the second most important cue. The two pupils scoring low on the Phonics Test, however, differed here from each other and from the high phonic scorers. The middle cue was the most important for one pupil and the second most important for the other. The low phonics scorer who chose the first cue most often, did not choose shape or the last letter at all. The other child of the

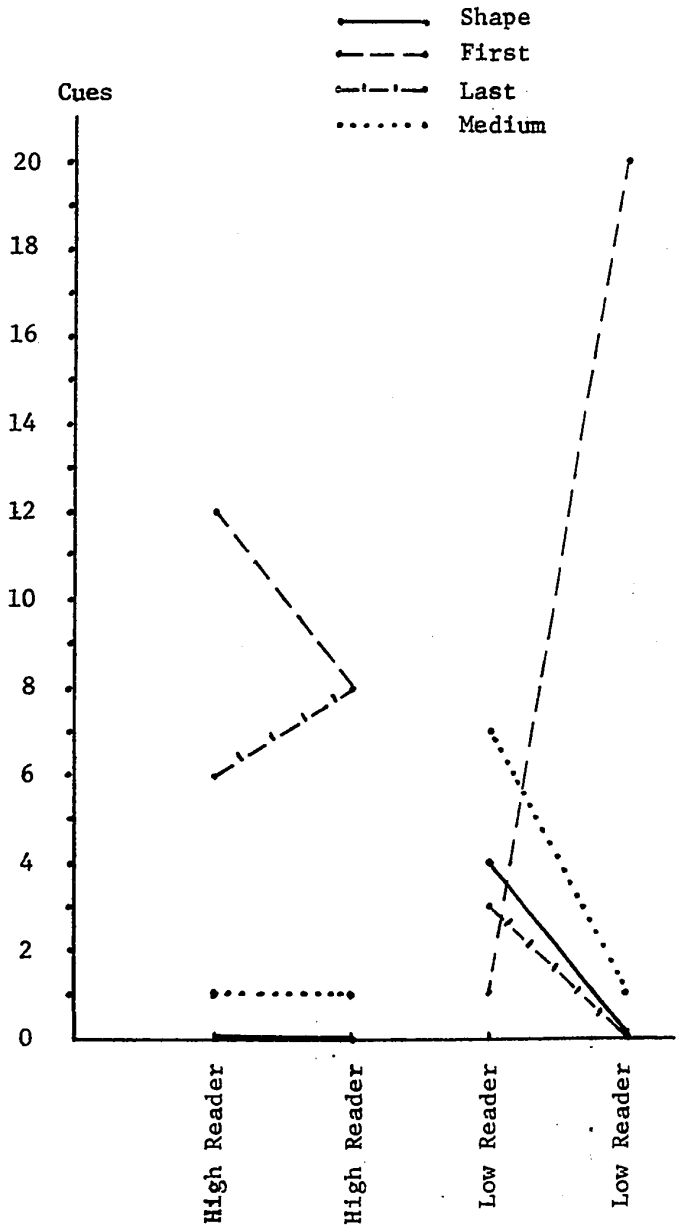

Figure 12. Quingram Cues of Selected High and Low Readers

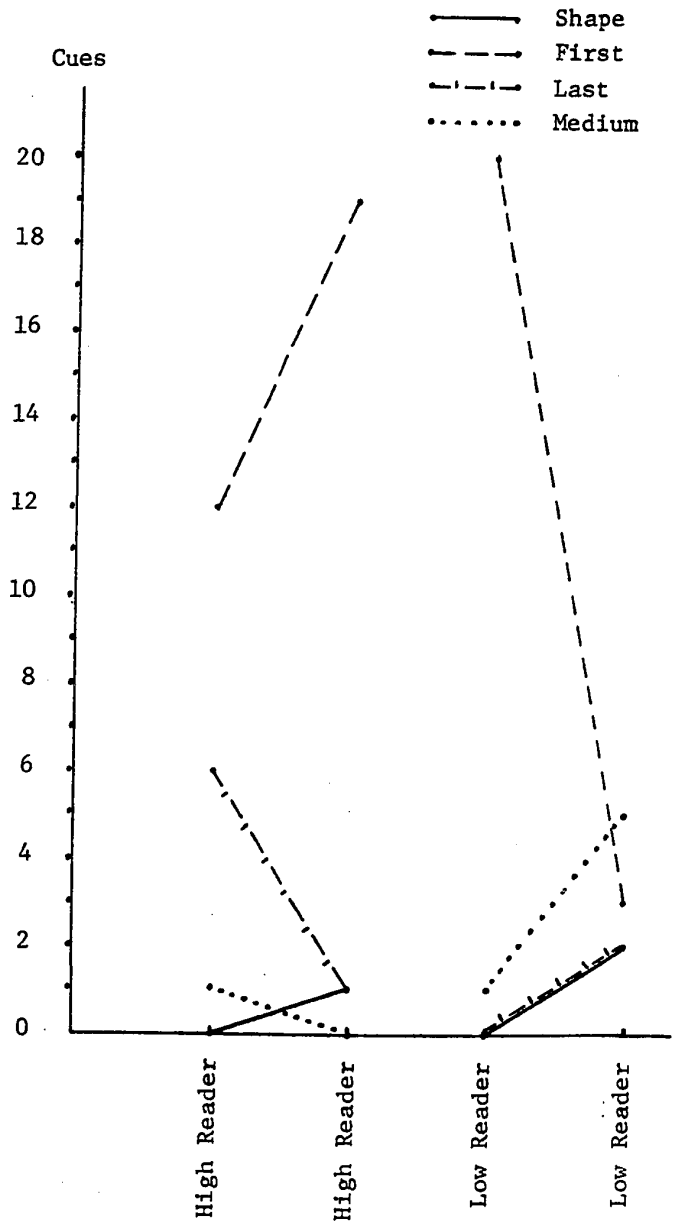

Figure 13. Quingram Cues of Selected Pupils Scoring High and Low on Phonics Knowledge

pair chose shape and the last letter an equal number of times.

These eight pupils, as in the case of the trigram series, were chosen because they were high or low reading achievers, or had high or low phonics scores, so the schools they attended were not considered as a significant variable in the choice. However, the same children appeared in the samples for the quingram series as for the trigram series and the four low pupils came from the same classroom.

