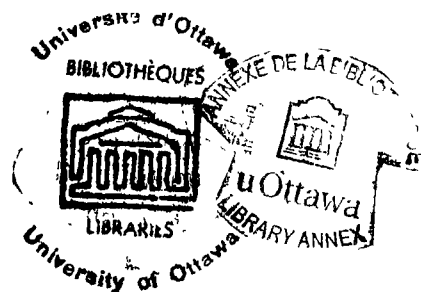


THE EFFECT OF PHONETIC-KINESTHETIC
TRAINING ON THE MEASURABLE READING PERFORMANCE
OF PRIMARY PUPILS WITH REVERSAL
AND INVERSION DIFFICULTIES

by Doris Sutherland de Merlis

Thesis presented to the School of
Psychology and Education of the
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CURRICULUM STUDIORUM

Doris Sutherland de Merlis was born (Doris Edna Sutherland) at Almonte, Ontario, March 25, 1928. She received her Bachelor of Arts degree from Carleton University, Ottawa, in 1952. Her Master of Arts degree was received from the University of Ottawa in 1956. The title of her thesis was The Influence of Formal Training in the Names and Sounds of Single Letters on Measurable Reading Readiness of Kindergarten-Primary Pupils. She received her Bachelor of Education degree from the University of Ottawa in the same year.

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INTRODUCTION

The twentieth century, with its interest turned toward the learner rather than the matter to be learned, has brought considerable change in the orientation of educational research. The area which has received probably the greatest attention is the process of the individual's growth in learning to read adequately. Reading as a skill and as a thought process has been variously defined. The definition of Dolch is generally acceptable.

Reading is imagining, thinking and feeling about ideas and thoughts made from past experiences that are suggested by perception of the printed word.¹

Not only has the normal growth of this ability been studied, but considerable research has been centred around the individual who either cannot learn to read or who experiences great difficulty in learning to do so. The various causes of retardation in reading, the physical, intellectual and emotional difficulties as well as the limitations of the environment, have been examined. The reading handicaps of children with poor eyesight or of those who are mute, of children who are mentally retarded, of children who show severe personality deviations, and of children for whom adequate instruction is not available, have been easily isolated and

¹Edward Dolch, Psychology and the Teaching of Reading, Champagne, Garrard Press, 1951, p.9.

are being studied in detail. However, from time to time, investigators have been puzzled by a small group of children with adequate eyesight, hearing and speech, with normal intelligence or better, with no discernable severe personality problem, and who had the advantage of adequate instruction, who nevertheless experienced various degrees of difficulty, usually from the earliest stages of reading instruction. A few of these children never learned to read with any competence and others had reading ages considerably retarded behind their respective mental ages by the time the intermediate grades were reached. The common factor in this group seemed to be a poor memory of visual word images usually characterized by tendencies to reversals and inversions in letters and word forms.

This investigator has undertaken to discover whether these children can be helped to learn to read by a method which stresses phonetic and kinesthetic contact with letters and words, as well as by the necessary visual contact. The present report aims at disclosing the results of an experiment in which the investigator attempted to measure the effect of a phonetic-kinesthetic method used during beginning and early reading instruction in Grades I to III with children who appeared to belong in the category which has just been described. It attempts to find out whether there was significant

difference between the reading age at the end of training and a reading age fairly closely corresponding to mental age which could be expected in a normal group. An effort will be made to show whether there exist certain factors in the difficulties of some children which limit the amount of improvement made under the experimental training.

The First Chapter of the report presents the background of the problem. It furnishes, in addition to definitions of the terms, a survey of the literature. This chapter is divided into four sections. The first contains general definitions and descriptions of reversal errors, of methods of teaching primary children to read, and of dominance patterns; the second gives a description of the specific difficulty in word recognition being studied; the third presents theories of causation and estimates of incidence; the last describes some attempts that have been made at diagnosis and remedial training.

Chapter II is concerned with a description of the experimental procedure. The contents and methods of training used in the experiment are discussed and the tools of measurement are stated. Chapter III is the presentation of the selection and description of the subjects who received the training.

The Fourth Chapter presents the results of the experiment and attempts to make adequate interpretation of the results.

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At the end of the report, a summary of the conclusions is given and the possible implications, if any, for further practice and research, are suggested.

CHAPTER I

THE BACKGROUND OF THE PROBLEM

The goal of the present research was to find a method which would help primary children for whom learning to read is difficult due to the tendency to reversals and inversions, whether in memory of visual images, in direction of attack, or in perception. A phonetic-kinesthetic method was chosen for the first experimental attempt to solve the problem, and the reasons for the selection as well as the content and methodology will be presented. The goal of the research then became more explicitly to find whether primary pupils showing strong evidence of the reversal and inversion pattern could learn to read adequately with a phonetic-kinesthetic method usable in a special class in the regular school system.

In order to state the problem in a form permitting statistical analysis, it was reduced to the following hypothesis:

a) The measurable reading performance of primary children with the described difficulty will not improve significantly with phonetic-kinesthetic training.

b) If there is significant improvement, the reading age indicating the measurable reading performance at the end of the training period will be significantly less than the expected reading age corresponding to the mental age.

1. Preliminary Definitions

First it is necessary to define some of the terms used in this report. A general definition of reading has been stated in the introduction. However, because this report concerns primary reading skills, the definition must be adapted to the more limited aspects of reading at that level. Again a definition of Dolch will be given. Of beginning reading he says,

(..)reading is recognizing most of the words, guessing or working out the others, getting the meaning and then discussing it in a class situation.¹

The part of this definition which will receive the most attention in this report is "recognizing most of the words", because it is in this area that the children with whom the research was done, were handicapped.

It has been mentioned that children in the group studied showed evidence of reversals and inversions in letter and word recognition. Reversals may be divided into several types. First are static reversals which are confusions of single letters similar or identical in configuration but differing in spatial orientation so that such letters are often identified as their right to left opposites. For example, "b" is identified as "d", "p" as "q", "s" as "a" or as "z".

¹Edward Dolch, Psychology and the Teaching of Reading, Champagne, Garrard Press, 1951, p. 19.

Secondly are found kinetic reversals in which the directional sequence of letters within words or of words within phrases is confused. Examples within words are reading "clot" for "colt", "bread" for "beard", "left" for "felt" and "who" for "how". Some authors accept only purely palindromic reversals. "was" is read for "saw"; "on" is read for "no" or "but" is read for "tub".

A third category of errors attributable to reversals is said to be produced by the combined effect of static and kinetic reversals and occurs when the child pronounces strange and often meaningless combinations. Omissions, additions, perservations and substitutions are often regarded as a fourth group, considered as a by-product of the confusion caused by incomplete and complete reversals coupled with the child's attempt to "make something out of the word".

Inversions are confusion of single letters similar or identical in configuration but differing in orientation in vertical form. Thus "u" may be identified as "n", "h" as "y", "M" as "W", "f" as "t", "b" as "p" and "d" as "q".

It is necessary to clarify what is meant by each of the methods of teaching reading which will be mentioned in the subsequent chapters of this report. Generally speaking methods of reading instruction may be divided into three groups. The first group contains the so-called whole

or global methods. They are based on the assumption that isolated letters have no meaning for the child and that, therefore, he must begin with words, or better still, with phrases and sentences that are full of meaning for him. The methods are called analytic from the child's point of view because it is presumed that after learning to recognize the whole, the child will realize the parts or letters contained in the whole. Whole methods are often called sight methods since they rely on the child's visual memory of the configuration of each word in order to recall and identify it each time that it is encountered in reading material.

Into this category are placed the word method, the phrase or sentence method, the story method, the picture-story method, the intrinsic method and the non-oral method. In the word method, the child is taught lists of isolated words which form the vocabulary of the books which he is to read. All types of drills and games are used to reinforce the visual memory of the configuration of each word. It is probably hoped that the child's powers of visual discrimination will be adequately keen to learn thousands of words by remembering the small differences in their general shapes. In practice it is found necessary to point out at least first and last letters and often combinations

of letters within the words. Frequently, after the first one hundred sight words, the word method must become a joint sight and phonetic method.

In the phrase or sentence method, the child begins with groups of words which are very meaningful to him. He is expected to recognize words learned in a familiar phrase in the context of new material.

The story method requires that in order that the child may begin with even larger meaningful wholes, the teacher read stories. The child repeats these and in so doing learns to recognize certain words through their repetition in the story. He then reads his own stories and unfamiliar words are told to him immediately so that he will not lose sight of the meaning of, or interest in the whole because of difficulty with the parts.

In the picture-story method, the child is presented with cards or pages at the top of which are large pictures and underneath a few words or lines telling something about the pictures.

The intrinsic method means a combination of methods based on the assumption that the meaning of the paragraph is more important than the exact wording. Therefore any method is used to help the child learn and recall the meaning if not the exact wording.

When the non-oral method is used the child is never asked to read the exact words orally, and thus is never required to know all the words as long as he can answer questions on the ideas presented in the material which he reads silently.

It is not the purpose of this report to criticize various techniques of teaching reading. A few general remarks suffice. If the above methods are used in their pure form, and this probably happens very rarely, even the normal child may have some difficulty in becoming an independent reader since he must rely on either the adult or the picture for the identification of each new word. There also may be danger of memorization of stories and of over-use of guessing. However, since it appears to be true that many children do indeed become aware of and use the letters contained in the wholes which have been taught, and because for most teachers the trend seems to be toward a combination of sight and phonetic methods, it is possible that the adapted use of whole methods can be a speedy and meaningful way of learning to read for normal children. But for the child with poor or confused visual memory it seems obvious that chief reliance on accurate memory of visual word forms cannot be as successful.

The second large category of reading methods is the group of part methods. These methods require that the child learn first the parts or letters before he puts them together in words representative of objects or happenings in his experience. Visual memory is relied on here for recognition of the twenty-six letter forms. But since the letters in themselves have little meaning to the child he must learn to identify the letters by their sounds and thus have an auditory as well as visual avenue to his reading. The part methods are usually called synthetic methods from the child's point of view because he is required to put together the letters or parts in order to get meaningful words.

In the alphabetic method, the child is taught first the names of the letters of the alphabet. These letters are combined into words. The child is expected to recognize and remember the words through his knowledge of the letters making up these words. Generally he is asked to spell the words as part of the learning process.

A variation of this is the phonic or phonetic method in which the child is taught the common sounds of the vowels and consonants and then the sounds of combinations and special arrangements of these letters. Often words with common combinations are arranged in word families and the child learns to read words in lists with little relation to each other outside of the common sound elements. In the pure form of this method, sentences and paragraphs are devised

for the child to read in which meaning and interest are secondary to frequency of words from the sound family being studied.

The alphabetic-phonetic method combines the first two methods of this group requiring the child to learn the names of the letters so that he can spell the words orally but to hear and to recognize the sounds of these letters in the words that he learns.

A last method in this category involves the systematic analysis of speech elements. It is called the linguistic method and is not in common use.

Again it is not in the province of this report to criticize the ordinary use of these methods. It is sufficient to generalize that in the pure use of most of the second group of methods meaning takes second place to recognition of symbols in the early stages. If reading is considered as a means of communication then the child's interests and purposes seem to be denied at the beginning of his association with this avenue of communication. On the other hand the question must be asked, and it must go unanswered, is the six or seven year old child who is learning to read chiefly interested in the meaning which is communicated to him in the reading material, or is he at first anxious to acquire an adult skill, to find out how to use the strange symbols which are so important to grown-ups?

The last main category contains both conjunctive and functional methods. The natural method is based on the child's natural interest. Vocabulary which he uses every day is taught by seeing the word, saying the word, sometimes writing the word, acting out the word, and by using it in reading and writing as much as the child wants.

The kinesthetic method is a writing and tracing method. Usually the word which the child wants to use is written with large crayon and the child traces it with his index finger until he is able to write it without looking. If he hesitates or makes an error he must trace it again until he can write it without error. When he wishes to use or read the words thus learned he has to refer to his file of tracing words and retrace if necessary in order to write or identify.

In the experience methods, use is made of experience charts. The children tell about something which has happened on the way to school or in the classroom. The teacher writes the story on the blackboard as it is dictated by her class. The pupils read it aloud. They learn to distinguish the words through configuration, sounds, or any other way in which the teacher finds will help them learn to read what they have asked should be written for them. Later they learn to read and write their own stories.

When the purposeful method is used the child must first feel a need to acquire ideas, facts or fun from printed materials. He learns the words which he needs to read by any of the above methods. A general statement about this last group of methods should point out that perhaps too much responsibility rests with the child as to what shall be his reading vocabulary. The nearly complete dependance on the child may limit the amount learned and may tend to make it inadequate in organization and system.

Because no method is used exclusively in its pure form in most of the schools today, for the purposes of this report it should be understood that reference to a method means that the method named is the basic one used but that the teacher may and does at her discretion add other secondary methods to aid the whole class or individual pupils in the class. For example, when it is stated that the regular Grade I class learned to read by the word method and phrase method, it is meant that these two sight methods were the basis of reading instruction but the teacher did teach phonics as a secondary approach in the second half of the Grade I year after many sight words had been learned. She also used from time to time picture-story lessons, experience charts, non-oral lessons and even kinesthetic work to add variety and to give extra

drill to some pupils. Similarly, visual drills and practice are inescapable parts of the phonetic-kinesthetic instruction to be described.

Following the various reading methods, the next term to be defined and described is "dominance", a word which is met very frequently in the literature. By lateral dominance is meant the preferred use and superior functioning of one side of the body over the other.

Dominance is said to be crossed when the dominant hand and eye are on opposite sides of the body. Although the term "mixed dominance" has been used to include both crossed and incomplete dominance, it is considered generally to be the same as incomplete dominance in which the individual shows nearly equal use of and indecision about both sides in either eye or hand dominance or both. Converted dominance means that the individual formerly preferred the other hand; usually it refers to the use of the right hand by formerly left-handed individuals.

Having stated the problem and defined the terms, this report now proceeds to a description of the background of the topic and in so doing, provide a survey of the literature dealing with the problem.

2. The Specific Reading Difficulty in word Recognition

Although there had been from almost the beginning of the twentieth century occasional mention of an inexplicable difficulty in learning to read suffered by a very small percentage of otherwise normal children, no assumptions about its cause or cure had been suggested, other than the name "congenital word blindness", until the twenties. In 1921, Burt² described reading errors consisting of failure to discriminate between similar visual forms, especially those which differed in orientation or order of component parts. He said that pupils with this difficulty failed to remember a series of sounds in the proper order and also failed to associate the sound with the symbol when there was no meaningful connection.

In the same year, Fildes³ stated that a source of trouble to some readers was slowness of discrimination of similar or like forms of different spatial orientation and he stated that this difficulty was greater when the method of perception was strictly visual.

²C. Burt, Mental and Scholastic Tests, London, King, 1921, p. 269-295.

³L. G. Fildes, "A Psychological Inquiry into the Nature of the Condition Known as Congenital word-Blindness" in Brain, Vol. 44, 1921-22, p. 286-307.

Orton⁴, the first author to give a detailed account of this type of error and to suggest an explanation, in 1925 differentiated between static reversals and kinetic reversals and, adding to these the partial reversals that he saw in substitutions, omissions and additions, he thus listed the symptoms of what he termed strephosymbolia.

Monroe, in speaking of Children Who Cannot Read⁵ in 1932, mentioned as the most frequent errors among her poor readers, reversals, total errors, omission of sounds, repetitions, faulty consonants and addition of words. She further said that ⁶a child's inability to discriminate successfully similar words and sounds might affect not only his reading but his speech. She differentiated this difficulty from lack of auditory acuity and said that in her experiments the reading defects children were significantly different from the controls in ability to combine isolated letters into words. She argued that for a successful use of phonics the child must be able to differentiate the sequence of letters as well as the spatial pattern of letters and she found many reversals of order. She further suggested

⁴Samuel T. Orton, "word Blindness in School Children" in Archives of Neurology and Psychiatry, Vol. 14, issue of November, 1925, p. 581-615.

⁵Marion Monroe, Children Who Cannot Read, Chicago, University of Chicago Press, 1932, p. xii-201.