Summary

An analysis of the selected pupils in this chapter does not indicate any consistent relationship between the cues chosen by the readers and their level of reading achievement. When pupils were selected by reading level it was apparent that there was a tendency to choose shape as a cue less often than any of the other cues. Furthermore, high reading achievers chose shape as a cue less often than did low reading achievers. However, there did not appear to be a consistent pattern for the other cues, and individuals within a pair of readers (high or low) tended to choose the other cues varying numbers of times.

When pupils were selected on the basis of the cue chosen most often, those who chose shape tended to be the highest reading achievers. Further analysis, however, indicated that the teacher may be the influential factor in these cases. Moreover, it must be remembered that shape was seldom chosen more often than any other cue and thus it may be that the higher reading achievers use shape and another cue equally as often.

Again it must be pointed out that with an analysis of so few

pupils, the above findings should be considered very tentative.

It appears also from the findings in this chapter that the pupils use different cues in remembering short (three-letter) words and longer (five-letter) words.

CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

I. SUMMARY

The main purpose of this study was to examine the cues beginning readers use to recognize words, and to investigate the relationship between the selection of these cues and phonic knowledge and the children's level of reading achievement.

A sample of grade one readers of average IQ was chosen, with equal distribution over sex and reading ability. The total sample involved groups of forty-eight pupils, with twenty-four boys and twenty-four girls divided into equal groups of high, average, and low achieving readers.

II. FINDINGS AND CONCLUSIONS

Hypothesis 1

There is no significant difference between the expected proportion (.25) of each trigram cue, and the observed proportion.

This hypothesis was rejected in part. There was a significant difference between the expected and the observed proportions for shape and the first letter for all groups. There was also a significant difference between these proportions for the third letter for the total group, the girls and the low readers. For the other cues the hypothesis was not rejected. The first letter was chosen more frequently than

was expected, whereas the third letter (for the groups noted) and shape were chosen less often than would have been expected by chance.

Conclusion

These results suggest that the first letter of a trigram word is the most important cue in word recognition, and that shape is the weakest cue used. These findings substantiate Edelman's (1964) results concerning first letter and shape as cues. Her claim that the last letter is also an important cue is not supported.

Hypothesis 2

There is no significant difference between the expected proportion (.166) of each quingram cue, and the observed proportion.

This hypothesis was rejected for all but the second cue. There was no significant difference between the stated and expected proportions for the second cue for the boys and girls, and for the high and average groups of readers. The first letter was chosen most often, the observed proportion being much greater than would be expected by chance, while shape was the weakest cue, having been chosen the least frequently of any of the other cues. The middle, fourth and fifth letters were also selected as word recognition cues less often than would have been expected by chance.

Conclusion

The results indicate that the first letter of a quingram is the most important cue in word recognition and that shape is the weakest cue used. The second letter was chosen slightly more often than the

third, fourth and fifth letters. The observed proportion of the second letter did not differ significantly from that expected by chance, which further enhances the strength of the first letter as the cue favoured by the pupils of this sample.

Theories which propose that beginning readers recognize words as wholes by their shape have not been supported by this study. Shape, as a cue, may have value in word recognition situations other than those used in this study.

Theories which propose that ascending and descending letters are major cues in word recognition also have not been supported by the results of this study. Although ascenders, descenders and on-the-line lower case letters were used in every position in the stimulus words the first letter was, in all cases, the most preferred cue.

Hypothesis 3

There is no significant difference between high, average and low reading achievement groups in the number of times they choose particular cues in order to recognize three-letter and five-letter words.

This hypothesis was not rejected for all groups. A one-way analysis of variance showed that there was no difference between the groups of readers in their choice of cues in recognizing trigrams. However a significant difference ($p<.05$) existed between the reading groups for shape in the quingram series. Differences occurred between the average and low readers, with the latter group choosing shape more

frequently. The high readers did not differ from either group at the statistical level of significance that was set for this study ($p<.05$).

Conclusion

The results show that in the trigram series there was no difference between the groups in their choice of the first letter. The low reading group, however, tended to choose shape more often than either the high or average readers. In the quingram series a significant difference ($p<.05$) existed between average and low readers for the choice of shape, with the low group choosing this cue most frequently. Thus, with the exception of shape, it may be concluded that pupils, regardless of their reading achievement levels, tend to use similar cues in remembering words previously seen.

Hypothesis 4

There is no significant relationship between the number of times a particular cue is used and (a) phonic knowledge; (b) reading achievement.

(a) Phonic Knowledge. This hypothesis was rejected for some of the groups in both the trigram and quingram series. When trigrams were considered there were negative but significant correlations between shape as a cue and the scores of average readers on medial and final sounds and the total phonic score ($p<.10$). For the low achieving readers a significant relationship ($p<.05$) occurred between shape and knowledge of sound-symbol correspondence for the initial letter of a word. A positive correlation ($p<.10$) occurred between the use of the

middle letter as a cue in recognizing words - (i) the sound-symbol correspondence scores of the middle and final letters of a three-letter word, and (ii) the total phonic score for average readers. The only significant correlation between the use of the final letter as a word recognition cue and phonic knowledge occurred for low achieving readers. There were no significant correlations between the use of the first letter as a word recognition cue and knowledge of phonics for any of the groups in the sample.

When quingrams were considered, negative but significant correlations occurred between shape as a cue and the scores of the total group on initial sounds, the total phonic score and the score for reading accuracy. A similar significant relationship ($p<.05$) occurred between the choice of the second cue and the final phonic score of the high readers.

For the high readers a positive and significant correlation ($p<.10$) occurred between the first letter as a cue in recognizing words and the sound symbol correspondence scores of the first letter of a quingram word.

The average readers showed a positive correlation ($p<.10$) between the choice of the fourth letter of a five letter word and the initial sound-symbol correspondence. The average readers showed a negative correlation ($p<.10$) between the choice of the fifth letter of a quingram and the final phonics sound.

The low readers showed a positive correlation ($p<.10$) between the initial phonic sound and the first letter of a five-letter word.

(b) Reading Achievement. This hypothesis was rejected for all groups. There were no significant correlations between cues used and reading achievement.

Conclusion

The results suggest that those who were scoring low on a knowledge of the initial phonic sound tended to select shape or the final letter of a word as a cue in recognizing words. It is also possible that pupils who have little awareness of sound symbol correspondences may not have learned to analyse a word into component parts.

The cue chosen also seemed to have no relation to reading achievement. That is, reading ability, or lack of it, does not appear to affect the choice of cues children use to recognize words, or vice versa.

Hypothesis 5

There is no significant difference between boys and girls in the number of times they choose particular cues in recognizing words.

This hypothesis was not rejected for the three letter words. There were no significant differences between the choices made by boys and girls in the trigram series.

The hypothesis was rejected, in part, for the five letter words. Boys and girls differed significantly in the number of times the middle letter of five letter words was chosen. The boys chose this cue more frequently than the girls.

Conclusion

The present study shows that sex is not an important factor in the choice of word recognition cues. It may be assumed, therefore, that no variation in instruction is necessary when teaching boys and girls cues for word recognition.

Hypothesis 6

There is no significant relationship between the types of cues chosen for word recognition and IQ scores.

This hypothesis is not rejected for trigrams. All correlations between total IQ and various cues used in recognizing trigrams were low and non-significant.

This hypothesis is rejected in part for the quingrams. There was a correlation significant ($p<.05$) between shape and IQ. There were also significant correlations ($p<.05$) between the choice of the fourth letter and verbal meaning, and the choice of the fifth letter and perception speed.

Conclusion

The results suggest that IQ is not a significant factor in determining the cues children use in recognizing words.

Hypothesis 7

There is no significant relationship between scores on a test of phonics knowledge and levels of reading achievement.

This hypothesis is rejected for the total group, boys, and girls for all phonic scores (first letter, medial letter, final letter,

and total score) and reading accuracy scores. The hypothesis is also rejected for the high readers who showed a positive correlation between the initial phonic sound and reading accuracy and for the average readers who showed a positive correlation between the final phonic sound and reading accuracy. Correlations between the medial, final and total phonics scores and reading accuracy scores reached significance for the low reading achievers.

Conclusion

It appears that a knowledge of phonics is related to a pupil's reading achievement level. The fact that more significant relationships between these scores were found for low reading achievers than for the other reading groups would suggest that a knowledge of phonics aids these pupils in pronouncing words.

III. ANALYSIS OF RESULTS OF SELECTED PUPILS

In each series, trigrams and quingrams, eight students were chosen according to the cues they had selected. Of these, two students had selected the initial letter of the stimulus word most often, and two had selected the final letter most often. Two students were chosen because their choice of cues showed no marked preference for any one cue. Shape was the cue chosen least often in both the trigram and quingram series. Two students were selected, therefore, because they had chosen shape more often than every other cue except the first letter.

An analysis of the scores of these sixteen pupils indicated that pupils who chose the initial letter as a cue in word recognition scored

low on reading and phonics, whereas those who chose shape tended to score highest in these areas. This pattern was different from that which seemed to emerge in Chapter IV.

A second analysis was made with sets of four selected pupils who were high or low reading achievers and who had high or low phonic scores. The results suggest that the high readers may use a variety of cues and strategies depending on the word to be remembered.

With regard to the choice of cues, however, the first letter was the most used cue while shape was the least chosen. It appears, also, that pupils use different cues in remembering short (three-letter) words and long (five-letter) words.

An important finding from these analyses, however, indicates that the teacher was a very important variable in determining which cues a child selected and the level of reading success which he had attained.

It must be remembered, however, that the number of pupils chosen for analysis was small and any conclusions must be viewed as tentative.

IV. LIMITATIONS OF THE STUDY

In addition to those limitations already outlined in Chapter I the following factors became apparent during the testing, and these may tend to limit the applicability of the findings.

(1) The teachers of the children involved in this project maintained that use of the first letter was stressed when word recognition

skills were taught. This may have caused the children to look only for the first letter. This was borne out by the examiner's observation that some children appeared to search automatically for the first letter. Secondly, when the first letter was held constant, the necessity to choose an alternate cue tended to cause the children some difficulty.

(2) The presence of distinctive pairs of letters in the stimulus words may have affected the choice of cues.

(3) The design of the present study was constructed to examine the cues children use to help them to recognize words. It is admitted that other strategies may be employed by children when the word appears in an actual reading situation.

(4) The design of this study required words in isolation and without actual verbal meaning. This may have caused the children to resort to strategies other than those they normally use.

(5) The average IQ for the total group ($\bar{X}$ = 110) was approximately ten points above the normative mean. Therefore, the sample involved in the present study may possibly be atypical in their level of general intelligence.

V. SUGGESTIONS FOR FURTHER RESEARCH

1. A follow-up study, using the present sample, might be conducted in such a way that the teacher variable is used as the key to find answers to the questions raised in this project.

2. A follow-up study might also be conducted in which the mode of teaching is considered an important variable. For example, children taught by the sight method (without the use of phonics), those taught with the help of phonics and, if possible, those taught by a method in which shape is used as a predominant word recognition cue, may all vary in their choice of cues.

3. A similar study might be conducted using a sample of children who are poor readers.

4. A study might be planned using other cues such as pairs of letters based on "letter sequence."

5. Research might be conducted which focuses more on the children's reading. Passages may be constructed with actual words which children had been previously taught and would be required to recognize.

VI. IMPLICATIONS

1. The results of this study suggest that there is a relationship between phonic knowledge and reading. However, all the children tested tended to have more difficulty with medial than with initial or final sounds of words. This would seem to indicate that more stress should be placed on vowel sounds, especially when they are medial, than on initial sounds.

2. In this study all the children showed confusion in their selection of cues when the first letter of the word was held constant. This seems to indicate again that stress in teaching reading should move from exclusive concentration on the first letter of a word.

3. Word recognition cues, such as the first letter and shape, did not appear to relate to reading achievement and therefore there may be no need to stress these. Smith's (1971) theory that words should be shown side by side to encourage children to abstract differences (i.e., where, there) may have some validity and may be worth pursuing.