⁶Ibid., p. 93-97.

that both causes may present the same symptoms of reading disability so that two children may both make excessive reversals, one because of his difficulty in perceiving the orientation of the visual patterns and the other because of his difficulty in perceiving the temporal sequence of sound patterns. Two children might have excessive consonant errors and fail to associate the visual and auditory symbols accurately, one owing to the lack of precision in either auditory discrimination or articulation or both, and the other owing to the lack of correct perception of spatial pattern.

In 1934, Jastak⁷ reviewed literature on reversals in reading patterns up to that date and stated that all studies of reading difficulties in which analysis of error had been attempted, pointed to the strephosymbolic error pattern.

A year later, Davidson⁸, in describing the same type of errors, reported a high incidence of both reversals and inversions but stated that they tended to disappear during the Grade I year with the "d-b", "q-p" and "b-d" reversals being the last to go at about mental age seven years to seven years, eleven months.

⁷Joseph Jastak, "Interferences in Reading" in Psychological Bulletin, Vol. 31, No. 4, issue of April, 1934, p.244-272.

⁸Helen P. Davidson, "A Study of the Confusing Letters B, D, P and Q" in Journal of Genetic Psychology, Vol. 47, No.2, issue of December, 1935, p. 458-468.

She provided further analysis to show that inversions disappeared before reversals and that girls lost the errors before boys. She seemed to feel that reversals were part of the genetic sequence of growth in form perception and perception in spatial position and therefore not a true reading difficulty.

In 1937, Orton⁹, in perhaps his most complete report on what he had called strephosymbolia, described the various syndromes. Of developmental alexia, formerly called word-blindness, but renamed by him strephosymbolia, he said that those suffering from this difficulty had the ability to see the words normally but had the striking tendency to distorted order in recall of the visual image of the word¹⁰. He admitted the presence of all the other standard causes of reading disability, but said that when these groups were excluded there remained a group of considerable size which showed no physical, mental or emotional abnormality until school age was reached at which time these children could not learn to read or spell and even had some difficulty in writing due to the tendency to reverse the order and orientation of letters.

⁹Samuel Torrey Orton, Reading, Writing and Speech Problems in Children, New York, Norton, 1937, 200p.

¹⁰Ibid., p. 78-80.

That there is no true blindness for words as the older nomenclature would suggest is clearly emphasized by the fact that these children see the word and will make an attempt to read it although such an effort commonly does not bring correct recognition, and this is still further brought into relief by the fact that many of these non-readers are able to copy correctly words which they cannot read (...)¹¹

In his own description of strephosymbolia, he said,

While the early cases of strephosymbolia and those of more extreme severity often have learned to read very little indeed, nevertheless an observation of the type of errors which they make in attempting to read is instructive. In the beginning we find a very wide range of letter confusions - b's are mixed with h's; m, n and u are confused, etc. Such confusion is present in practically all children in the very beginning but the more facile readers quickly straighten them out and even the reading disability cases, with a little teaching, soon get most of the letters properly associated with their names, with the notable exception of those letters which are similar in form but reversed in orientation, that is b and d, and p and q. In some of our more confused cases, difficulty has been encountered in telling t from f, and a from g. This will be more readily understood if the imprint of the lower case type of these letters is examined in the mirror, as this brings out similarities which might escape us otherwise (...)¹²

Later, he continued,

In the poor readers, reversable words also form a serious stumbling block; was and saw, on and no, not and ton are inextricably mixed. There is also a marked tendency to twist around a pair of letters in a word, leading to a confusion between such words as from and form, calm and clam, etc. Or occasionally the reversal of one syllable of a word occurs when tarnish is read ratnish, or there may be a reversed assembly of the two syllables

¹¹Ibid., p. 78.

¹²Ibid., p. 78-79.

of a word, each of which has been read in the proper direction, as when repast is read as ast-rep. One striking fact about this reversal tendency is its instability. The letter b is sometimes b and sometimes d; was encountered several times in the same paragraph may come back as either was or saw with no consistency. As the child grows older and progresses somewhat in his ability to solve these puzzles of direction, and especially when he begins to make use of the context to determine his choices between two possibilities, the use of three and four-letter nonsense syllables will frequently uncover a tendency to reversals which has to a considerable extent disappeared from familiar words (...)¹³

He then went on to describe the reversals in writing and sometimes in arithmetic, such as saying 12 for 21, or the difficulty with the direction to be followed in carrying when adding, or in borrowing when subtracting. The greatest difficulty, according to Orton¹⁴ was in spelling. With very severe cases or with moderate but untreated ones, almost no progress was made in reading or spelling which could be measured by standardized tests during the first two or three years. Those who had had some treatment learned to read or recognize words before they were able to reproduce them. However, in a few children with unusual rote memory, oral rote spelling enabled reproduction of a large part of one grade's spelling but these children had forgotten the words of the previous grade.

¹³Ibid., p. 80.

¹⁴Ibid., p. 85.

In extremely severe cases of what Orton had named strephosymbolia, the visual recall of the details of a word was so defective that unless the child had been taught the phonetic values of the letters he could not spell at all and his attempts produced most bizarre results.¹⁵

Orton also stated that some of the children who suffered the described handicap had considerable trouble in learning to print or write while others learned to do so with comparative ease.¹⁶

In 1941, Wile and Davis¹⁷ reported that 72 out of 100 problem cases at Mt. Sinai clinic revealed reversals, transpositions and confusions in writing letters and numbers, in oral and written spelling, in reading aloud, in solving problems and in performing computations.

One of the first authors to give a detailed account and some appraisal of a methodology for use with problem readers was Fernald¹⁸ in 1943. In her section on diagnosis she listed frequent occurrence of inversions, reversals and confusions of symbols. She gave as examples on for no,

¹⁵Ibid., p. 87.

¹⁶Ibid., p. 89.

¹⁷I.S. Wile and Rose Davis, "A Study of Failures on the Stanford Binet in Relation to Behaviour and School Problems" in Journal of Educational Psychology, Vol. 32, No. 4, issue of April, 1941, p. 275-284.

¹⁸Grace M. Fernald, Remedial Techniques in Basic School Subjects, New York, McGraw-Hill, 1943, p. 83-92.

was for saw, oh for no, now for how, ate for eat, who for how, so for as, bump for pump, bay for day, puppie for puddle and pird for bird.

In 1950, an article by Ilg and Ames¹⁹, which presented a gradient of reading behaviour from fifteen months to nine years, repeated the findings of Davidson, showing that reversals were normal when the child began his reading readiness programme at five and one half years, but that these reversals gradually disappeared until they were gone at about the age of nine years. The authors said that this included both letter reversals and reversals of order in words and phrases.

The following year, Kennedy²⁰ reported from her study similar results. She said that such errors were common at Kindergarten level but decreased rapidly during Grade I and disappeared by the end of Grade II. She suggested that this was a natural developmental sequence but she did not rule out exceptionally difficult cases which did not follow the normal pattern.

From this list of references to mentions in the literature of reversal patterns it can be seen that a specific reading difficulty has been the object of observation

¹⁹Frances L. Ilg and Louise Bates Ames, "Developmental Trends in Reading Behaviour" in Journal of Genetic Psychology, Vol. 76, No. 2, issue of June, 1950, p. 291-312.

²⁰Helen Kennedy, "Reversals, Reversals, Reversals!" in Journal of Experimental Education, Vol. 23, No. 2, issue of December, 1954, p. 161-170.

for more than twenty-five years. The descriptions that have been reported by various authors following their observations can be roughly classed into four groups.

In the first group are authors like Burt, Monroe and Fernald who describe inversions, reversals and confusions, omissions, additions and substitutions of letters as confused perceptions of letters and words. In the second group is Orton. Besides coining the term "strephosymbolia", he described the symptoms as reversals and inversions in memory of perceived letters and words. The members of the Orton Society²¹ have continued since his death to put forward this description.

Without stating definitely whether the reversals occur in perception or in memory, the members of the third group, of whom examples are Davidson, Ilg and Ames, and Kennedy, have described the difficulty as a step in the developmental sequence. They have attributed no special importance to these errors in the total picture of faulty word recognition and feel that they usually disappear quite naturally by the age of eight or nine years. Even Orton²²

²¹In 1949, after Orton's death, a group of his former colleagues formed the Orton Society with Mrs. Orton as the leader. The purpose of the group was to continue the influence of his contribution. At annual meetings the various syndromes of the language difficulties delineated in his writings are discussed and methods for dealing with the difficulties are reported.

²²Samuel Torrey Orton, Reading, Writing and Speech Problems in Children, New York, Norton, 1937, p.80.

admitted that the child begins to sort out reversals as he grows older.

A fourth group comprises most of the prominent authors on reading problems who admit that the reversal difficulty exists but do not consider it as a specific reading problem but rather as one of the many symptoms of the poor reader. Robinson²³, writing in 1946, stated that the various theories about reversals had never been proven and that confusions of this type were just one of the many aspects to be studied in the case of the problem reader.

It is not the purpose of this report to accept or deny any one of these descriptions. All or none of them could be accurate. All four could be descriptions of different degrees of the same difficulty. The description of the observable symptoms is but the beginning of the understanding of the nature of the specific reading disability being studied and therefore it is now necessary to proceed more deeply into the matter and to examine the various theories which have been put forward as to what is the cause of the difficulty.

²³Helen Mansfield Robinson, Why Pupils Fail in Reading, Chicago, University of Chicago Press, 1946, p.xii-249.

3. Theories on Causation

a) Maldevelopment or Destruction of Visual Memory Centres. - The earliest theories about the cause of the specific reading difficulty under discussion were presented in the time when the term "congenital word blindness" was still in common usage. One of the first to attempt an explanation was Hinshelwood²⁴. He said that the reading disability was caused by destruction or maldevelopment of the visual memory centres which he located in areas of the left cerebral hemisphere. The existence of separate centres for words, letters, figures and notes was assumed by Hinshelwood. For some time this theory was accepted by many and the reason given for the greater frequency of word blindness among boys was that boys had larger heads at birth and therefore were more likely to suffer brain damage during labour.

A similar theory of incapacity of visual centres was advanced by Ranschburg²⁵ in 1928. He said that while the structure of the brain remained intact, the visual centres for words suffered a lack of blood and therefore oxygen and were thus incapacitated.

²⁴J. Hinshelwood, Congenital Word-Blindness, London, Lewis, 1917, p. ix-112.

²⁵P. Ranschburg, Die Lese und Schreibstörungen des Kindesalters, Halle, C. Marhold, 1928, 314 p.

A few other theories which received only minor recognition included suggestions of weakening of the excitability of nervous tissue, psychological exhaustion of the nervous system, retarded development of connecting fibres between visual and auditory centres, and defect of the synapses linking neurons of closely associated nerve centres.²⁶

Of course the general criticism against the theories in this category of maldevelopment or destruction of visual memory centres was the criticism against the concept of preformed centres. Also there was little likelihood that exactly the same deficiency or destruction in exactly the same areas would take place in so many cases. As a substitute theory there grew up the opinion that the non-reader or the handicapped reader was a type of mental deficient or a victim of some kind of mental disease.

Another kind of theory which received some notice during the early period of study was that of Bronner²⁷. He suggested that reading ability varied as a unitary trait to fit the curve of probability. But it is very difficult to think of reading as a single skill which could be separated from all other abilities particularly other communication skills.

²⁶Joseph Jastak, "Interferences in Reading".

²⁷A.F. Bronner, The Psychology of Special Abilities and Disabilities, Boston, Little, Brown and Company, 1917, p. 75-117

b) Mixed Cerebral Dominance. - From the very beginning of the investigation it had been noticed that many children who appeared to suffer from the specific reading disability were either left-handed or ambidextrous. It was only to be expected that attempts would be made to link the difficulty with sidedness either of the organs of reading and writing or with the activities of the nervous system connected with them.

One of the first authors to do so was Samuel Orton and his theories of mixed cerebral dominance and similar theories of others who came after him are the subject of the next group of suggested explanations of the reversal difficulty.

Orton²⁸ published several articles in the late twenties in which he attributed reading difficulty to differences

²⁸S.T.Orton, "Specific Reading Disability - Strophosymbolia" in the Journal of the American Medical Association, Vol. 90, part 2, 1928, p. 1095-1099.

_____, "A Physiological Theory of Reading Disability and Stuttering in Children" in the New England Journal of Medicine, Vol. 199, 1928, p.1046-1052.

_____, "An Impediment to Learning to Read - A Neurological Explanation of Reading Disability" in School and Society, Vol. 28, 1928, p.286-290.

_____, "The Three Levels of Cortical Elaboration in Relation to Certain Psychiatric Symptoms" in the American Journal of Psychiatry, Vol. 8, No. 4, issue of January, 1928-29, p. 647-659.

_____, "The Neurological Basis of Elementary Education" in the Archives of Neurology and Psychiatry, Vol. 21, no. 3, issue of March, 1929, p. 641-647.

in the functional organisation of the visual memory centres of the two cerebral hemispheres. He said that there were three levels of cortical elaboration. The perceptive level, he said, controlled awareness of external stimuli; the recognitive level controlled the recognition of objects; the highest or associative level controlled the communicative skills of speech, reading and writing. While at the two lower levels the activity of both hemispheres was involved, he said, at the associative level, the oneness of impressions was achieved by hemispheric dominance rather than by the fusion of two images. He argued that the physiological habit of dominance was for the most part predetermined by heredity. The large majority of people, according to him, were dominant in the left cerebral hemisphere, opposite to the right dominant hand. The dominance of the right hemisphere as of the left hand was, according to him, a sex-linked trait.

Orton did not mean that only one hemisphere was used, but rather that both sides of the brain were activated. However, the engrams of one side were the mirror images of those on the other side. Under normal circumstances, only the engrams of the dominant side were operative in reading. He then went on to postulate that interferences in reading were caused by the failure to establish complete dominance so that there were interferences by the mirrored engrams of the supposedly non-dominant side.

Although he received a great deal of criticism, particularly for his vertical theory of neuro-faculty arrangement, for more than ten years Orton went on developing and modifying to but a small extent his theory. In 1937, he said, while attempting to compare his cases of strephosymbolia to cases of aphasia due to injury,

A second interesting fact and one which seems to be of major meaning to us in understanding language disorders of children is that one side of the brain is all important in the language process and the other side is either useless or unused. So striking is this that we know that a very small area of destruction in an appropriate area of the controlling or dominant hemisphere of the brain will give rise to extensive loss of speech or reading while an equal area of destruction in exactly the same part of the non-dominant or subjugate hemisphere will be followed by no language disorder whatsoever and indeed will give no recognizable symptoms. This concentration of the whole control of speech, reading and writing in one half of the brain bears an intimate relation to the development of unilateral manual skill in the individual.²⁹

Orton then went on to describe the aphasias which occurred when there was an injury to the dominant hemisphere in the various areas. Alexia or acquired word blindness he said was a "highly selective loss of the capacity to recognize at a glance constellations of printed or written letters which before the injury carried with them specific meaning."³⁰

²⁹ _____, Reading, writing and Speech Problems in Children, p. 27.

³⁰Ibid., p. 37.

Auditory aphasia or the loss of ability to understand the spoken word although it is still heard, motor agraphia or loss of the ability to copy writing, motor aphasia or loss of speech, and apraxia or inability to carry out skilled acts, were discussed. Following these discussions of losses due to injury he went on to show the similarity of these acquired difficulties to the congenital difficulties in learning which he had observed in some children.

A discussion of laterality was presented also. He argued that the infant at birth had no unilateral superiority but had an inherited tendency to one side or the other. Training and social pressures added to inherited tendency gradually formed unilateral habits. He believed that through the centuries the human race had developed motor intergrades in which there was a mixture of tendencies to both sides, but in the use of the eyes, the hand and the foot there was usually a greater preference, strength and dexterity in one side.

Orton³¹ argued that it was the result of lack of complete one-sided dominance or of confusion of dominance in the cerebral hemispheres that caused the reversals problems that he described. While he could offer no proof that dominance

³¹Ibid., p. 152-153.

of one side or lack of dominance was passed on in heredity, he suspected that it was the case. He felt that the symptoms that he described were so much like acquired asphasias that they could be called developmental asphasias.

His description of reading problems has already been given. On developmental word deafness, he said,

Naturally, since the syndromes of developmental word blindness and developmental word deafness are so closely comparable in every respect, we are led to look for reversals in the order of speech sounds in cases of the latter condition and a few such distortions have been observed as when a child used the word naf for fan, for example. Reversed order of parts of the sounds in a word as in emeny for enemy and promerad for promenade is somewhat more common as is the transposition of the two parts of paired or associated words as when "cuff buttons" is recalled for "button cuffs" (...). Usually the first few sounds are given correctly while those towards the end are distorted in order or slurred or omitted. (...) While these children show many errors of a wide variety of kinds it is clear that their difficulty is not in hearing and not in the speech mechanism but in the recalling of words previously heard, for the purpose of recognizing them when heard again or for use in speech, and that one of the outstanding obstacles to such recall is remembering all of the sounds in a word and these sounds in their proper order³².

Before he offered his neurological interpretation of the disorders with which he had been dealing he offered a word of caution that no general formula could be found which would be generally applicable to all the syndromes discussed, but in fact he did find one common factor in the whole group

³²Ibid., p. 146-148.

of the six language difficulties which he discussed³³. He identified this disability as the difficulty in repicturing or rebuilding in the order of presentation, sequences of letters, sounds or units of movement.

Of the reading and spelling difficulty syndrome he said,

The reading disability cases are sufficiently advanced intellectually when they encounter their trouble so that they can be very intensively studied and it is clear that this disorder is not one of sensory perception but of memory. By a variety of tests it is possible to show that these children see the word that they are attempting to read correctly, but that the record left by the previous exposure to the same word is not sufficiently clear to suffice for its recognition, as in reading, and still less for its reproduction, as in spelling.³⁴

Of writing disability he said that "the chief obstacle in cases of writing disability is the formation of the sequence of letters by which a word is constructed."³⁵ Similarly he gave explanations involving sequence and direction for the cases of auditory and speech difficulties, including stuttering, and for the cases of motor confusion.

He summed up his case for developmental alexia and at the same time for the five other so-called developmental asphasias with which he dealt, as follows:

³³Ibid., p. 143.

³⁴Ibid., p.145-146.

³⁵Ibid., p. 146.

Studies of laterality in the cases of developmental alexia have shown a very considerable number of crossed patterns between handedness and eyedness, as well as other forms of motor intergrading, but this is by no means without exception and we have encountered extreme cases of the reading disability in children who were completely left-sided. Manual dexterity is variable in the group but often is quite highly developed. This is also true of general athletic skill and we find no motor problems consistently associated with the reading disability. Since developmental alexia is primarily a difficulty in recognition, and hence falls in the category of sensory disorders, the problem of the child's handedness is of no importance from the standpoint of re-training unless there is co-existent writing disability, speech defect, or apraxia. The presence among the reading disability cases, however, of large numbers of children who show mixed or crossed motor patterns is considered suggestive evidence that as a group they belong among the intergrades, and this is borne out by the fact that the family history in by far the greater number of cases shows the presence of left-handedness in the stock and very often language disorders of one sort or another in other members of the family as well³⁶.

Samuel Orton presented perhaps the largest volume of theory on the causes of directional problems in reading. Unfortunately his works were never well accepted in the psychological or educational worlds and only partially approved in neurological society. There have been many criticisms. Important among these have been, first, the disagreement with his physical locating of a hierarchy of intellectual and sensational faculties, and, secondly, the lack of valid and

³⁶Ibid., p. 90-91.

reliable experimental data to substantiate his theories. A third criticism has been made of his tendency, whether intentional or not, to group together a very large proportion of reading, spelling, speech, auditory, writing and motor problems under one explanation. Other authors have felt that there was no such simple explanation for so much.

However he has left fairly accurate descriptions of six different educational handicaps. To review briefly, they are, first, developmental alexia which he called strephosymbolia, secondly, developmental agraphia or reversals and awkwardness in handwriting, thirdly, developmental motor aphasia or motor speech delay, fourthly, developmental word deafness or inaccuracies in understanding and repeating language, fifthly, developmental apraxia or abnormal clumsiness, and lastly stuttering in childhood.

Following Orton came other authors, some of whom advanced theories identical or similar to his, and others who completely opposed him. His theory was more or less accepted by Vernon³⁷ in 1931, and Eames³⁸ reporting on the

³⁷M.D. Vernon, An Experimental Study of Reading, Cambridge University Press, 1931, p. xv-190.

³⁸Thomas Harrison Eames, "The Ocular Condition of 350 Poor Readers" in the Journal of Educational Research, Vol. 32, No. 1, issue of September, 1938, p. 10-16.

ocular dominance of 350 poor readers in 1938 showed that at least one quarter were crossed, that is had dominant left eye and dominant right hand.

c) Crossed Dominance. - Monroe³⁹ in 1932 offered her explanation of the relationship between reading disability and hand and eye preference. While presenting a theory of mixed dominance, there was emphasis on the mixed direction of motor responses and crossed dominance rather than on lack of dominance in the central nervous system. She said,

A simple explanation of the relationship between reading disability and hand-and-eye preference is presented on the basis of the proposition that space perception is developed and co-ordinated through motor responses. We attribute to visual objects the spatial characteristics of near, far, up, down, right, left, etc., through adaptive bodily movements. Among the directional movements towards visual objects there are ocular movements as the eye adjusts to the various parts of the visual pattern, and manual movements as the hand manipulates the object. A child whose ocular and manual movements are inconsistent in preferred direction may have some difficulty in developing spatial organization which contributes consistently the meaning of "right" and "left" to the visual pattern. Children who are left eyed may also encounter difficulty in adjusting to the conventional eye-movements of reading. Similarly, children who are left-handed may encounter difficulty in adjusting to the conventional manual movements of writing. The effects of ocular and manual preferences on reading may vary for different individuals. In some cases there may be no

³⁹Marion Monroe, Children who Cannot Read, Chicago, University of Chicago Press, 1932, p. xvi-201.

observable effect as shown by cases of good readers who are left-eyed or right-handed and left-eyed. In other cases the effect may be observable in the slow rate of reading rather than in reversals, mirror reading or mirror-writing. There are, moreover, a number of other factors which may produce the same manifestations in reading. Reversals may be associated with confused auditory patterns or with the lack of precision in motor control. Children of superior intelligence may make superior scores in mirror-reading and mirror-writing because they can intelligently transpose sequence and quickly adapt to new organizations of responses. The relationship between hand-and-eye preferences may be obscured because of these many variables. Further controlled experimentation is needed to disclose the nature of the relationship.⁴⁰

It is interesting to note that Monroe also saw a linkage between reading disability of the reversals type and confused auditory patterns and poor motor control although she did not integrate all three into a theory of mixed dominance as the sole cause. In general her arguments were aimed at the observable level of performance and she avoided discussion of the cerebral implications.

A good description of the variety of problems encountered by the individual with reversal difficulties was given by her. She listed⁴¹ confused directional preference which impedes the discrimination of orientation of pattern, difficulty in the discrimination of complex patterns, difficulty in the discrimination of the temporal sequence of speech sounds with the directional sequence of printed words,

⁴⁰Ibid., p. 90-91.

⁴¹Ibid., p. 126-129.

difficulty in motor precision of eye movements and failure to observe that reading has a definite directional sequence.

In 1943, Fernald⁴² published a report of the results of training, by a kinesthetic method, cases of reading disability. She listed many problems of inversions and reversals, of mirror writing and mirror reading, but she seemed to dispute the importance of these symptoms as reading disability by pointing out how easily they were cured in her clinic. She mentioned the Ortonian theory but seriously questioned it as an explanation saying that Orton was using the name "strephosymbolia" as an explanation rather than as what it really was, a new name for an old condition⁴³. However, in its place she offered her own theory which was essentially similar to Orton's, certainly more similar than that of Monroe. She said,

It would seem that there must be some fundamental traits that explain the failure on the part of the intelligent individual to develop the brain condition, whatever it may be, that is necessary for learning in connection with quite limited subject matter.

The fact that we find normal or superior learning rate with complete success as the end results in 62 cases of total disability that we have studied seems to indicate some specific peculiarity of brain structure and function in the case of these individuals.

⁴²Grace M. Fernald, Remedial Techniques in Basic School Subjects.

⁴³Ibid., p. 157-178.

The fact that our experiments with first-grade children show that a certain percentage of them learn best by some kinesthetic method seems to us further evidence of some fundamental difference in brain function⁴⁴.

However, that this fundamental difference in brain function was caused by conflicting eye and hand dominance she discounted, arguing thus:

That non-corresponding eye and hand dominance is not a prime cause of reading disability seems to be indicated by the following facts:

1. Corresponding eye and hand dominance is found in many of our cases of extreme disability (...). The cases of matched eye and hand dominance resemble the cases in which the dominance is not matched, are as serious in their deficiency, learn by the same methods, and are as successful in the final outcome.
2. In the cases of unmatched eye and hand dominance, the dominance is not changed as a result of the remedial work. The subject with unmatched eye and hand dominance learns to read in an entirely normal manner with eye and hand dominance still opposite.
3. A very large number of individuals who have never had the slightest reading disability, many with distinctly superior skill, have unmatched eye and hand dominance.⁴⁵

This list of objections to theories of unmatched eye and hand dominance is not contrary to Orton who had reported exactly the same observations. He had suggested only that the percentage of individuals with mixed dominance was higher in the group of reading disabilities than in the normal group. Orton also said that motor intergrading did not

⁴⁴Ibid., p. 159-160.

⁴⁵Ibid., p. 160-161.

necessarily show up in hand or eye preference but the confusion could exist at the neurological level. Even the work of Monroe is not challenged. Although Monroe's theory hinged on the motor implications of mixed dominance rather than on the cerebral confusion, she had never claimed that training to read would change the dominance patterns of the children but rather that they would learn to read in spite of them.

Fernald⁴⁶ went on to suggest, as Orton did, that the symptoms were similar to those of alexia due to injury.

In the following year Schilder⁴⁷ presented the results of a study with a small group of seven children, six boys and one girl, at the Bellevue Hospital. He tested these cases of reading difficulties with letters, numbers, words, sentences and pictures in various orientations. He found that the printed letters of the alphabet were well recognized with the mistakes similar to the reversals and inversions described by Orton. There were more mistakes when the letters were in words than when they were single. The same letter mistakes were made in spontaneous writing and in dictation. There were fewer mistakes with numbers, and

⁴⁶Ibid., p. 163-164.

⁴⁷Paul Schilder, "Congenital Alexia and its Relation to Optic Perception" in the Journal of Genetic Psychology, Vol. 65, No. 1, issue of September, 1944, p. 67-88

four digit numbers were recognized correctly while four letter words were not. Picture recognition, optic perception of movements and their direction and differentiation between right and left were excellent.

Although it was difficult to generalize with so few cases, the author stated that while Orton may have been correct he was incomplete. Schilder said that there seemed to exist a primary difficulty in optic perception which he called imagination. He also saw a primary disturbance concerning sound structure in written words. The suggestion made by Schilder was one of disintegration between right and left impulses. He stated that there were sufficient hints in the so-called optic mistakes and in the inability to co-ordinate single sounds in the whole word, and to differentiate the whole word into the single sounds, to suggest a primary inability and insufficiency of centres.

In summing up his conclusions, he said,

The basic difficulty in congenital reading disability is the difficulty to differentiate the spoken word into its sounds and to put together the sounds of a word, (...) Two other independent difficulties may be present - mirror mistakes and trouble in the optic perception of letters. There are no troubles in other optic perceptions. We deal with an isolated trouble in the gnostic-intellectual function⁴⁸.

Opposing these few writers who have more or less defended Orton's theories are a great number of leaders in the field of reading difficulties who have seriously questioned

⁴⁸Ibid., p. 87.

his explanations. Durrell⁴⁹, writing in 1940, discounted the importance of the reversal tendency and mixed laterality as factors in retarded reading. Spache⁵⁰ also completely denied that laterality, handedness, eye-hand dominance, cerebral dominance, reversals, poor motor co-ordination, poor auditory or visual memory span were true causes of reading difficulty. He did not give any other specific explanations except physical impairment, lack of development and improper and inadequate training.

Gates⁵¹ who has been greatly concerned with primary reading difficulties said that Orton's theory was purely speculative and did not agree with neurological findings. Blair⁵² placed little importance on left-handedness or mixed eye-hand dominance.

Many studies have been done in which the characteristics of retarded readers have been compared with those of

⁴⁹Donald B. Durrell, Improvement in Basic Reading Abilities, Yonkers-on-Hudson, World Book, 1940, p. 283.

⁵⁰George D. Spache, "Factors which Produce Defective Reading" as reported by Helen M. Robinson in "Prevention and correction of reading Difficulties" in Education, Vol. 77, No. 9, issue of May, 1957, p. 541-545.

⁵¹Arthur I. Gates, The Improvement of Reading, New York, MacMillan, 1939, p. 140-172.

⁵²Glenn Myers Blair, Diagnostic and Remedial Teaching, New York, MacMillan, 1956, p. 61-65.

reading achievers. Such a study was that of Smith⁵³ in 1950. She found no significant relationship between poor reading and change of handedness, preference of eye, of foot, of hand, of ear, or of combinations of preference. Kendall⁵⁴ in 1948 found no significant relationship either. Witty⁵⁵, in 1936, examined the relationship of eye and hand preferences, mixed dominance and eye difficulties and found little if any relationship between reversal errors and mixed eye-hand dominance although he admitted that poor readers did make more reversals. All these writers, although they found the specific difficulty of reversals and inversions did exist, either preferred to offer no explanation, or to make these symptoms part of the syndrome of general reading inefficiency and to offer other more all-inclusive reasons. There was also a marked tendency to confuse mixed dominance or indecisiveness of laterality with crossed dominance or opposite eye and hand preference. This confusion exists all the way through the literature.

⁵³Linda C. Smith, "A Study of Laterality Characteristics of Retarded Readers and Reading Achievers" in the Journal of Experimental Education, Vol. 18, No. 4, issue of June, 1950, p. 321-329.

⁵⁴Barbara S. Kendall, "A Note on the Relation of Retardation in Reading to Performance on Memory for Designs Test" in the Journal of Educational Psychology, Vol. 39, No. 6, issue of October, 1948, p. 370-373.

⁵⁵Paul A. Witty and David Kopel, "Sinistral and Mixed Manual-Ocular Behaviors in Reading Disability" in the Journal of Educational Psychology, Vol. 27, No. 2, issue of February, 1936, p. 119-134.

For example, Bond⁵⁶ listed word recognition problems and directional errors in his classification of reading difficulties but did not admit Orton's theory. He said that "there is, of course an excessive incidence of reversals among certain reading disability cases, but these have been better explained in other ways."⁵⁷ Later in his book he gave his own explanation and treatment⁵⁸ for directional confusion and his feelings seemed to summarize the feelings of those who did not accept the neurological or muscular explanations. Bond argued that until the child came to school he had little or no practise using the left-to-right sequence and that if this practise was lacking or insufficient in reading-readiness training or in the early reading period, the child might suffer directional confusion not only in the left-to-right line sequence but in attack on words. He said that some children were slower than others in gaining this concept and skill.

Other suggestions advanced by Bond about the causes of reversal difficulties in word recognition were visual defects necessitating numerous fixations on the same part of

⁵⁶Guy L. Bond and Miles A. Tinker, Reading Difficulties, Their Diagnosis and Correction, New York, Appleton-Century-Crofts, 1937, p. 148-149.

⁵⁷Ibid., p. 99.

⁵⁸Ibid., p. 303-322.

the word, too great vocabulary burden, poor discrimination of sound sequences, misplaced instructional emphasis on word endings and over-use of phonetic analysis in the early stages of learning to read.

Most of the other authors who have attempted to give an explanation of confusion in word identification have suggested some or all of these reasons and have therefore included directional difficulty as only one of the many possible errors since the above list of causes would not necessarily make for only reversals and inversions.

Hildreth⁵⁹, in her report on handedness, admitted the possibility of a relationship between mixed dominance and reading difficulty but felt that reports were too conflicting for a definite position to be taken. She made the observations that higher relationships were found in clinical studies than in reports of group studies and remarked that this was due probably to the fact that only the most severe cases were referred to clinics while the group studies included children of all levels and types of reading difficulties. Because of Hildreth's opinion that handedness was more a result of training than of heredity,

⁵⁹Gertrude Hildreth, "The Development and Training of Hand Dominance" in the Journal of Genetic Psychology, Vol. 76, first half, issue of March, 1950, p. 39-100 and 101-104.

she implied that reading difficulties possibly due to mixed conditions could be prevented in the pre-school years⁶⁰.