4. IQ does not appear as an important factor in word recognition cues. If this is so, the way in which reading groups are organized in some schools may require reconsideration.

VII. CONCLUDING STATEMENT

This study confirms Edelman's (1964) findings that the first letter is the cue most often used, and shape the cue least often used, when children are attempting to recognize words. The choice of cue, however, did not appear to relate to a child's phonic knowledge or level of reading achievement. An analysis of selected pupils indicated that the teacher may be the important variable in influencing this relationship.

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APPENDIX A

PHONICS TEST

Directions: "I want you to pronounce some words for me. These are not real words. That is, they don't mean anything. I just want you to say them as you think they would sound."

PHONICS TEST

Word	Initial Consonant	Medial Vowel	Final Consonant
kob			
bik			
dor			
fet			
hes			
lon			
vip			
yeb			
cul			
jat			
gof			
mip			
rog			
poj			
tik			
sur			
waf			
nid			

Phonics Test (continued)

Word	Initial Consonant	Medial Vowel	Final Consonant
ald			
int			
url			
ost			
emp			
est			
ank			
ilt			
osk			
ung			
arp			
eld			

Name of Child _____

APPENDIX B

COMPOSITION OF WORD RECOGNITION TEST

(a) Trigrams

(b) Quingrams

TRIGRAMS

	Stimulus Word	Responses	Cue Held Constant
1.	ste	sha	Shape
		slo	
		itu	
		atu	
		ofe	
		obe	
2.	anl	aif	Shape
		aek	
		onf	
		cnt	
		mel	
		vel	
3.	niy	neg	Shape
		nup	
		sig	
		rij	
		cay	
		vey	
4.	soj	sig	Shape
		suy	
		nop	
		vop	
		caj	
		unj	

	Stimulus Word	Responses	Cue Held Constant
5.	def	dak	First letter
		dut	
		dey	
		dej	
		dyf	
		dlf	
6.	haj	hiy	First letter
		hup	
		har	
		hau	
		hlj	
		htj	
7.	ote	ofa	First letter
		obu	
		oty	
		otk	
		oue	
		oye	
8.	bak	bol	First letter
		bef	
		bam	
		bau	
		byk	
		btk	

	Stimulus Word	Responses	Cue Held Constant
9.	ent	onl	Second letter
		unf	
		eny	
		eng	
		ynt	
		pnt	
10.	biy	hij	Second letter
		tij	
		bif	
		bia	
		aiy	
		jiy	
11.	yat	gak	Second letter
		paf	
		yan	
		yar	
		dat	
		lat	
12.	yot	gok	Second letter
		pof	
		yor	
		yoj	
		fot	
		kot	

	Stimulus Word	Responses	Cue Held Constant
13.	gen	jon	Third letter
		yan	
		gyn	
		gtn	
		sen	
		uen	
14.	arl	nol	Third letter
		cil	
		agl	
		afl	
		trl	
		hrl	
15.	boi	hai	Third letter
		fui	
		byi	
		bti	
		yoi	
		moi	
16.	fes	dis	Third letter
		hus	
		fys	
		fls	
		ges	
		jes	

QUINGRAMS

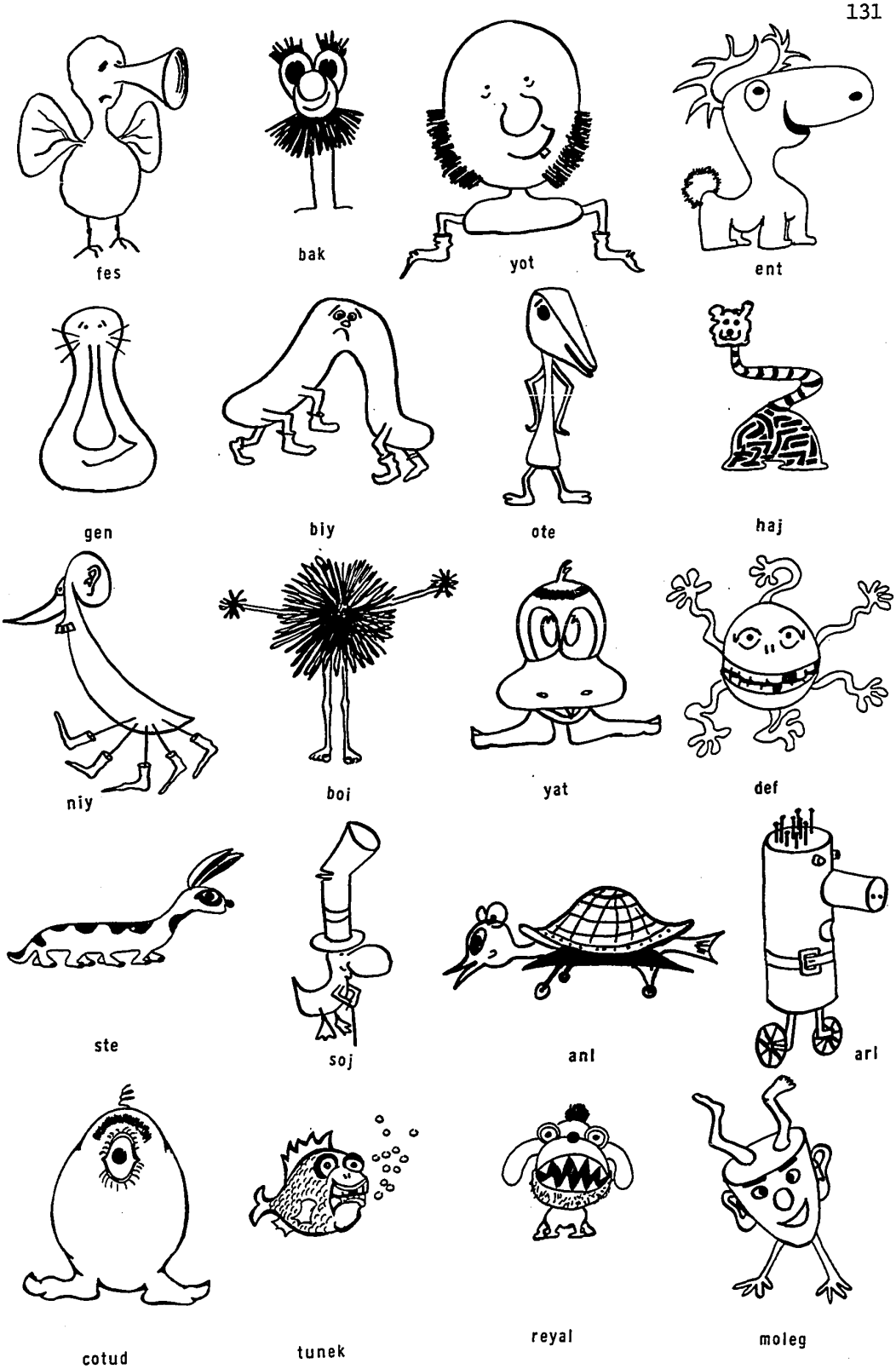
	Stimulus Word	Response		Cue Held Constant
(1),(2)	cotud	calek	celik	Shape
		wohaf	volaf	
		ritah	retah	
		sekul	sakul	
		milad	wefid	
(3),(4)	reyal	rupot	rigut	Shape
		mepok	neguk	
		icyot	coyif	
		mupaf	cogah	
		injol	sigol	
(5),(6)	moleg	makiy	mutiy	First letter
		moyut	moyah	
		milat	mulni	
		maten	mutek	
		mayug	mynig	
(7),(8)	tunek	tasal	tiraf	First letter
		tufam	tuloy	
		tonog	tynal	
		taleq	tifey	
		tahok	tiyok	
(9),(10)	vapuk	nayit	mayol	Second
		vatiy	vahit	
		yapon	wapiy	
		nayus	raluy	
		sahok	casek	