It would appear from the lists of theories and studies presented here that opinions fall into two groups; those who agree with Orton's neurological theory of mixed dominance or at least accept it at the motor level, as crossed dominance, as Monroe did, and those who completely discount it. Those who reject it are inclined to consider only purely palendromic reversals in totalling the incidence of reversals, forgetting the much greater number of errors which occur in pairs of twisted letters inside words. They feel that reversal errors form but a small part of the total errors made in word recognition and that therefore this one relatively unimportant type of error does not merit a theory of causality and a methodology of its own. They endeavour to show that often there is little difference between the number of reversals made by mixed or crossed dominance cases and others. However, Orton said that the strephosymbolic syndrome often occurred in those who seemingly were one-sided in skills.

Other criticism levelled at Orton and his followers is that they fail to take into sufficient account that fact

⁶⁰Ibid., p. 103.

that little children beginning reading naturally tend to confuse and reverse symbols. But Orton and others have indicated, if not too clearly, that it is the continuance of these errors that indicates a special difficulty. Lastly, probably the most general criticism against the mixed dominance and crossed dominance theorists is their tendency to blame nearly all reading failure on this one cause. It is true, particularly in the works of Orton, that the impression is given that his theory is the one answer, but actually, as will be shown later in this chapter in the discussion of incidence, he estimated that strephosymbolia was the main cause in only two per cent of children. On the other hand those who discount the mixed dominance theories offer either no alternative or merely those factors either subjective or in the learning situation which are used to explain all difficulties in word recognition, and those rare extreme cases, in which marked reversal tendencies continue, are left unexplained.

It is not in the province of this report to either unreservedly accept or to deny any one theory and therefore, for the purposes of this investigation, the possibility of the mixed dominance theory being correct either at the neurological level or at least at the motor level, must be accepted. Weber⁶¹ suggested most of these arguments in 1944,

⁶¹C.O. Weber, "Strephosymbolia and Reading Disability" in the Journal of Abnormal and Social Psychology, Vol. 39, No. 3, issue of July, 1944, p. 356-361.

and in 1956 Preston⁶² entered a plea for a broader attack than has been generally made on this problem of mixed dominance. He said,

We believe, however, that easy disposition of the neurological factor is not permissible. Our review of 83 published reports of investigations dealing with alexia and kindred problems, reveals 58 which supply data on the relation between reading disability and neurological factors; data from 10 of these 58 reports are inconclusive. Data from 17 of the reports indicate the probable absence of any relationship between reading disability and neurological factors. The majority of the 58 reports, on the other hand, or a total of 31 show a positive relationship. To be sure, not all of this research is of equal quality, and in any case one cannot establish truth by counting research conclusions, pro and con. Nevertheless, it is difficult to ignore the significance of any factor, such as the neurological factor, when it has been reported as operating by a number of responsible workers from a variety of fields and representing more or less independent work in seven different countries⁶³.

d) Left Dominance. - At about the same time that Orton was developing his theory of mixed cerebral dominance, others, also observing the seeming relationship of reading disability with handedness and eyedness, began to develop a theory of left dominance as the cause of reversal tendencies. The works of this group are the subject matter of

⁶²Ralph C. Preston and J. Wesley Scheyer, "The Neurological Background of Nine Severely Retarded Readers" in the Journal of Educational Research, Vol. 49, No. 6, issue of February, 1956, p. 455-459.

⁶³Ibid., p. 456-457.

the fourth large category of theories of causation. Walter F. Dearborn⁶⁴ might be considered as the first and chief exponent of this theory of motor tendency caused by left-sidedness. A 1925 paper stated

In the cases studied by the writer, now about twenty-five in number, at least a third have been left-handed. This is, of course a somewhat larger proportion than would be expected in a group of otherwise normal or superior children such as these cases are. The way in which left-handedness may possibly operate as an initial handicap in reading, just as it has shown to be in writing, is suggested by the following observations. The outgoing movement of the left hand is from the centre of the body towards the left. The left-handed person, possibly because he watches what his preferred hand does and thus establishes the habit, may show a preference for this same direction in his eye movements. (...) In tachistoscopic experiments there is a tendency for the left-handed to catch the end letters of the word first, just as the right-handed commonly get the initial letters first⁶⁵.

In 1931, in a review of his experiments, Dearborn⁶⁶ said that he believed that left-handedness or the lack of ocular or hand dominance were associated with or might be the cause of reading disability because reading in English

⁶⁴Elizabeth E. Lord, Leonard Carmichael and Walter F. Dearborn, Special Disabilities in Learning to Read and Write, Cambridge, Graduate School of Education, Harvard University, 1925, p. 3.

⁶⁵Ibid., p. 3.

⁶⁶Walter F. Dearborn, "Ocular and Manual Dominance in Dyslexia" in the Psychological Bulletin, Vol. 28, No. 9, issue of November, 1931, p. 704.

required dextral sequence of eye movements and the conditions mentioned made for uncertainty about the correct ordering of word forms and resulted in the storing up in the mind of faulty word images. Because these distorted images did not agree with the phonetic sequence of words, prompt recognition was difficult.

This theory also gained followers. In 1934, Woody⁶⁷ reported on an experiment with pairs of right and left-handed pupils from Grades I, II and III. The right-handers were better in reproduction from memory but the number of reversals were not significantly different except for the reproduction of capitals. However, Woody felt that left handedness had some bearing on the problem and argued that the absence of significant difference might be due to the fact that mixed conditions had not been taken into account.

Experiments with poor readers seemed to indicate that superior readers excelled in the left visual field and that inferior readers were better in the right visual field. Some authors, such as Crosland⁶⁸, inferred that left-eye dominance

⁶⁷Clifford Woody, "The Effects of Handedness on Reversals in Reading" in the Journal of Educational Research, Vol. 27, No. 9, issue of May, 1934, p. 651-662.

⁶⁸H.R. Crosland, "Superior Elementary-School Readers Contrasted with Inferior Readers in Letter Position, 'Range of Attention' Scores" in the Journal of Educational Research Vol. 32, No. 6, issue of February, 1939, p. 410-427.

had something to do with inferior reading in the manner that Dearborn had suggested: that is, that the left dominant individual looked at sequence from right to left.

The largest study of hand dominance and the problems associated with it was made by Hildreth⁶⁹. She argued that eye dominance was an indicator of hand dominance and that the latter was trainable in the early years. Much so-called mixed dominance was then due to error in training. She said⁷⁰ that the hand was secondary and that the eye was primary in writing and drawing and reading and that the better the eye-hand co-ordination the more easily these skills were acquired. According to Hildreth⁷¹, left-handedness and eyedness were related to reading problems in several ways. Firstly, reading was a perceptual process involving spatial orientation and left-sidedness was confusing. Secondly, she believed left-sidedness to be a cause of stuttering and reading was linked with oral speech. Emotional problems concerned with forced change of hand at school age might influence reading. Hildreth⁷² concluded that left-handedness was not in itself

⁶⁹Gertrude Hildreth, "The Development and Training of Hand Dominance".

⁷⁰Ibid., p. 57.

⁷¹Ibid., p. 77.

⁷²Ibid., p. 450-456.

necessarily a cause but that it was a contributing factor in some cases of reading difficulty.

The opposition to Dearborn's theory on left-sidedness as a cause of reading difficulty came from almost the same sources as the opposition to Orton. Examples of this opposition are given here. Witty⁷³ found little if any relationship between hand dominance and reading errors although he admitted a possibility of more reversals. From his data, Gates⁷⁴ found nothing to indicate that problem readers had a consistent tendency to left-handedness, and stated that Dearborn's theory of normal muscular movement and direction was inadequate to explain more than a few cases.

Similarly, Fernald wrote,

Handedness does not seem in itself to be a sufficient cause of reading disability or even an important one. There is no apparent difference in the type of disability in the right- and left-handed cases. The right-handed cases are just as extreme in every way as the left-handed and ambidextrous cases. The two latter groups learned as rapidly and by the same methods as the right-handed group.⁷⁵

⁷³Paul A. Witty and David Kopel, "Factors Associated with the Etiology of Reading Disability" in the Journal of Educational Research, Vol. 29, No. 6, issue of February, 1936, p. 449-459.

⁷⁴Arthur I. Gates and Guy L. Bond, "Relationship of Handedness, Eye-Sighting and Acuity Dominance to Reading" in the Journal of Educational Psychology, Vol. 27, No. 6, issue of September, 1936, p. 450-456.

⁷⁵Grace M. Fernald, Remedial Techniques in Basic School Subjects, p. 162-163.

Robinson⁷⁶ mentioned Dearborn's theory and was inclined to discount it. Smith⁷⁷, reporting on her experiment in 1950, said that, using pupils from Grades II to V, she found no significant relationship between poor reading and preference of hand, of eye, of ear or of foot.

Research studies like those of Kirk⁷⁸ and Wolfe⁷⁹ found no special relationships between handedness and reading disability.

Again writers are divided into two opposing camps in considering the validity of Dearborn's theory. Followers of Dearborn tend to disagree about which is the more important in measuring left dominance, the eye or the hand. Dearborn stated that the eye followed the habits of the hand while Hildreth felt that the eye was primary and the hand secondary. They fail to take into sufficient account changed handedness. Thus many individuals counted as right-handed may have been converted left-handers. There is perhaps a tendency to over-generalize about the causal relationship between left-handedness

⁷⁶Helen Mansfield Robinson, Why Pupils Fail in Reading.

⁷⁷Linda G. Smith "A Study of Laterality Characteristics of Retarded Readers and Reading Achievers".

⁷⁸Samuel A. Kirk, "A Study of the Relation of Ocular and Manual Preference to Mirror Reading" in the Journal of Genetic Psychology, Vol. 44, No. 1, issue of March, 1934, p. 192-205.

⁷⁹Lillian S. Wolfe, "Differential Factors in Specific Reading Disability: Laterality of Function" in the Journal of Genetic Psychology, Vol. 58, No. 1, issue of March, 1941, p.45-46.

and poor word recognition, although Hildreth did underline the notion that left handedness did not always result in reading disability but was a predisposing factor in some cases.

Opponents of the theory have tended to neglect changed handedness too. It is possible that many pupils examined in the third decade of this century were performing as right-handers due to training but actually were converted left-handers.

In the efforts of the opponents to disprove the theory they have looked for left-handedness or eyedness among cases of all types of reading deficiency and have, of course, found little relationship. If studies were available in which only reversal difficulties were checked for left-sidedness, the results might be more significant.

As before, it is not the purpose of this report to disprove or prove theories. For this research, the possibility of left-handedness or eyedness being one of the causes of reversal tendencies in some cases is accepted.

e) Delayed Development in Spatial Orientation. - For the fifth group of theories, the way was pointed by Wechsler in 1937. He questioned the meaning of reversal in terms of orientation, mentioning not only the rotation but also the plane and angular distance involved.

In the studies up to the present most authors have assumed that the rotation occurs primarily around one of the axes, namely, the vertical axis. At least, this is the implication of their predominant preoccupation with mirror-writing and so-called sinistro-dextral inversions. Actually the rotation may take place in any one of the three spatial planes, giving rise to inversions about the horizontal and depth axes as well as about the vertical axis. In any case the analysis of different "reversal" errors show that in order to explain them intelligibly we must have recourse to a rotation not only about one or two but about all the three axes, and sometimes to a combination of two of them. Thus, to use some of the familiar examples again: $b = d$ when rotated about its vertical axis; $u = n$ when u is rotated about its horizontal axis; $N = Z$ when rotated about its depth axis.

But sometimes an identical reversal may be achieved through different axial rotations. Thus one may account for the common $b = q$ "error" either as a clockwise 180° rotation about the depth axis or by a double rotation, thus; first about its horizontal axis which gives $b = p$, then again about its vertical axis which gives the required q (...) ⁸⁰

Realizing that correct orientation in space was a part of perceptual development ordinarily reached during the pre-school years, authors began to suggest that reversal difficulties were due to persistence of infantile space orientation or lack of adequate perceptual maturity. One reporter, Mintz ⁸¹, who was working on the reading problems

⁸⁰David Wechsler and Myrtle I. Bignatelli, "Reversal Errors in Reading: Phenomena of Axial Orientation" in the Journal of Educational Psychology, Vol. 28, No. 3, issue of March, 1937, p. 217.

⁸¹Alexander Mintz, "Reversals and Lateral Preferences in a Group of Intellectually Subnormal Boys" in the Journal of Educational Psychology, Vol. 37, No. 8, issue of November, 1946, p. 487-501.

of the feeble-minded, tried to link their tendencies to reversals to mixed dominance but, finding no such relationship, suggested that the reversals were caused by infantile space orientation in those subjects whose mental functioning was considerably behind their chronological ages.

In 1953, Coleman⁸², who had been working with reading disability cases of all ages, but mostly under thirteen years, found them to be retarded almost a year in perceptual development as compared to their peers who had no reading problems. He suggested that perceptual retardation was cumulative and that it was a significant factor in reading disability. There was a possible value, he said, in training perceptual differentiation as a systematic treatment for reading difficulty.

Speaking to the Orton Society in 1951, Bender⁸³, while agreeing with Orton that mixed condition of laterality

⁸²James C. Coleman, "Perceptual Retardation in Reading Disability Cases" in the Journal of Educational Psychology, Vol. 44, No. 8, issue of December, 1953, p. 497-503.

⁸³Lauretta Bender, "Research Studies From Bellevue Hospital on Specific Reading Disabilities" (Resume) in the Bulletin of the Orton Society, Vol. 1, issue of June, 1951, p. 3-6.

might constitute a reading handicap, nevertheless indicated that she believed that the strephosymbolic syndrome was not so much a confusion caused by two opposing engrams as due to a developmental lag in perception in space.

This group of opinions on the cause of the reversal difficulty, hinges on perceptual immaturity and in this way is linked to the next group which discounts reversals as a primary reading problem stating that they are to be accepted as part of the genetic sequence, and, as in any ability which follows a developmental scale, extremes may occasionally be expected.

The first to suggest that reading with a gradual reduction of errors was a developmental phenomena was Lund⁸⁴. Two years later, in 1934, Davidson⁸⁵ published the first of a series of studies on reversals. She worked with Kindergarten and Grade I pupils and reported that more boys than girls made reversal errors and that all Kindergarten pupils had a significantly large percentage of reversals in letter forms and in words. She found a distinct decrease in reversal errors with increasing chronological age and mental age.

⁸⁴F.H. Lund, "The Dependency of Eye-Hand Coordinations Upon Eye Dominance" in the American Journal of Psychology, Vol. 44, No. 4, issue of October, 1932, p. 756-762.

⁸⁵Helen P. Davidson, "A Study of Reversals in Young Children in the Journal of Genetic Psychology, Vol. 45, No. 2, issue of December, 1934, p. 452-465.

This inclusion of mental age is somewhat confusing because higher mental age does not mean just greater ability, but also implies, if not more schooling, at least more reading practice.

Davidson mentioned the theories of both Orton and Dearborn and condemned them both as inadequate because she said that they dealt with only severe cases. Monroe was criticized too because her control group had somewhat higher intelligence than her experimental group.

The following year, Davidson⁸⁶ published another report describing the results of an experiment in which a letter perception test of the cancellation type had been given to pupils of Kindergarten and Grade I classes. The author reported that while a larger percentage of Kindergarten pupils had been confused by the letters b, d, p and q, there were still many Grade I pupils who exhibited the same confusion. She pointed out that the errors were both of reversal and inversion and again suggested a genetic theory of perception and perception of spatial position.

Wilson and Fleming⁸⁷ also studied primary pupils and reported in 1938 that there were no correlations between

⁸⁶ _____, "A Study of the Confusing Letters, B, D, P and Q".