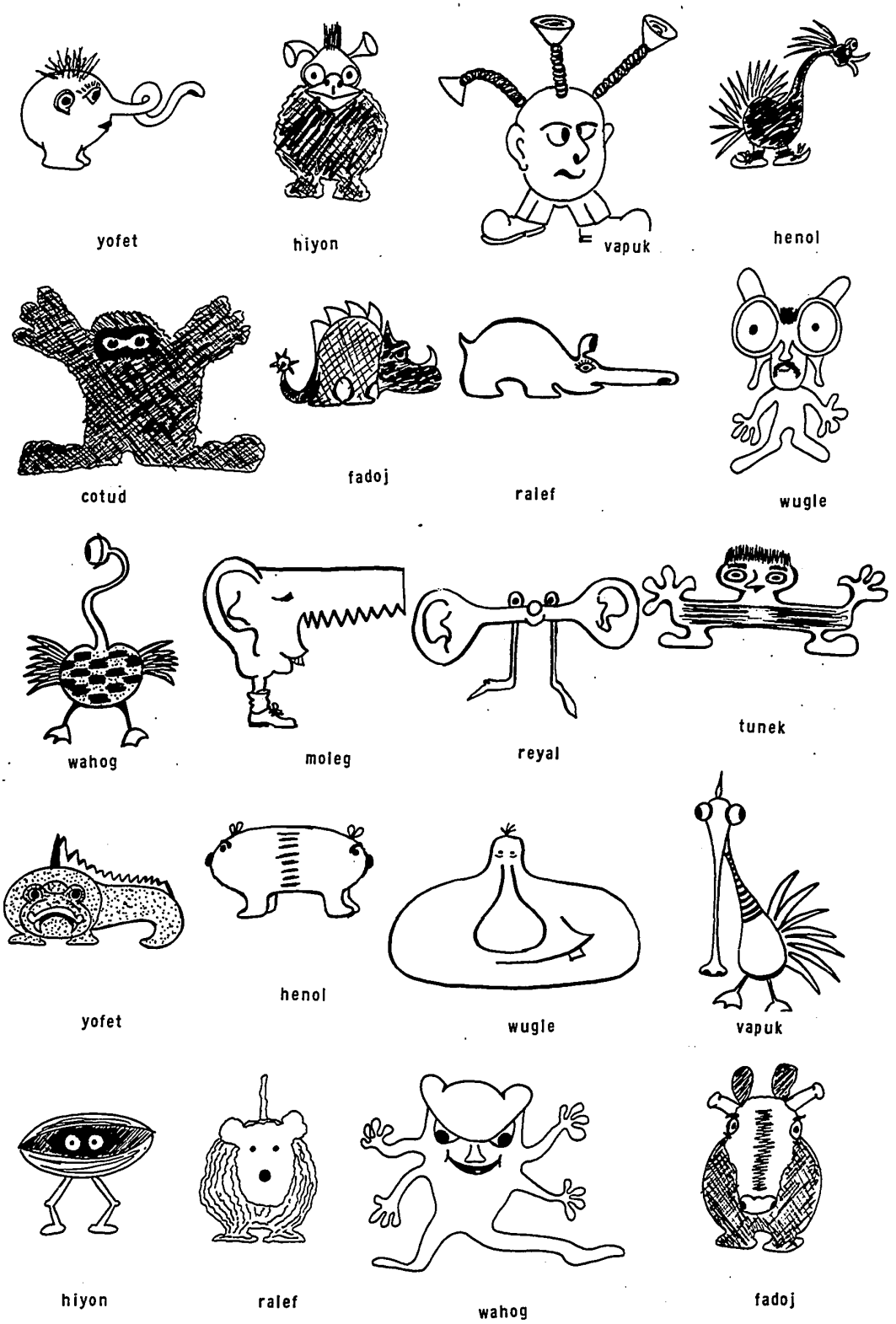
	Stimulus Word	Response		Cue Held Constant
(11),(12)	yofet	goluk	jokal	Second letter
		yogal	yolug	
		cofug	kofil	
		mogek	dorek	
		hoput	vopat	
(13),(14)	wahog	nehuy	cuhiy	Third letter
		wehil	wihuk	
		rahuk	nahet	
		rihol	mehol	
		sehyg	dehig	
(15),(16)	fadoj	heduy	hidep	Third letter
		feduk	fidul	
		radiy	vadey	
		hedot	pedok	
		miduj	yudej	
(17),(18)	hiyon	lepor	fajoe	Fourth letter
		hetoj	hulog	
		sikot	tilok	
		seyot	meyoh	
		sekon	rukon	
(19),(20)	henol	draok	fusoh	Fourth letter
		hayop	hutot	
		seyok	vesoy	
		manot	yanot	
		cayol	garol	