⁸⁷ Frank T. Wilson and Cecile White Fleming, "Reversals in Reading and Writing Made by Pupils in the Kindergarten and Primary Grades" in the Journal of Genetic Psychology, Vol. 53, No. 1, issue of September, 1937, p. 3-31.

visual and auditory reversals and mental age, personality or psycho-physical factors. They said that the tendency to reversals remained high until Grade II and then dropped sharply. Several reasons were suggested for reversals: imperfect and confused learning, carelessness of observation, habit, and the great variety and complexity of symbols to be recognized. There was no suggestion of individual tendencies to more or less reversal, but rather that some pupils appeared to have acquired habits of reversal.

In publishing a reading gradient from fifteen months through to nine years, Ilg and Ames⁸⁸ demonstrated that in their groups reversals began at five and a half years and decreased gradually to eight or nine years. The various theories of reversals were mentioned and the authors seemed to disagree with Wilson and Fleming that the reversals were caused by learning habits.

While these studies on the reversal tendencies of normal children in the early stages of reading serve to caution those who would brand every reversal as abnormal, nevertheless by failing to continue the study to later grades, the various authors ignored the problem of persistent reversal patterns continuing beyond the primary grades and thus

⁸⁸Frances L. Ilg and Louise Bates Ames, "Developmental Trends in Reading Behaviour" in the Journal of Genetic Psychology, Vol. 76, No. 2, issue of June, 1950, p. 291-312.

offered no explanation for the type of reversal tendency which constitutes a reading difficulty.

f) Poor Visual Memory. - The last major group of theories to be offered is the one concerned with poor visual memory. The theorists in this group were not so much concerned with the type of error as with the general inaccuracy of recalled visual images as it showed itself in faulty word recognition. Cole⁸⁹ in 1938 mentioned the child with poor visual memory and cautioned that he could not learn to read by visual recognition techniques only.

Robinson⁹⁰ in 1946 suggested that part or total language disabilities were linked with poor memory span both visual and auditory. Reporting on his studies, Rizzo⁹¹ said that he had found a positive relationship between reading disability and poor auditory or visual memory span. Studying failure on the Stanford-Binet in relation to school problems; Wile⁹² suggested a relationship between poor reading including reversals and transpositions, and poor visual

⁸⁹Louella Cole, The Improvement of Reading, New York, Farrar and Rinehart, 1938, p. 267-269.

⁹⁰Helen Mansfield Robinson, Why Pupils Fail in Reading, p. 53.

⁹¹Nicholas D. Rizzo, "Studies in Visual and Auditory Memory Span with Special Reference to Reading Ability" in the Journal of Experimental Education, Vol. 8, No. 2, issue of December, 1939, p. 208-244.

⁹²Ira S. Wile and Rose Davis, "A Study of Failures on the Stanford-Binet in Relation to Behaviour and School Problems" in the Journal of Educational Psychology, Vol. 32, No. 4, issue of April, 1941, p. 275-284.

learning, memory and recall.

Stauffer⁹³ in investigating the relationship which exists between associative learning test findings and memory span test findings using retarded readers, suggested that the most important element causing difficulty seemed to be contiguity in time.

8) Summary. - The explanations given by those who do not adhere to any one theory about the causes of directional difficulty in reading and who look on reversals as just one aspect of faulty word recognition rather than as a specific difficulty requiring specific training, have already been fairly exhaustively listed in the paragraphs devoted to criticism of each theory. Since visual and auditory acuity are already ruled out in the definition, the remaining explanations either focus on the child's learning habits, his personality and his ability, or are critical of the learning situation, the teacher's ability, the methods used and the adequacy of training. These are the general reasons given for any reading difficulty.

If reversals and inversions are considered as symptomatic of a specific difficulty, then six main theories have

⁹³Russel G. Stauffer, "Certain Psychological Manifestations of Retarded Readers" in the Journal of Educational Research, Vol. 41, No. 6, issue of February, 1948, p. 436-452.

been put forward to explain why such a specific difficulty occurs. These, in review, are maldevelopment or incapacity of brain centres, mixed dominance, crossed dominance, left-handedness and eyedness, developmental lag in perception of orientation in space, and poor visual and auditory memory span. The first theory has been dropped in modern psychological thinking, but the other five theories still have advocates. May it be repeated again that it is not the purpose of this report to deny any one of the five but rather to admit that any or all of them may be correct. In other words, it is possible that the various degrees of severity of symptoms and the presence or absence of other accompanying symptoms in different cases, may indicate different manifestations of one syndrome described in one of the theories, or it may indicate that different individuals suffer similar difficulties for different reasons. The reporter is quite prepared to accept that out of the many existing cases of persistent reversals and inversions, some individuals may have as a predisposing factor, mixed dominance, others, crossed dominance, others, left sidedness, others delayed development of perception of orientation in space, others, the residue of habits formed during the genetic sequence of overcoming reversals, and still others, poor memory span. There could be, also, many combinations of these factors. Indeed there are signs

in the results of the present experiment that a variety of causes do exist although there is by no means adequate proof.

In many of the writings mentioned in this survey, authors have noted other symptoms peculiar to specific reversal disability. While they are not the chief concern of this report, it is proper nevertheless to mention them and for convenience the list compiled by Jastak⁹⁴ is used. Individuals suffering this disability tended to have a pronounced lack of meaningful intonation and accents, to be unaware of errors and sometimes unable to correct them even when they are pointed out. Such individuals were inclined to have short fixations and numerous regressions, to have difficulties in spelling and writing, to have poorer motor control, to be later in learning to talk and to have some inaccuracies in pronunciation, to be more successful in arithmetic than in language subjects although there was a tendency to reversals in numbers. They were sometimes timid and sometimes unusually aggressive. Often they appeared to be careless in attention and application. More boys than girls were found in this category. Some of the characteristics reported are the results of the difficulty rather than the primary symptoms of it.

⁹⁴Joseph Jastak, "Interferences in Reading", p. 244-272.

There have been various estimates of the number of children in school who might be expected to suffer sufficiently from reversal difficulty to be seriously handicapped in reading. One of the earliest estimates was supplied by Wallen⁹⁵ in 1921 who found in a survey of 2,116 school children, 4.5 per cent suffering from what he called congenital word blindness. He made the interesting comment that the number was greater than the total of epileptics, psychopaths, mongols and cretins. Orton⁹⁶ himself estimated that from two to four per cent of the general population had reading ability low enough to be a great obstacle in school progress. Presumably he meant that this percentage of school children suffered from what he called strephosymbolia. In 1932, Monroe⁹⁷ said that twelve per cent were retarded in reading but she did not mean that all of these were hindered by the specific reversal difficulty. Robinson⁹⁸ in 1953, said that eighty per cent did not read up to capacity and among these

⁹⁵J.E.W.Wallen, "Congenital word Blindness - Some Analysis of Cases" in the Training School Bulletin, Vol. 17, issue of 1920-21, p. 76-84 and 93-99.

⁹⁶S.T.Orton, "Specific Reading Disability - Strophosymbolia" in the Journal of the American Medical Association, Vol. 90, No. 2, issue of 1928, p. 1095-1099.

⁹⁷Marion Monroe, Children Who Cannot Read

⁹⁸Helen Mansfield Robinson, (ed.) Corrective Reading in Classroom and Clinic, Supplementary Educational Monograph No. 79, Chicago, University of Chicago Press, December, 1953, p. 20.

were many children with consistent reversal problems. There are no reliable statistics available to show how many of the present school population in Ontario, or in North America for that matter, are finding it almost impossible to learn to read despite adequate intelligence, or whose tendency to reversals and high ratio of word recognition inaccuracies are persisting beyond Grade III.

4. Attempts at Diagnosis and Remedial Training

Remedial training in reading, while intended to be highly individualized, has often become very general. Once the diagnosis of reading difficulty has been made, the child has been given more individual drill on that which he found difficult, which was learning to read, of course. Consequently the lessons have been more of what he could not do in the regular classroom, presented perhaps in a different way and to a smaller group. This is not always the remedial teacher's fault because she may be presented with a case in which the symptom is considered as the cause, and she has only a general guide applicable to all, to help her cure a symptom.

For example, Bond⁹⁹ in his directions for dealing with orientation difficulties said that the remedial teacher must not assume that the correction of tendencies constitutes the

⁹⁹Guy L. Bond and Miles A. Tinker, Reading Difficulties, Their Diagnosis and Correction, p. 311-322.

whole programme but that other difficulties are usually present, and must be overcome as soon as the directional one is under control. Suggested methods for getting this directional difficulty under control were using the finger as a pointer in a continuous left-to-right movement but only for as long as it was needed, or initial use of single line readings with a greater space between words, or any of the methods of Monroe, Kirk or Fernald. The point is that the use of these methods was foreseen as for a short time only and it was inferred that the symptom would disappear without reference to its cause so that the teacher might get on with other aspects of the pupil's retarded reading.

Authors who have been willing to look for, or at least to guess at the cause, have presented their suggested re-training methods aimed at the symptoms but based on the assumed cause. Monroe¹⁰⁰ in 1928 presented a report of data on about 380 cases which she had examined. Of these 120 were normal readers of Grades I to IV, 175 were retarded readers of Grades I to IX and 85 were marginal cases. The reading grades of all were between Kindergarten-Primary and V. The mean intelligence quotient of the normal group was 110 and of the retarded group, 93 but since the mean handicap on the Stanford Binet test is 4.75 for non-ability to read, she concluded

¹⁰⁰Marion Monroe, Methods for Diagnosis and Treatment of Cases of Reading Disability, Genetic Psychology Monographs, Vol. 4, No. 445, issue of October-November, 1928, p. 333-456.

that the difference was more apparent than real. This assumption may be somewhat difficult to justify. In the normal group the number of boys equalled the number of girls but in the retarded group there were 3.5 boys for each girl. She found that the retarded readers made a much greater number of reversals, repetitions and total errors but that the only other significant difference was that the retarded readers were significantly superior in mirror reading and mirror writing. Orton¹⁰¹, writing a forward for her report, said,

I also suggested that such children probably could be trained to read by a repetitive drill on the fundamentals of phonic association with letter forms, both visually presented and reproduced in writing, until the correct association between the visual and auditory engrams, reinforced by the kinesthetic, were built up¹⁰².

Monroe herself suggested as a remedial method, the use of sounding and tracing to learn the letters and kinesthetic work for words. She said that it was important to use the initial sound clue rather than the phonetic family in learning words.

In 1932, Monroe¹⁰³ again stressed the eye-ear-hand linkage. She added to her earlier suggestions the use of cursive writing because the movements of cursive writing

¹⁰¹Samuel T. Orton, forward to Marion Monroe, Methods for Diagnosis and Treatment of Cases of Reading Disability, p. 335-339.

¹⁰²Ibid., p. 338.

¹⁰³Marion Monroe, Children who Cannot Read, p. 111-136.

seemed to be more easily distinguished than print-script. Monroe suggested the use of a pointer to follow lines. The amount of progress seen in younger children following the method was reported as being somewhat over half a year for two months' work. Monroe suggested that this progress was linked with the child's intelligence, age, number of hours in training, duration of treatment, severity of disability, personal and behaviour problems and the closeness of the supervision and the effectiveness of the teacher.

Orton¹⁰⁴ spoke out sharply against the use of the sight-reading method which was becoming popular in the twenties, saying, "The sight method will not eradicate a reading disability of this type and may actually produce a number of new cases". In 1937¹⁰⁵, he repeated his warning and suggested that if no spoken language difficulty existed, phonics combined with kinesthetics would help eradicate confusions with twin letters and maintain a constant dextrad progression, at the same time fixing the association between the sound and the correctly oriented letter form and later on combinations of these letters in words. He admitted that it made

¹⁰⁴Samuel T. Orton, "The 'Sight-reading' Method of Teaching Reading as a Source of Reading Disability" in the Journal of Educational Psychology, Vol. 20, No. 2, issue of February, 1929, p. 135-143.

¹⁰⁵_____, Reading, Writing and Speech Problems in Children, New York, Norton, 1937, p. 156-200.

for slow reading at first and sometimes forever, but he said that often it was not choice between fast and slow reading but between slow reading or no reading at all.

One of the first and almost the only test to select in Grade I those pupils who might be expected to have difficulty in learning to read because of reversals was devised by Teergarten¹⁰⁶ in 1933. It included group tests of writing or printing from memory, matching script characters, matching printed characters, copying nonsense characters and an individual test of order of naming. Unfortunately there is not sufficient experimental data concerning the predictive accuracy of the test.

Berman¹⁰⁷ in 1939 experimented with the learning of nonsense syllables and geometric figures by 17 elementary pupils of average ability who had a retardation of at least two years in reading vocabulary. He used two methods: first, visual-auditory-motor, and secondly, visual-auditory. He found that the first method seemed superior for the learning

¹⁰⁶Lorene Teergarten, "Tests for the Tendency to Reversal in Reading" in the Journal of Educational Research Vol. 27, No. 2, issue of October, 1933, p. 81-97.

¹⁰⁷Arthur Berman, "The Influence of the Kinesthetic Factor in the Perception of Symbols in Partial Reading Disability" in the Journal of Educational Psychology, Vol. 30, No. 3, issue of March, 1939, p. 187-198.

of both the nonsense syllables and figures but the amount of difference was not significant. There was no difference of retention. The writer argued that the failure to secure more significant findings was due to the small numbers.

Calling attention to a frequent criticism of the kinesthetic method as a merely motor approach, Berman pointed out that it obviously was not just that but a linked visual, auditory and motor sensory avenue.

Robinson¹⁰⁸ suggested the kinesthetic method with phonetic help and Fernald¹⁰⁹ advocated the kinesthetic method utilizing the experience approach. The latter's method which she had demonstrated as quite successful with older severely handicapped cases, was tried out with a group of Grade I pupils not specially selected for difficulties and good results were reported. It is interesting to note that Fernald's method was tried in Ontario¹¹⁰ with severely handicapped readers of all elementary grades and the teachers using it claimed varying degrees of success.

¹⁰⁸Helen M. Robinson, "Treatment of Severe Cases of Reading Disability" in the Journal of Educational Research, Vol. 32, No. 7, issue of March, 1939, p. 531-535.

¹⁰⁹Grace M. Fernald, Remedial Techniques in Basic School Subjects, p. 35-55.

¹¹⁰G.E. Stethers, Report on a Kinesthetic Method in Remedial Reading, Spelling and Composition, Toronto, Department of Education for Ontario, 1944.

Another approach was taken by Barger¹¹¹ who, admitting mixed dominance as a probable cause, argued that such children had difficulty in adjusting to the accepted biaxial conventions in certain specialized cerebral areas. He set out to retrain these pupils using a double prism device with block-lettered words. The subjects saw words in upside down partially reversed image but spontaneously unscrambled and printed accurately. Use of this device for a few lessons or weeks helped children begin to read whereupon an automatic adjustment was made, according to Barger, and the device was no longer needed.

Barger advanced some interesting suggestions about the manner in which the specific disability occurs. He believed that the reading reversals occurred in the neural pathways before stimulus reached the brain. The reversal was the result of failing to make the customary axial correction. Why this should happen with symbols and not with objects, he explained by saying that the symbol area was last to make the physiological and developmental adjustment in axial function. He added,

¹¹¹William Calvin Barger, "An Experimental Approach to Aphasie and to Non-Reading Children" in the American Journal of Orthopsychiatry, Vol. 23, No. 1, issue of January, 1953, p. 158-170.

3. Because of the varying degree of intensity of the aphasic constellation it might account for more educational deviates than has heretofore been recognized. The condition can be confused with multiple other physical and emotional diagnoses.

4. Since boys outnumber girls approximately 8 to 1 in the speech and reading aphasia series, the genetic possibility of a sex-linked chromosomal determinant in the genes with the aphasic condition arises. (...)

6. The high incidence of mixed cerebral dominance among children showing either verbal or reading aphasia seems significant (...)

7. The presence of mixed laterality and verticality was observed ultimately to be less important than the fact that through the intermediation of the mirror the non-reader made an adjustment in his reversals and inversions, sometimes as soon as in two lessons¹¹².

Barger's reasoning while linked to Orton's was different in that the former identified the area of confusion as part of the perception of symbols while the latter saw it in the memory of what was correctly perceived. Unfortunately statistical data is not completely available on Barger's work and the future reading progress of his subjects.

In a paper in 1953, French¹¹³ rejected the importance of the visual and auditory involvement in the

¹¹²Ibid., p. 167-168.

¹¹³Edward L. French, "Kinesthetic Recognition in Retarded Readers" in Educational and Psychological Measurement, Vol. 13, No. 4, issue of the winter, 1953, p. 636-654.

kinesthetic approach. He felt that the kinesthetic factor in a motor sense might be the important factor since clinical observation indicated that severely retarded readers tended to exhibit motor disfunction. Many of the so-called visual perception tests in which the retarded readers had difficulty involved a motor aspect, and there was a high reported correlation between reading disabilities and poor spelling and handwriting. He used a tracing apparatus with two groups of children and found the poor readers to be significantly lacking in precision.

It is difficult to understand how kinesthetic activity can be measured without at least a visual linkage in the present act or in previous experience involving visual linkage but such was the conclusion reported by French.

Leavell¹¹⁴ reported in 1954 an experiment with reversal cases in which he had tried to train the hand to match the eye and found, he said, significant improvement.

Reporting on an experiment with thirty-four fulltime cases at Temple University Laboratory School in which 97.1 showed reversal errors and 93.6 showed evidence of confusion in what was called central dominance, Johnson¹¹⁵ used a

¹¹⁴U.W.Leavell, "The Problem of Symbol Reversals and Confusions, Their Frequency and Remediation" in the Peabody Journal of Education, Vol. 42, issue of November, 1954.

¹¹⁵Marjorie Seddon Johnson, "A Study of Diagnostic and Remedial Procedures in a Reading Clinic Laboratory School" in Journal of Educational Research, Vol. 48, No. 8, issue of April, 1955, p. 565-578.

tactile and kinesthetic approach and reported that she found reasonable improvement.

One of the followers of Orton's thinking is Anna Gillingham¹¹⁶. She has written a method for children with the specific strephosymbolic language difficulty. The method is a word-building one and is being used in a few American schools such as Francis W. Parker school in Chicago, Fieldstown Lower School and Sidwell Friend's school in Washington. Durbrow¹¹⁷ who handles the programme in the last-named school reported that the candidates were selected in Kindergarten and that their progress has been good. Hanbright¹¹⁸ who teaches at the Parker school also reported progress. Although no formal experimental data seems to be available, at least to this writer's knowledge, Deis¹¹⁹ writing in a popular

¹¹⁶Anna Gillingham, "The Prevention of Scholastic Failures due to Specific Language Disability" in the Bulletin of the Orton Society, Vol. 6, issue of April, 1956.

¹¹⁷Helene C. Durbrow, "Teaching the Strephosymbolic, I - At the Primary Level" in the Bulletin of the Orton Society, Vol. 6, issue of April, 1956, p. 17-19.

¹¹⁸Hope Hanbright, "The Prevention of Scholastic Failure due to Specific Language Disability, Part II" in the Bulletin of the Orton Society, Vol. 6, issue of April, 1956, p. 32-36.

¹¹⁹Darlene Deis, "The School Where Johnny Does Read" in Coronet, Vol. 40, No. 6, issue of October, 1956, p. 86-90.

magazine, described these special classes in action in 1956. The Gillingham method is very similar in many ways to the method on which the present study is based although the two were developed independently. The chief difference lies in the different stress on word building in the case of Gillingham and on word recognition in the present case.

The various methods of training the child handicapped by the specific reading disability have been presented as they are reported in the literature. Except for the novel attempts of Barger and Leavell, most of the other authors who have looked for a method with the cause of the difficulty in mind, have felt that either the kinesthetic or the phonic method or a combination of the two was necessary. There appears to be a disagreement about which of the two approaches is better or if the combination is needed. Some authors argue that the sensory approaches cannot be completely separated. It seems reasonable to suppose that the visual contact is implied in all suggested methods. Also there is a lack of experimental evidence on the improvement of pupils when many of the methods were tried. There is little written on differences in amount and speed of improvement. Neither is there information on whether the changes noted were permanent once the child had left the remedial situation.

This research intends to report on the use of a combination of the two methods, showing why the specific relationships were established. It purposes to show not only the mean amount of improvement but also differences in that improvement. It also intends to report where possible the permanence of the effect.

The terms have been defined, the problem specified, and the literature outlined. In the next chapter a description will be given of the experimental procedure of the present research.

CHAPTER II

THE DESCRIPTION OF THE EXPERIMENT

At the beginning of the First Chapter, the problem was stated of determining whether primary children who are handicapped in reading due to consistent directional confusion in word recognition, could be helped to learn to read adequately. For the purposes of the present research, the problem was broken down into two sub-hypotheses:

a) The measurable reading performance of primary children with the described difficulty will not improve significantly with Phonetic-Kinesthetic training.

b) If there is a significant improvement, the reading age indicating the measurable reading performance at the end of the training period will be significantly less than the expected reading age corresponding to the mental age.

In the survey of the literature presented in the rest of that chapter, various factors were put forward as variables which might be related to the initial difficulty, and as a consequence, to the amount of improvement possible. Also, there are some factors which are usually considered as being related to any progress in learning to read. Hence, it seemed advisable to investigate these possible variables as part of the study of the effect of the method to be used. These factors, therefore, were gathered into a third sub-hypothesis,

in the setting up of the experimental design. This third hypothesis was as follows:

c) Differences in measurable reading performance at the beginning and at the end of the training are not related to:

1. Grade level and amount of time spent in the regular classroom before entering the experimental group.
2. Intelligence Quotient.
3. Quotients in Perception and in Space.
4. Sex.
5. Presence or absence of speech or auditory confusion.
6. Diagnostic group.

By this addition to the hypotheses, it was hoped that the experimental design would be set up in such a way as to enlarge the range of information about differences in performance of subjects with the difficulty described in the first statement of the problem.

The description of the experiment designed to test the three sub-hypotheses contains two sections: the choice of teaching method and the detailed description of the programme, and the procedure used to check the sub-hypotheses. This latter section contains a statement of how progress was measured including a description of the tools used to measure initial and final reading performance, and an explanation of how the data resulting from the use of these tools was used to compare reading performances within the framework of the three hypotheses. There will be included a statement of statistical method. The selection and description of the population used in the experiment will be discussed in Chapter III.

1. The Methods and Materials of Training

In order to find out whether primary pupils exhibiting the early stages of confusion and retardation due to directional difficulties in reading could be helped by a method taking into account their specific problems, it was necessary to devise such a method for experimental purposes. The two main suggestions in the literature were taken into account with the following arguments.

If the primary pupil has difficulty in word recognition due to a consistently high ratio of part or complete reversals and inversions, then regardless of what theory of causation is accepted, the "sight" or "whole" method of teaching reading is not sufficient because the presentation of whole words or phrases does not in itself involve direction but only sight units. These sight units are taught as blocks of symbols rather than as series of symbols. However, both the phonetic and the kinesthetic methods include direction of the series of symbols as part of the learning, because in order to sound a word or to trace a word one must begin at the beginning and move toward the end. Therefore for those children suffering from confusion in direction due to such suggested causes as mixed cerebral dominance, crossed dominance or left-handedness, direction might be established by either one or both of these methods.

If, on the other hand, confusion is attributed to poor visual memory, then phonetics give the child a tool for independent word attack. Thirdly, if the visual perception of form and orientation in space is poor as some authors suggest, the kinesthetic method should re-inforce this perception. Therefore a method combining both of these approaches was devised and the further reasons for the combination method as well as a description of the evolvement of the method, the method itself and the materials used in connection with it, will be presented.

Keeping in mind that the experiment was to be carried out with primary children of Grades I to III, ages six to nine years, of at least average intelligence, the kinesthetic method and the phonetic method were each tried out, separately, for approximately four months periods with a preliminary group of small numbers. There were not enough children nor were the trials long enough to justify much generalization, but the single use of each of the methods seemed to have certain drawbacks. The Kinesthetic Method of Fernald¹ based on story-writing from the child's experience and initiated by the child, appeared to be insufficient at this early age level

¹Grace M. Fernald, Remedial Techniques in Basic School Subjects, New York, McGraw-Hill, 1943, p. xv-330.

because there was a lack of systematic accumulation of reading vocabulary which would be usable in reading from prescribed school readers and which would enable the child to return to the regular grades, and because there was almost complete dependency on the instructor for the learning of each new word to use in the stories written.

When a purely phonetic method was tried, it was found to be incomplete because letters and words learned were not always sufficiently retained, and because some children had difficulty blending letters into words by sight and sound alone. Coupled with the previously stated arguments, this experience in the preliminary trials seemed to point to a combination method for at least the first experimental situation.

It also appeared likely from the literature and from experience with a few of the potential candidates for the experimental class that there would be some with seemingly delayed motor development who might not be able to take full advantage of kinesthetics with the desirable fluent rhythmic motion. Others, with confused auditory perception or speech patterns might not be able to use phonics to the fullest extent. Because it was intended to train with the same method the full group of pupils with directional handicaps without regard to attendant difficulties and without necessarily separating the various causes of the symptom in this first experiment, it seemed desirable in the method to provide avenues to learning for all who might be included.

Consequently, a combined method teaching single letters followed by blends, combinations and words and used as soon as possible in the reading of phrases, sentences and paragraphs, was taught by tracing and writing with accompanying sounding. For those non-phonetic words and words with advanced phonetic rules which were needed to read within a reasonable length of time such simple storybook and reader material as was available for school use, these words were taught by Kinesthetic work alone until phonetic training was able to re-inforce the learning and recognition. This combination method which seemed to be the most efficient for the purposes of this experiment in helping the children described, is referred to in the remainder of this report as the Phonetic-Kinesthetic Method. The method and the materials used in teaching by it are described in the pages immediately following.

It should be clear from the beginning that the sequences of letters, blends and combinations, and the exact types of oral and seatwork lessons to be described are not the only possible sequence and combination. Rather, when the materials were being prepared, it seemed that the sequence used gave some of the earliest contacts with words, and the types of lessons suggested made convenient arrangement for seatwork with learning value. Consideration was given also to variation

in order to maintain interest although several examples of one type of activity were provided consecutively so that the child gained sufficient practise to enable him to learn to do each type of activity fairly well. It is readily admitted that other sequences of letters and other arrangements of activities would in all probability be just as efficient and interesting, provided that the basic learning procedures of phonics and kinesthetics were consistently and sufficiently provided.

A further point should be brought out. Just as in a regular grade when a new pupil enters the class he as an individual already has certain learning and skills, so when the individual pupil entered the experimental group, especially when he entered from Grade II or Grade III, his previous learning was thoroughly checked making it possible in some cases to omit certain sections or to review certain letters using only part of the material provided, and then to take him on to new learning. Similarly, children learned at different rates requiring more or less drill in each area, and capable of acquiring, remembering and using new material at different rates. In other words, each child individually was taken from where he was, at the rate he could go, to the point he could reach within the training period. The materials to be described and the methods using it, then make up the basic course which was varied within the boundaries of

phonetic and kinesthetic training to meet the individual's needs.

The elements of the Phonetic-Kinesthetic method used in the experiment, were as follows. Cursive handwriting was used instead of print script which is recommended for use in the schools of the province of Ontario. This was done so that a joined, rhythmic "feel" of the word might be obtained as much as possible. This necessitated the learning of four letter forms: the printed upper and lower case forms for use in reading printed material, and the written upper and lower case forms for use in tracing and writing. The printed forms were presented along with the written forms and a picture for each letter and attention was drawn to the similarity with the written forms which the child was using for tracing and writing as he learned the letter. Visual drill in new and review material was given in both forms until all the letters had been learned. After that reading material was presented always in printed form, except on the blackboard and on a few worksheets requiring tracing or filling in blanks, where it was written. All written drill and kinesthetic practise was continued of course in cursive writing. The handwriting used by the child had to be as large and clear as was comfortable for the child. For the first months two space high writing was used by all children and for Grade I

children this size was continued throughout the year. Handwriting was strongly slanted toward the right which meant a steep reverse slant of the paper for all those using left hand.

For the non-reader, regardless of grade, and for the beginning reader who had been diagnosed as belonging to the group, the letters were taught singly both by name and by sound. As soon as the child knew sufficient letters to blend syllables and words this activity was added. Later, special combinations were learned as kinesthetic units, and more complex phonetic rules were studied. Each learning was reinforced by much tracing and writing from dictation the letter or combinations of letters being studied. The letters were divided into groups of five with daily intense review of the letters in each unit until each unit was completed, and with frequent return to review of previous units at intervals depending on the child's retention of what had been studied.

As soon as the child knew well most of the sounds of the letters and was able to blend them sufficiently well, he was given simple sentences to read. This was followed by the use of graded readers commonly used in the schools. Readers based on phonetic learning might have been preferable but a suitable series was not available so the instructor used two series in regular use, the names of which will be

mentioned in the paragraphs devoted to listing materials. The vocabulary of these readers contained many words which were non-phonetic or which were phonetic by rules which the child had not yet learned. These words were taught by kinesthetic drill as needed. By this it is meant that the word was traced and pronounced until the child was able to write while pronouncing it, without looking at the copy. Words taught thus, were easily forgotten and had to be reviewed frequently. All phonetic words within the child's skill were analysed and sounded out by the child as he met them in the story.

The child was not allowed to prepare stories ahead of time until he was reading at a late Grade II level because of the danger of memorization of short stories in early readers and of guessing from the generous amounts of illustration. After one careful reading of a story, the child went on to another one or to a variation of the first one to avoid a tendency to memorize. Many words from the stories, both new and old, were given as dictation in follow-up lessons, or were required to be written in answers to questions. All words which presented difficulty to the child, whether phonetic or not, were written and pronounced many times. When lists of new or difficult words were presented on the blackboard before the formal reading of the story,

this list was considered as an exercise in phonetic analysis.

In the usual classroom situation, the teacher tries to make sure that the pupil has mastered the new words to be encountered in the story to be read before he comes to the actual reading of the story. This desirable state of preparation could not be expected in the experimental group because it was recognized that the pupils in the group often were not capable of retaining an accurate visual image of words presented and would find it necessary to re-analyze phonetically often or even every time these words were encountered, for periods of greater or lesser time depending on the individual. Therefore, the best that could be hoped for was that this type of preparation would give at least some familiarity with the new words and might make it possible for the pupil to recognize some of them either at sight or after a quick partial phonetic analysis.

At about the same time that the child reached the stage that he could read with some success from simple readers and story books, he began to write simple answers, directions, labels and stories using new and already acquired reading vocabulary. If he needed a word which he did not know and could not write using the phonetic rules already learned, the word was written for him in crayon in large letters and he traced it until he could write it independently. The exact size of tracing models and the paper used will be

described in the section devoted to materials.

The amount of time devoted to all types of reading lessons was as follows. At the beginning when the child was studying letters, blends and simple word families, one forty-five minute period and one half hour period in the morning and one half hour period in the afternoon were set aside for this type of lesson. About half of the time was devoted to individual teaching or to teaching in groups of two or three if there were children in the group who were very close in level reached, and the rest was given over to carefully supervised practise seatwork. When the child was able to read from simple readers and story books, the morning half hour period was used for oral reading and, in advanced stages of improvement, for directed silent reading. The afternoon half hour period was used for story-writing, writing answers to information-type questions on the material read and other composition-type activities.

In addition to this, children who had reached Grade II level and higher were required to learn formal spelling and the word lists from the prescribed spellers as well as words from the reading lessons were taught using phonetic analysis and tracing. Because the class was carried on in a public school, all subjects in the curriculum had to be taught although permission was given to allot more than the regulation

amount of time to language activities. However, for children at Grade II and III level, as much use as possible was made of reading material in simple arithmetic problems, as well as in social studies, natural science and health training and even in songs and rhymes, to give further practise in reading skills and to increase vocabulary. The basic methods stated for reading instruction in itself were always used for these materials too.

Since the early emphasis had to be on letter recognition and word recognition in the experimental method, it was feared that the child would be so involved with the mechanics that he would lose sight of meaning and interest. Therefore great care was taken to check on the child's understanding of word meaning and of information and ideas presented by the story material. The instructor always checked by questions answered orally to make sure that the child had understood the material read. If necessary the instructor retold parts of the story. As the child's skill increased so that he was able to read with more ease and fluency, the instructor was able to let the child re-read in order to grasp ideas which had escaped him in the first reading.