	Stimulus Word	Response		Cue Held Constant
(21),(22)	ralef	motuf	cikuf	Fifth letter
		rogif	ruyof	
		capuf	nayof	
		milyf	culyf	
		migef	dohef	
(23),(24)	wugle	coyte	noyte	Fifth letter
		wotie	witre	
		quate	hufse	
		cagne	nagie	
		tonle	cikle	

APPENDIX C

PICTURES USED FOR WORD RECOGNITION TEST


fes
bak
yot
ent
gen
biy
ote
haj
niy
boj
yat
def
ste
soj
anl
arl
cotud
tunek
reyal
moleg


yofet
hiyon
vapuk
henol
cotud
fadoj
ralef
wugle
wahog
moleg
reyal
tunek
yofet
henol
wugle
vapuk
hiyon
ralef
wahog
fadoj

APPENDIX D

WORD RECOGNITION TEST AS ADMINISTERED

Directions: "I am going to show you a word for a few seconds. On it there is a picture with a word printed below it. You are to look at the word carefully. When I take it away I will give you another card with five or six words on it. You are to choose the word most like the one you saw with the picture and draw a ring around it."

WORD RECOGNITION TEST

	Stimulus Word	Response	Cue Held Constant
1.	wugle	wotie	Fifth letter
		quate	
		cagne	
		coyte	
		tonle	
2.	moleg	moyah	First letter
		mutiy	
		mynig	
		mulni	
		mutek	
3.	gen	gtn	Third letter
		sen	
		yan	
		gyn	
		uen	
		jon	
4.	ote	obu	First letter
		otk	
		oye	
		ofa	
		oty	
		oue	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
5.	moleg	moyut	First letter
		maten	
		makiy	
		mayug	
		milat	
6.	boi	hai	Third letter
		bti	
		fui	
		byi	
		moi	
		yoi	
7.	cotud	ritah	Shape
		calek	
		milad	
		wohaf	
		sekul	
8.	haj	har	First letter
		htj	
		hlj	
		hau	
		hiy	
		hup	
9.	tunek	tufam	First letter
		tasal	
		taleq	
		tonog	
		tahok	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
10.	wahog	rahuk	Third letter
		nehuy	
		sehyg	
		rihol	
		wehil	
11.	yat	yar	Second letter
		dat	
		yan	
		paf	
		lat	
		gak	
12.	def	dey	First letter
		dak	
		dut	
		dej	
		dlf	
		dyf	
13.	vapuk	nayus	Second letter
		nayit	
		vatiy	
		yapon	
		sahok	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
14.	yofet	goluk	Second letter
		yogal	
		hoput	
		mogek	
		cofug	
15.	ste	slo	Shape
		itu	
		obe	
		ofe	
		atu	
		sha	
16.	soj	unj	Shape
		sig	
		caj	
		suy	
		nop	
		vop	
17.	wahog	nahet	Third letter
		cuhiy	
		wihuk	
		dehig	
		mehol	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
18.	cotud	sakul	Shape
		wefid	
		retah	
		volaf	
		celik	
19.	henol	yanot	Fourth letter
		vesoy	
		hutot	
		fusoh	
		garol	
20.	niy	vey	Shape
		cay	
		sig	
		neg	
		nup	
		rij	
21.	hiyon	tilok	Fourth letter
		meyoh	
		hulog	
		rukon	
		fajoe	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
22.	ent	unf	Second letter
		onl	
		pnt	
		ynt	
		eny	
		eng	
23.	tunek	tynal	First letter
		tuloy	
		tifey	
		tiraf	
		tiyok	
24.	fes	fls	Third letter
		dis	
		hus	
		fys	
		jes	
		ges	
25.	wugle	cikle	Fifth letter
		witre	
		noyte	
		hufse	
		nagie	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
26.	yofet	yolug	Second letter
		kofil	
		jokal	
		dorek	
		vopat	
27.	yot	gok	Second letter
		yoj	
		yor	
		pof	
		fot	
		kot	
28.	ralef	nayof	Fifth letter
		culyf	
		ruyof	
		dohef	
		cikuf	
29.	fadoj	radiy	Third letter
		feduk	
		heduy	
		hedot	
		miduj	
30.	hiyon	seyot	Fourth letter
		lepor	
		sekon	
		sikot	
		hetoj	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
31.	vapuk	wapiy	Second letter
		raluy	
		mayol	
		casek	
		vahit	
32.	bak	bol	First letter
		bam	
		bef	
		byk	
		btk	
		bau	
33.	reyal	mepok	Shape
		mupaf	
		icyot	
		injol	
		rupot	
34.	fadoj	yudej	Third letter
		fidul	
		hidep	
		vadey	
		pedok	
35.	henol	hayop	Fourth letter
		seyok	
		draok	
		manot	
		cayol	

Word Recognition Test (continued)

	Stimulus Word	Response	Cue Held Constant
36.	reyal	sigol	Shape
		coyif	
		cogah	
		rigut	
		neguk	
37.	biy	bif	Second letter
		aiy	
		tij	
		jiy	
		hij	
		bia	
38.	ralef	milyf	Fifth letter
		motuf	
		migef	
		capuf	
		rogif	
39.	anl	onf	Shape
		mel	
		aif	
		vel	
		aek	
		cnt	
40.	arl	nol	Third letter
		agl	
		hrl	
		afl	
		cil	
		trl	

APPENDIX E

TABLE XVII

NUMBER OF TIMES EACH CUE WAS CHOSEN IN TRIGRAMS SERIES

	Shape	First	Second	Third
Total Group	75	354	184	155
Boys	38	174	91	81
Girls	37	180	93	74
High Readers	24	114	65	53
Average Readers	25	117	60	54
Low Readers	26	123	59	48