In fact, the child was learning reading, spelling and writing simultaneously. Some notions have been presented regarding checking of reading. Handwriting was checked daily

for accuracy of form and for legibility so that the writing would not deteriorate through lack of care to a point where its kinesthetic value would be lessened. Large, easy, rhythmic writing was aimed at but it was recognized that some children, especially those who appeared to be handicapped by mixed or crossed laterality, might not be able to meet excessively high standards of form and rhythmic ease.

Spelling was very carefully checked. On no account was a child allowed to fix up part of a misspelled word. He was required always to rewrite completely such a word so that the kinesthetic value of the complete correct word form would not be missed. It was recognized that a child, even though he had used tracing and writing to learn his words, might not necessarily be expected to remember how to spell all the words he encountered, although he might remember how to recognize them in a reading passage. Therefore every word which the child encountered was not reviewed at regular intervals as spelling material, but only those words required at the grade level in spelling and comparable words from reading material. Of course words which were simply phonetic were drilled regularly.

The two basic methodological approaches have been stated: the phonetic approach and the kinesthetic approach. The visual avenue is always present but the point has been made that it was not relied upon alone in the experimental

method. An attempt has been made to show how these two approaches were used in teaching reading to a selected group of pupils of primary ages and grades who had been diagnosed as having or likely to have a specific difficulty in learning to read. The materials used in the teaching are stated in the following paragraphs.

For initial tracing with the index finger of letters and phonetic combinations such as blends, pieces of sandpaper of the finest commercial grade available in hardware stores, were used. The letters were written approximately three and one half inches high with black wax crayons. For permanent display at an easily reached height in the classroom so that the child might refer to them at any time, cards were prepared on rough drawing paper containing a picture of an object starting with the letter, a three and a half inch tracing model of the written letter in upper and lower case forms and a two inch upper and lower case form of the printed letter. The only exception was the letter "x" for which the picture of a box was used and the pupils were taught that the sound appeared at the end of the word. The pupil was free to trace with his finger the written form for use in his written work at any time he needed, and to examine and if necessary trace the printed form for use in his reading from the printed text.

For tracing and writing of his own, lined workbooks were provided. Grade I pupils used thick soft "primary" pencils and older pupils used soft pencils of the regular size.

Supplementary tracing materials for pupils who had some difficulty in getting the feel of symbols, included fine sand in trays, and large pans containing about an inch of water. Infrequent use was made of these last two media. Some children found it helpful to walk around the letter shape drawn on the floor. All such movements were accompanied by sounding.

The bulk of the material for tracing and phonetic analysis was prepared by the instructor by hand on work sheets reproduced on a spirits-type duplicating machine. These sheets were eight and a half by twelve inches and were saved by the pupils to make into booklets, one booklet for each unit of study. Covers were made of coloured paper by the pupils for the booklets as each was completed.

There were one hundred and forty-two work sheets in all divided into two series. The first series of seventy pages was intended for the Grade I level and therefore all tracing models presented in these pages were two spaces high. In the second series of seventy-one sheets, the tracing models were one space high. In both series the tracing models were in cursive writing. Other material intended for reading was

presented approximately half in writing and half in print-script in the first series and approximately eighty per cent in printing and the rest in writing in the second series. This was done in order to give pupils continuing practise in recognition of both forms of the letters. In the first series, there were simple illustrations on about sixty per cent of the sheets to provide child interest, but there was practically no illustration in the second series. Forty-two different types of seatwork activities all based on some form of tracing, writing or sounding were provided in all. For the most part, the same types of activities were repeated several times in each unit in order to give the child familiarity with what was required so that his concern could be turned toward the material to be learned rather than the activity used in learning it.

At the end of all units except the first one, there were short checking exercises calling for sight recognition but these were always made up of material which had already been approached by the avenues of ear and hand. A game using the learning of each unit was presented at the end of the unit and the game was used when necessary for repeated review while the child proceeded with the next section.

Samples of worksheets are presented in the appendices of this report. It is impossible to give examples of all types of activities and the samples are intended only to clarify this description.

The first series presented all the letters of the alphabet with their common sounds, that is the short sounds of the vowels, and the two sounds of the "g" and the "c", and of course the one sound of each of the other consonants. The names of the letters were taught also, so that a child could be told that in a given word a certain vowel said its name rather than its sound. The speech blends, "sh", "ch", "th" and "wh" were included. A great many words of Grade I vocabulary level which could be worked out by the child were presented and these were combined into sentences and paragraphs as was feasible. Early in the series, the colour words and the number words were presented. A few words not easily analysed from this amount of instruction were presented in the sheets to be learned by tracing in order to make it possible for the child to read simple seat-work directions.

As has already been pointed out, the order of presentation represents only what appeared to be convenient for early combination into words and there is no reason to suspect that many other orders of presentation would not have been just as usable.

In detail, the presentation of the first series was as follows, making flexible allowance for individual differences. The vowels, "a", "e", "i", "o" and "u" made up the first unit. The child was presented with each letter in its four shapes along with an illustration of an object starting with the

letter. He was given tracing experience with the written forms on fine sandpaper and in his workbook. He practised making the written forms. He listened for the sound in words spoken by the teacher. He suggested words of his own beginning with the sound. He picked out the letter in its four different forms in words written or printed and pronounced by the teacher. He made letter cards of his own with suitable illustrative material. The tracing forms of the letter were placed where he could easily reach them when he wished to use the letter. There was an illustration with the tracing form so that he would always associate the proper sound with the form his hand traced or wrote. He learned the name of the letter. Most children were able to learn a vowel a day with five or six days review at the end before new letters were added. Review material included picking out the vowel that started words illustrated on his work sheet, writing the vowel that started the name of an illustrated object, and finding required letters in written and printed material. Game material consisted of matching the four forms of each vowel in sets.

The second unit contained the consonants "f", "m", "h", "n" and "l". The child repeated all of the activities listed for the first unit as well as blending each consonant with all the vowels and sounding out three letter words which could be made from the letters known. Review material contained activities listed in unit one. The words "I see" were

learned kinesthetically and the child read and wrote the short sentences thus made possible. He read the sentences silently too and showed that he understood them by illustrating suitably each one. Game material consisted of word cards to be read by players using the sounds known.

The third unit consisted of the colour words "red", "orange", "yellow", "green", "blue", "purple", "brown" and "black". These were learned by repeated tracing and writing in the appropriate colour using wax crayons followed by writing with soft pencils. The printed words were presented on charts showing the appropriate colours. The four words "make", "draw", "colour" and "it" were learned kinesthetically, thus making possible several exercises requiring the child to draw and colour various objects. Game material consisted of matching colour words and coloured squares.

Unit IV contained the letters "r", "s", "b", "t" and "d". All the lessons of the first unit were repeated with each letter. A beginning was made on word families which the child not only read but wrote from dictation, tracing when necessary to learn a word. The child received practise in reading little stories and in following written directions which he could read from his phonetic knowledge. The word "the" was introduced kinesthetically. Since the letters "b" and "d" are two very commonly confused by individuals suffering from directional difficulties, special attention was paid to these letters.

The word "bed" was used to show how the "stick" is on the left side of the "ball" in "b" and on the right side in "d". Cut outs of the two confusing letters were made and the "b" was given a permanent place to the left of the blackboard while the "d" was placed to the right. Review material contained several lists of similar words in which the child had to select the one word spoken by the instructor. Considerable practise in reading, tracing and writing from dictation these lists of words was provided. Seat-work included drawing objects to match words. Game material provided practise with word families.

The fifth unit presented "j", "k", "c", "p" and "v". The same presentation as that given to the letters in Unit I was used, along with matching initial consonants to word endings to make words, and filling in blanks in sentences with words selected from several similar choices. The child was also asked to write words to match pictures. Two special sections on the letter "c" were given. The child learned when to use "ck" at the end of words and syllables, and when "c" was given the "s" sound. Much reading and writing drill was used for each concept. The words "yes" and "no" were presented kinesthetically. The child was asked to read several questions and to answer them by a written "yes" or "no". The child was asked as a further review activity to write as many words as possible for several given word families. Another

activity involved drawing and colouring according to directions read by the child. Game material consisted of matching pictures to words read by the child.

Because the child had now presumably mastered twenty of the letters in the alphabet and was considered ready to broaden his reading experience to other reading material in readers and story books, a simple test to check learning was provided at the end of Unit V. The child was asked to fill in missing vowels in words, and to read lists of two syllable words which included several times each of the letters studied. Reasonable proficiency demonstrated by the child was a signal for the teacher to begin other reading material and to ask the child to begin to write short stories. The reading material used will be listed at the end of this section.

Unit VI consisted of the number words from one to ten. It was assumed that the child had learned already the figures from one to ten and had had some practice in the use of numbers. The number words and corresponding figures were placed side by side on sandpaper cards along with pictures prepared by the children, and took their place beside the display of colour words. The children worked out simple problems in which the words were substituted for the numbers. The word "times" was presented kinesthetically so that the child might follow printed directions to perform given activities a certain number of times.

The seventh unit contained the letters "w", "g", "qu", "x" and "y". It should be noticed that the letters "q" and "u" were taught as a unit. The learning procedures of Unit I were followed, to which were added practice in adding the given initial consonant to a variety of endings to make words, and practice in finding small words inside larger words. The words "who", "what", "when" and "where" were presented kinesi-
thetically and this made it possible to require the child to read short phonetic stories presented at the end of each section on a given letter and giving as much practise as possible in that letter, and then to answer in writing various questions about the content of the story. There were also exercises on filling in blanks in sentences by choosing words from a given list. Special sections were devoted to differentiating the written "q" and "g" and the printed "b" and "q". Because the letters "p" and "q" are two other letters most frequently mentioned as being confusing, the cut-outs of these letters were placed below the "b" and "d" respectively. Review material included writing words to match given pictures, answering "yes" and "no" questions, drill with sight lists, and written dictation. The game for this unit was an adaptation of "I Spy" using the initial sound as a clue.

The last unit in the first series contained the letter "z" and the speech blends, "sh", "ch", "wh" and "th", taught as units. The presentation was as in Unit I accompanied by

practice in learning to spell by sounding and tracing two and three syllable words emphasizing the given letters. Regular systematic review of all the letters of the alphabet was provided. Special attention was paid in this review to distinguishing similar words, and those words presenting possibilities for reversal errors. A beginning was made in the study of root words and endings, with practice being given in adding the following endings: "s", "ed", "ing", "es", "ies", "d", "ed", "er", "est", "ier" and "iest". Review materials included all types of exercises so far presented and applied particularly to the matter of this unit.

It should be remembered that during Units VI to VIII regular daily use was being made of readers. Also the child was required to write at least one story from his own interest and experience after the presentation of each new letter or speech blend. The methods used in story writing and reading of non-phonetic material have already been presented. The time required to complete each of the units differed from one individual to another ranging anywhere from eight days to four weeks.

For those children who were of Grade I age, these seven units of the first series completed the prepared worksheet material presented during the school year. The only other phonetic rule which was taught as a practical advantage in reading was the use of the long vowel with the silent "e"

or with two vowels together. Older children who came to the group completed as much of this material as was individually necessary and then proceeded to Series II in which the vocabulary was more difficult and the phonetic rules more complex.

Series II had six units. All tracing models were given one space high and a similar size of writing was used in work-books. Use was made where necessary of the larger sandpaper and art paper tracing models displayed in the classroom and which had been used in Series I.

The first Unit presented a review of single letter sounds and names and the four speech blends. These were presented in the two printed and the two written shapes. The review material consisted of reading check lists of words, sentences and word families and the writing from dictation of all of these. There were some exercises in writing words to match pictures, in filling in blanks from a list of choices, in writing rhyming words, in adding endings, in differentiating the two sounds of the letters "c" and "g" and in drawing from directions read by the pupil.

Unit II gave a specific review of the speech blends "sh", "ch", "th" and "wh" with the added combination "tch". Each blend was reviewed by tracing, writing and reading drills and by exercises requiring the pupil to fill in one of these

combinations in order to make words to complete meaningful sentences. The common consonant blends "sl", "sp", "sw", "sc" and "sk", and of "sm", "st", "tr", "fr" and "cr", and of "pr", "dr", "gr", "br", "pl" and "gl", and of "bl", "cl" "tw" and "sn", and the speech blend "ph" in the groups listed were given specific practise. Review material at the end of the unit included filling in the speech blends or consonant blends required to make words, filling in blanks, and dictation. The game consisted of fitting phrases into sentences.

The third unit in the second series gave specific practise in the long vowels. The long "a" with the silent "e", with an "i" and with a "y", the long "e" with a silent "e", with an "a" or an "e" or an "i" or another "e" or a "y", the long "y" at the end of short words or syllables, the long "i" with a silent "e", the long "o" with a silent "e", with an "a" or an "e" as well as the special sounds of "oi", "oo", "ou", "ow" and "oy", and the long "u" with a final "e", and with an "e" as well as the special sound of "ew" were presented. Each combination was taught with kinesthetic drill, phonetic drill, dictation and sentences in which the missing word contained one of the combinations studied. Some of the types of exercises already mentioned were used for seat work. Review material at the end of the unit added the sounds of "aw" and "au". Seatwork exercises included riddles to be

answered by a word containing the required combinations, correction of errors, marking of long and short vowels and the filling in of blanks. The game consisted of unscrambling sentences.

Unit IV consisted of special word families "ing", "ill", "each", "all", "ir", "or", "ur" and of silent letter combinations, "kn", "wr", "gn" and of special combinations "ight", "tion", "augh", "ough", "ould", long "o" as in "old" and "ost". Lessons in this section consisted mostly of words lists and seatwork exercises requiring the filling of blanks with words containing the combinations of letters being studied. The game at the end of the unit required scanning newspapers for the combinations stated.

Having covered the major phonetic rules in English, the next Unit focussed attention on word endings, prefixes and suffixes. The endings "en", "ly", "er", "est", "ful", the prefixes "re", "de", "dis", "ex", "pro", "con", "com", "pre", "in", "im", "en" and the suffixes "tion", "ment", "ness", "ance", "ant", "ful", "ious", "able", "ful" and "ive" were given, taught through kinesthetics, and sounds where possible. Meaning was taught and practise was given in reading, in writing and in completion of words and sentences as well as in dividing words into root words, prefixes and suffixes. The game consisted of making as many words as possible from a given root word.

Unit VI gave practise in compound words, division into syllables and use of contractions. The first section on compound words gave practise in finding the components of such words, in putting together compound words, with seat-work in answering riddles by compounds and in putting together word halves. The second section stressed the rules for dividing into syllables and the third drilled contractions each with appropriate exercises in word lists, filling in blanks and riddle type answers. There were appropriate reading lists for checking and drill purposes.

It is again stressed that all units in the second series were accompanied by increased oral and silent reading exercises and story writing and spelling drills of the written variety. The last two units were quite difficult in vocabulary and were reserved for pupils having mental ages of at least eight and one half years although simple practise in such skills often occurred in the reading material of the younger pupils.

The specially prepared materials have been described and although there was considerable practise material in the one hundred and forty-two pages thus prepared, it was often necessary to supplement the work sheets by other material. Many phonic materials are commercially available and out of

the abundance, the two graded series Eye and Ear Fun² and Phonics We Use³ along with the Dolch games⁴ and Help for Slow Readers⁵ were found to be easily adaptable to the requirements of the experimental class. There are, in all likelihood, many other series which would have been just as useful, but these answered the requirements and were readily available as supplementary materials.

It has been mentioned that oral and silent reading from text books was carried out regularly after the fifth unit in the first series. No adequate series of phonic readers was available and although little phonic stories were prepared from the pupil's experience for blackboard reading, text book material was selected from either the Curriculum Foundation Series⁶ or the Ginn Basic Readers⁷, both readily available in the school. There is no evidence to show that

²Clarence R. Stone, Eye and Ear Fun, New York, Webster, 1933, revised 1943, a graded series.

³Mary Meighn, Marjorie Pratt and Mabel Halvorsen, Phonics We Use, Chicago, Lyons and Carnahan, 1946, a graded series.

⁴E. W. Dolch, Phonic Game Series: Vowel Lotto, Consonant Lotto, The Syllable Game, Champaign, Garrard, 1948 and 1949.