TABLE XVIII

NUMBER OF TIMES EACH CUE WAS CHOSEN IN QUINGRAM SERIES

	Shape	First	Second	Third	Fourth	Fifth
Total Group	77	510	166	130	125	144
Boys	44	226	85	79	66	76
Girls	32	283	82	52	60	67
High Readers	23	172	54	43	41	51
Average Readers	16	174	60	40	46	48
Low Readers	37	164	51	48	39	45

APPENDIX F

FORMULA FOR DIFFERENCES BETWEEN PROPORTIONS

TRIGRAM $$z = \frac{P - .25}{\sqrt{\frac{PQ}{N}}}$$

QUINGRAM $$z = \frac{P - .166}{\sqrt{\frac{PQ}{N}}}$$

P = Observed Proportion

N = Number of Possible Cues

TABLE XIX

DIFFERENCES BETWEEN PROPORTIONS OF OBSERVED AND EXPECTED TRIGRAM CUES

		Shape	First	Second	Third
Total Group	P	.0975	.4606	.2393	.2012
	z	-14.247	11.709	-0.695004	-3.3734
Boys	P	.0987	.4531	.2368	.2106
	z	-9.9405	7.99511	-0.608457	-1.89358
Girls	P	.09625	.4687	.2418	.1925
	z	-10.2211	8.5881	-0.375284	-2.8579
High	P	.0937	.445	.2537	.2068
	z	-8.5817	6.2781	0.136053	-1.70662
Average	P	.0975	.4568	.2343	.2106
	z	-8.22553	6.64244	-0.593068	-1.5461
Low	P	.1012	.48	.23	.1875
	z	-7.89407	7.3659	-0.760398	-2.56205

TABLE XX

DIFFERENCES BETWEEN PROPORTIONS OF OBSERVED AND EXPECTED QUINGRAM CUES

		Shape	First	Second	Third	Fourth	Fifth
Total Group	P	.0666667	.4425	.144583	.113333	.109157	.125
	Z	-13.516	18.8948	-2.06699	-5.63906	-6.25541	-4.20776
Boys	P	.07625	.39375	.1475	.137083	.114583	.131667
	Z	-8.11612	11.1875	-1.2521	-2.01785	-3.87422	-2.43692
Girls	P	.0570833	.49125	.142083	.09	.104167	.117917
	Z	-2.43692	15.6144	-1.64409	-6.37357	-4.85795	-3.57816
High	P	.0595833	.447917	.142917	.111667	.106667	.1325
	Z	-8.80954	11.1093	-1.29242	-3.38049	-3.76652	-1.93628
Average	P	.0441667	.452917	.15875	.104167	.119583	.125
	Z	-11.6197	11.295	-0.388763	-3.9665	-2.80326	-2.42935
Low	P	.09625	.427083	.1325	.125	.10125	.117083
	Z	-4.63431	10.3429	-1.93628	-2.42935	-4.20619	-2.98139

APPENDIX G

TABLE XXI

ANALYSIS OF VARIANCE BY READING ACHIEVEMENT GROUPS ON TRIGRAM SCORES

	Source of Variance and Sum of Squares		Mean Squares		Degrees of Freedom		F	P
	Among Means	Within Means	Among Means	Within Means	Among Means	Within Means		
Shape	0.12	97.68	0.06	2.17	2.00	45.00	0.03	0.97
First	2.62	420.62	1.31	9.35	2.00	45.00	0.14	0.86
Second	1.29	171.37	0.65	3.81	2.00	45.00	0.17	0.84
Third	1.29	149.18	0.65	3.32	2.00	45.00	0.19	0.82

* = $p<.10$
** = $p<.05$
*** = $p<.01$

TABLE XXII

ANALYSIS OF VARIANCE BY READING ACHIEVEMENT GROUPS ON QUINGRAMS

	Source of Variance and Sums of Squares		Mean Squares		Degrees of Freedom		F	P
	Among Means	Within Means	Among Means	Within Means	Among Means	Within Means		
Shape	13.16	76.31	6.58	1.70	2.00	45.00	3.88	0.03**
First	3.50	1237.75	1.75	27.51	2.00	45.00	0.06	0.93
Second	3.16	168.81	1.58	3.75	2.00	45.00	0.42	0.65
Third	2.04	185.43	1.02	4.12	2.00	45.00	0.25	0.78
Fourth	1.62	205.62	0.81	4.57	2.00	45.00	0.18	0.83
Fifth	1.12	216.87	0.56	4.82	2.00	45.00	0.12	0.89

* = $p<.10$
** = $p<.05$
*** = $p<.01$

TABLE XXIII

CORRELATIONS BETWEEN FREQUENCY OF TRIGRAM CUES, PHONICS SCORES AND READING ACHIEVEMENT FOR TOTAL GROUP

	TRIGRAM CUES			
	Shape	First	Second	Third
Phonics Initial	-0.20	-0.01	0.21	-0.04
Phonics Medial	-0.16	-0.00	0.13	-0.00
Phonics Final	-0.21	-0.03	0.15	0.06
Phonics Total	-0.20	-0.01	0.17	0.00
Reading Accuracy	-0.03	-0.14	0.12	0.14
Reading Comprehension	0.01	-0.10	0.01	0.14

* = $p<.10$
** = $p<.05$
*** = $p<.01$

TABLE XXIV

CORRELATIONS BETWEEN FREQUENCY OF TRIGRAM CUES, PHONICS SCORES AND READING ACHIEVEMENT FOR HIGH READERS

	TRIGRAM CUES			
	Shape	First	Second	Third
Phonics Initial	0.11	0.15	-0.32	-0.09
Phonics Medial	0.05	0.10	-0.05	-0.21
Phonics Final	-0.04	0.21	-0.41	0.03
Phonics Total	0.05	0.16	-0.26	-0.13
Reading Accuracy	0.04	-0.21	0.18	0.21
Reading Comprehension	-0.01	-0.22	0.14	0.34

* = $p<.10$
** = $p<.05$
*** = $p<.01$

TABLE XXV

CORRELATIONS BETWEEN FREQUENCY OF TRIGRAM CUES, PHONICS SCORES AND READING ACHIEVEMENT FOR AVERAGE READERS

	TRIGRAM CUES			
	Shape	First	Second	Third
Phonics Initial	-0.28	-0.38	0.39	0.34
Phonics Medial	-0.47*	-0.17	0.45*	0.09
Phonics Final	-0.46*	-0.26	0.48**	0.18
Phonics Total	-0.47*	-0.29	0.50**	0.21
Reading Accuracy	-0.07	-0.29	0.13	0.34
Reading Comprehension	0.12	0.09	-0.19	-0.01

* = $p<.10$
** = $p<.05$
*** = $p<.01$

TABLE XXVI

CORRELATIONS BETWEEN FREQUENCY OF TRIGRAM CUES, PHONICS SCORES AND READING ACHIEVEMENT FOR LOW READERS

	TRIGRAM CUES			
	Shape	First	Second	Third
Phonics Initial	-0.54**	0.39	0.34	-0.54**
Phonics Medial	-0.23	0.35	-0.12	-0.15
Phonics Final	-0.35	0.23	0.05	-0.12
Phonics Total	-0.39	0.34	0.08	-0.27
Reading Accuracy	-0.25	0.33	-0.15	-0.08
Reading Comprehension	0.10	0.10	-0.10	-0.08

* = $p<.10$
** = $p<.05$
*** = $p<.01$

TABLE XXVII

CORRELATIONS BETWEEN FREQUENCY OF QUINGRAM CUES, PHONICS SCORES AND READING ACHIEVEMENT FOR TOTAL GROUP

	QUINGRAM CUES					
	Shape	First	Second	Third	Fourth	Fifth
Phonics Initial	-0.32**	0.23*	-0.03	-0.12	-0.01	-0.17
Phonics Medial	-0.21	0.15	-0.13	-0.01	-0.03	-0.05
Phonics Final	-0.22	0.08	-0.14	0.00	0.09	-0.03
Phonics Total	-0.26*	0.16	-0.11	-0.03	0.02	-0.08
Reading Accuracy	-0.30**	0.04	-0.03	-0.13	0.05	0.18
Reading Comprehension	-0.16	-0.08	-0.01	0.04	0.08	0.17

* = p<.10
** = p<.05
*** = p<.01

TABLE XXVIII

CORRELATIONS BETWEEN FREQUENCY OF QUINGRAM CUES, PHONIC SCORES AND READING ACHIEVEMENT FOR HIGH READERS

	QUINGRAM CUES					
	Shape	First	Second	Third	Fourth	Fifth
Phonics Initial	-0.20	0.44*	-0.21	-0.15	-0.40	-0.31
Phonics Medial	-0.10	0.25	-0.15	0.00	-0.17	-0.29
Phonics Final	-0.12	0.38	-0.54**	-0.09	-0.33	-0.11
Phonics Total	-0.16	0.39	-0.31	-0.08	-0.33	-0.29
Reading Accuracy	-0.30	0.10	-0.21	-0.31	0.04	0.28
Reading Comprehension	-0.15	0.03	-0.35	-0.06	-0.14	0.41*

* = p<.10
** = p<.05
*** = p<.01

TABLE XXIX

CORRELATIONS BETWEEN FREQUENCY OF QUINGRAM CUES, PHONIC SCORES AND READING ACHIEVEMENT FOR AVERAGE READERS

	QUINGRAM CUES					
	Shape	First	Second	Third	Fourth	Fifth
Phonics Initial	0.11	-0.38	0.04	0.31	0.44*	-0.03
Phonics Medial	0.17	0.21	-0.07	-0.05	-0.16	-0.29
Phonics Final	0.36	-0.03	-0.02	0.12	0.19	-0.42*
Phonics Total	0.25	-0.03	-0.02	0.11	0.13	-0.30
Reading Accuracy	0.27	-0.52**	0.06	0.51**	0.41*	0.01
Reading Comprehension	0.23	-0.34	0.02	0.53**	0.20	-0.12

* = p<.10
** = p<.05
*** = p<.01

TABLE XXX

CORRELATIONS BETWEEN FREQUENCY OF QUINGRAM CUES, PHONIC SCORES AND READING ACHIEVEMENT FOR LOW READERS

	QUINGRAM CUES					
	Shape	First	Second	Third	Fourth	Fifth
Phonics Initial	-0.34	0.48**	-0.19	-0.22	-0.17	-0.37
Phonics Medial	-0.26	0.11	-0.39	0.07	0.08	0.01
Phonics Final	-0.30	0.07	-0.37	0.08	0.18	0.03
Phonics Total	-0.32	0.22	-0.35	-0.00	0.04	-0.09
Reading Accuracy	-0.27	0.16	-0.33	-0.13	-0.10	0.25
Reading Comprehension	0.04	-0.24	0.22	0.08	0.29	0.01

* = p<.10
** = p<.05
*** = p<.01

TABLE XXXI

ANALYSIS OF VARIANCE BY SEX ON TRIGRAMS

	Source of Variance and Sum of Squares		Mean Square		Degrees of Freedom		F	P
	Among Means	Within Means	Among Means	Within Means	Among Means	Within Means		
Shape	2.08	97.79	0.02	2.13	1.00	46.00	0.01	0.92
First	0.75	422.50	0.75	9.18	1.00	46.00	0.08	0.77
Second	8.32	172.58	0.08	3.75	1.00	46.00	0.02	0.88
Third	1.02	149.45	1.02	3.25	1.00	46.00	0.31	0.57

* = p<.10
** = p<.05
*** = p<.01

TABLE XXXII

ANALYSIS OF VARIANCE BY SEX ON QUINGRAMS

	Source of Variance and Sum of Squares		Mean Squares		Degrees of Freedom		F	P
	Among Means	Within Means	Among Means	Within Means	Among Means	Within Means		
Shape	2.52	86.95	2.52	1.89	1.00	46.00	1.33	0.25
First	65.33	1175.91	65.33	25.56	1.00	46.00	2.56	0.11
Second	0.18	171.79	0.19	3.73	1.00	46.00	0.05	0.82
Third	15.18	172.29	15.19	3.75	1.00	46.00	4.05	0.05**
Fourth	0.75	206.50	0.75	4.49	1.00	46.00	0.17	0.68
Fifth	1.33	216.66	1.33	4.71	1.00	46.00	0.28	0.59

* = p<.10
** = p<.05
*** = p<.01

END OF REEL

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