⁵Margaret McEathron and others, Helps for Slow Readers, Buffalo, Kenworthy Educational Service, 1946.

⁶William S. Gray and May Hill Arbuthnot, Basic Readers, Curriculum Foundation Series, a revision of the Elson-Gray Basic Readers, (Canadian Edition), Toronto, W.J. Gage.

⁷David H. Russell and others, The Ginn Basic Readers, (a Canadian Series), Toronto, Ginn.

other graded primary series would not have done just as well. The only remedial readers were the Merrill Diagnostic Reading Workbooks⁸ and these were used in a supplementary manner and not by every pupil.

Considerable use was made too of story books brought from home and of those selected from the library. It was felt that any reading material at the level of the child in subject matter and vocabulary, and containing not more than two or three words on each page which were beyond the phonetic skill of the child, provided suitable material.

It should not be forgotten that, in addition to reading, it was required, because the class was held in a public school, that the pupils carry on as much as was possible for each individual, the prescribed course in language⁹.

In order to measure the reading performance of the experimental population both before and after the eight months period of training by the methods and materials just described, it was necessary to administer certain objective tests. These tools of measurement and the type of data obtainable through their use, will be described and explained in relation to the three sub-hypotheses of the problem being studied.

⁸Eleanor M. Johnson, Diagnostic Reading Workbooks, Charles E. Merrill Books, Columbus, Education Centre, 1937.

⁹Minister of Education, Province of Ontario, Programme of Studies for Grades I to VI of the Public and Separate Schools. Toronto, 1956.

2. - The Tools of Measurement

The description of the tools of measurement involves mainly the description of the Gates Primary Reading Tests¹⁰ and the Gates Advanced Primary Reading Tests¹¹. These two batteries of tests, the former designed for Grade I and the first half of Grade II, and the latter intended for the second half of Grade II and for Grade III, were used for two purposes. The first purpose was to establish the initial measurable ability of the subjects in the experimental group in reading before the Phonetic-Kinesthetic Method was used. In this way the results of the initial measurement formed part of the criteria of selection.

However, the other and all-important purpose in relation to the hypotheses was to provide a measure for comparison of reading skill at the beginning and at the end of training in order to determine whether significant changes had taken place. The performance on Form I administered during the first week in October which coincided fairly closely with the beginning of the experimental instruction, and on Form 2 administered during the first week of June, which coincided with the end of formal instruction using the experimental

¹⁰Arthur I. Gates, Gates Primary Reading Test, New York, Bureau of Publications, Teachers College, Columbia University, 1943.

¹¹_____, Gates Advanced Primary Reading Test, New York, Bureau of Publications, Teachers College, Columbia University, 1943.

method, were to provide the two sets of data to be compared. It was thought desirable to measure word recognition skills, and speed and comprehension in reading paragraph material. Therefore, while the Primary tests provide also a sub-test in sentence reading, only the tests dealing with word recognition and paragraph reading were used at this level, and the full battery which contains only these two types of tests was used at the Advanced Primary level. The use of these two types in the two batteries provided the data for comparison and analysis.

It might have been desirable to use reading tests which measured the child's ability to read in the phonetic manner, the method which formed one of the main considerations of the experimental method. However, no tests specifically designed for measuring reading skills based on this learning, and suitably standardized for use in this experiment, were known to the investigator. From a diagnostic and clinical point of view, it might have been equally desirable to have used tests which would have accurately measured the presence or absence of an unusual proportion of reversal type errors, but again no such tests appeared to be available. Therefore, it was necessary to select tests which measured reading skills in general at a suitable level, those reading skills not specifically based on any one method of reading instruction. It might be mentioned that from the date of

the tests' publication, it seemed most likely that the standardization procedure had been carried out during the time when the sight method of instruction was in common use. Because of this likelihood, the tests might not necessarily provide phonetic words and might therefore handicap especially those children who had not progressed very far in phonetic learnings. Success in this type of test, it was argued, would surely show a degree of competence in word recognition skills.

There are many tests of reading skills at the primary level available. No argument is offered that the tests selected were any more reliable or valid than those offered by other authors. It was known by the investigator that such tests existed that have been standardized in the Province of Ontario, and that it might be argued that that particular series might be more suitable for children resident in that province. Actually, the said Dominion Tests¹² were administered in a parallel manner to the preliminary group. It appeared that these tests were not quite so sensitive in measuring small differences in reading skills at the upper end of the primary level, and this, along with the fact that these tests had not been designed especially for the district of Ottawa, and that no tests which were specially designed for children

¹²Department of Educational Research, Dominion Tests, Toronto, Ontario College of Education, University of Toronto, 1953 revision.

taught to read under the Phonetic-Kinesthetic Method were available, seemed to cancel out any regional advantage which Ontario standardized tests might have had. It was not considered feasible to use both series as a check on each other, during the actual experiment, because of the danger of error in results due to conditioning, a factor not accounted for in the standardization of either series.

It was admitted that one disadvantage existed in the Gates Tests. In the New York area, where the tests were standardized originally, reading readiness instruction occupies the first two months of the Grade I year, and therefore formal reading instruction commences only on the first of November approximately. In many areas of the United States where the tests were later used for further standardization, a similar practice occurs. In this province, reading readiness is usually considered as part of Kindergarten-Primary training. On the Gates Tests, a reading grade of 1-2 means the performance of a child at the end of his second month in Grade I with no reading skill or a score of 0. The Dominion Tests are based on the assumption that reading instruction starts at the beginning of Grade I and a child with no reading skill is credited with a reading grade of 1-0.

If the Gates Tests in word recognition and in paragraph reading were to be used for the purposes stated, then

two points containing certain assumptions had to be considered. Firstly, if the Gates sub-test in Word Recognition measured the ability to recognize words and the sub-test in Paragraph Reading measured speed and comprehension in reading meaningful material, then performance on these tests should indicate approximate reading level. Secondly, if the reading age measured by the performance on these tests increased significantly, then gains might be considered to have occurred in reading performance, and if the reading age was not significantly different from the mental age at the end of the training period, the reading performance could be considered as adequate.

The assumptions underlying the first argument are now considered. In regard to the Gates Tests, Type I, Word Recognition¹³, the manual states that the test is designed to sample the ability to read words representative of the primary vocabulary¹⁴. This statement appears for both the Primary and Advanced Primary Tests. Little information is given about the statistical reliability and validity of the test for this purpose. The Gates Tests, Type 3, Paragraph Reading in the advanced primary series are, it is said¹⁵, designed to

¹³Arthur I. Gates, Manual of Directions, Gates Primary Tests, 45 p.

¹⁴Ibid., p. 5.

¹⁵_____, Manual of Directions, Gates Advanced Primary Reading Tests, p. 5.

¹⁶Ibid., p. 30-31.

measure ability to read thought units with full and exact understanding of the whole. Again little in the way of statistical evidence is available. The only coefficients appearing in the manual¹⁶ quote reliabilities computed by the separate halves method for two classes given the test near the beginning of the third grade. The Spearman-Brown reliability coefficients for word Recognition are .89 and .90, and for Paragraph Reading are .86 and .88.

The only information as to whether the tests measure validly what they are supposed to measure is that the primary word test was based on the first 1,000 words in the Gates Primary lists, and the advanced primary word test on the Thorndike list, and that the paragraph tests are similarly based. Since these two lists have been rather generally the basis of primary reading materials for some time, the tests are considered by the author as measuring what the primary pupil is supposed to have learned in his reading programme.

The norms, both in reading grades and reading ages have been based, in the Primary Tests on 250,000 records obtained from schools in all parts of the United States, and those in the Advanced Primary from 5,500 records.

¹⁶Ibid., p. 30+31.

These facts along with the continued and seemingly satisfactory use of the Gates tests in original and, more recently, revised forms, in many school systems and for comparison purposes for the designing of other more recent tests, seemed adequate evidence for the purposes of this study, so that the tests named were considered as providing a suitable measure of reading skills.

Considering now the assumptions contained in the second argument, since the tests being used were designed to provide increasing difficulty from beginning to end, and since the norms were computed on this basis, increase in score must be interpreted to mean advancement to a higher level of whatever skill is being measured. As far as the assumption that expected reading age should compare fairly closely to the mental age if the reading performance is adequate, the Gates tests were constructed with that hypothesis as a basis. Gates states that "the mental age of a pupil or class may therefore be taken as a standard with which to compare reading ability¹⁷".

In summary, then, it may be stated that the main measuring instrument in the present study was considered as being not ideally designed nor completely justifiable for the purposes of the experiment, but as suitable as was

¹⁷Ibid., p. 7.

available and in most respects, adequate. Therefore, for the purposes of the later argument to be presented, it will be assumed that the instrument did measure with the degree of accuracy required, the word recognition skills and the proficiency in understanding and speed of paragraph reading of the primary children in the experimental group. A more detailed account of the subtests will now follow.

The Gates Primary Reading Tests, Type I. word recognition provide in each of two forms, forty-eight exercises, each of which is comprised of a picture and four words. The task is to encircle the word which tells the most about the picture.

The first exercises are composed of easy and most commonly used words, those of high rank on the primary list, grouped with words selected to be but slightly similar or confusing (...) Gradually the words become less easy and common and are presented with words more similar on details and general configuration. (...) The identical elements are carefully determined and arranged so as to increase the difficulty of the problems gradually from the beginning to the end of the test. The arrangement is based on the assumption that as the child's vocabulary and reading experience widen the more frequently will he encounter "confusing words" (...) ¹⁸

This stated use of confusing words might be considered as suitable testing material for reversals and inversions, but while children with such tendencies might make more errors

¹⁸ _____, Manual of Directions, Gates Primary Reading Tests, p. 5.

in such words, it was fully understood that the so-called confusing words were not selected on the basis that the similar elements were partial or complete reversals and therefore the material in the test was not considered as specially sensitive to this one type of error.

The Gates Primary Reading Tests, Type 3. Paragraph Reading presented twenty-six exercises in each of the two forms. The first few were one sentence units but most consisted of multiple sentence paragraphs in which the vocabulary, sentence structure and length increased gradually in complexity and difficulty.

This test measures ability to read thought units with full and exact understanding of the whole (...)
The pupil must grasp clearly and exactly the total thought if he is to execute the directions successfully¹⁹.

These directions required certain markings on the pictures provided.

The Gates Advanced Primary Reading Tests, Type 1, Word Recognition is similar to the Primary test of the same type except that the words used are considerably more difficult. The Type 3, Paragraph Reading is similar also to the Primary test of the same kind except that it tests the pupil's ability to do independent reading in a more rigorous manner.

¹⁹Ibid., p. 6-7.

The main instruments of measurement have been described and the reasons for their use as well as their limitations have been stated. The interpretation attached to various performances on these measures will be considered in the last chapter.

The statistical methods used in describing and comparing the sets of data will now be considered. For all descriptive data, ranges of scores, means, standard deviations and standard errors of the means were computed. For data involving comparisons, the procedure varied somewhat according to the particular comparison being made.

At the beginning of the experimental training mean performances in both Word Recognition and Paragraph Reading, for Grades II and III considered both separately and together were compared to mental age on the Stanford-Binet Scale²⁰, using the t-test. Because two samples of behaviour by the same subjects are correlated, the formula

$$t = \frac{D}{\sigma_D} = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1} - 2r_{12}\sigma_{M_1}\sigma_{M_2}}}$$

was used. Grade I performance was not thus compared for reasons which will be stated in Chapter III. In these computations as in others to be described, when a grade group was considered separately,

²⁰Lewis M. Terman and Maud A. Merrill, Revised Stanford-Binet Scale, Form M, New York, Houghton Mifflin, 1937.

all subjects who received the experimental training in that grade were considered. When grades were combined subjects were considered only once, even though some subjects spent two grades in the group. In this case only the first grade level of attendance was considered.

For most computations it was considered advisable to convert reading ages into reading quotients, using the formula $\frac{R.A.}{M.A.} \times 100$. This was done because the higher the mental age and the greater the Intelligence Quotient and the larger the amount of initial retardation, the more improvement had to be made in order for the child to reach the expected reading age equal to mental age. Therefore it was necessary to reduce the reading level to percentages in order to compare. While the disadvantages of having no absolute zero, and of the inequality of units are present in this use of percentages, it has been used customarily in statistics dealing with Intelligence Quotients and seemed to be the only feasible method of comparison.

Thus at the end of the training period mean reading quotients for the total group were compared in two ways in order to check the sub-hypotheses 1 and 2. First the mean reading quotients at the beginning of the training period and at the end were compared using the formula

$$t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1} - 2r_{12}\sigma_{M_1}\sigma_{M_2}}}$$

Secondly the mean final quotients were compared with the expected perfect quotient of one hundred in which reading age would equal mental age. In this type of comparison in which the one hundred was considered as an absolute number which did not fluctuate and therefore had no standard deviation nor standard error of the mean, the formula used was

$$t = \frac{D}{\sigma_{M_1}} .$$

Comparisons also were made between final reading quotients and expected quotients, each grade taken separately and using the above formula. Performances in word Recognition and in Paragraph Reading were compared with each other in the total group and in the grade groups, using the formula

$$t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1} - 2r_{12} \sigma_{M_1} \sigma_{M_2}}} .$$

An attempt was made to find if a correlation existed between mental age and amount of reading improvement. The significance of the coefficient was tested using $t = r \sqrt{\frac{N-2}{1-r^2}}$.

The third sub-hypothesis considered the possibility of a relationship between measurable reading performance of subjects with the specific difficulty and one or more of the several possible contributing factors.

In order to investigate the significance of apparent differences at the end of the training period between grades inter-grade group comparisons were computed, this time using the formula $t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1}}}$, without the correction for correlation. It was possible also to sub-divide the total group according to amount of time spent in the regular classroom before entry into the experimental class, and to compare differences in mean reading quotients at the end of the training period using the same t-formula. Both these statistics were computed only for measurable final performance because of the difficulty in tabulating exact Grade I initial quotients. This will be discussed more fully later.

The second variable with possible influence which was listed was Intelligence quotient and the third was quotients in Perception and in Space. Coefficients of correlation were computed for each of these three variables with reading quotients in Word Recognition at the beginning and at the end of the training period. The resultant coefficients of correlation were tested for significance using the formula $t = r \sqrt{\frac{N-2}{1-r^2}}$. It did not appear necessary to repeat the computations for Paragraph Reading for reasons to be given in Chapter IV.

The Intelligence Quotient was based on the results of the Stanford-Binet Scale, as previously stated, and the quotients in Perception and in Space were taken from the Primary Mental Abilities test²¹. The Terman and Merrill scale scarcely needs description but since only two factors in development of intellectual capacity were selected from the Thurstone test, several paragraphs will be devoted here to an examination of those two sub-tests and to an explanation of why they were used.

The Primary Mental Abilities tests are constructed on the assumption that intelligence is not a unitary trait, but is composed of several different abilities which can be singled out for description and measurement. Two of the factors singled out in the tests designed for both age groups five to seven, and seven to eleven, categories into which all the children in the experimental group fell, were Perception in the sense of perceptual speed, and Space.

Perception as measured in the test is described as "the ability to recognize likenesses and differences between objects or symbols, quickly and accurately"²². It seems to be reasonable to argue that such discriminative ability is

²¹Thelma Gwinn Thurstone and L.L.Thurstone, SRA Primary Mental Abilities for Ages 5 to 7, and for Ages 7 to 11, Chicago, Science Research Associates, 1953.

²²Thelma Gwinn Thurstone and L.L.Thurstone, Examiner Manual for the SRA Primary Mental Abilities, Chicago, Science Research Associates, 1953, p. 3.

essential to word recognition and therefore the degree of competence in this aspect of intelligence might be related to reading performance and to the amount of improvement which a given subject in the experiment might make. Although the experimental training did not place sole or even chief reliance on visual perception of letters and symbols, the methods of word recognition taught were to be used by the pupil as an aid to the visual perception which cannot be separated from reading. In the tests presently described, Perception skills were measured by performance on tests asking the subject to find identical pictures and identical forms from among more or less similar pictures and forms.

Space is described as "the ability to visualize and to think about objects in two or three dimensions"²³. While it might at first appear that this ability would be related solely to handicrafts and drawing activities of the primary school child, examination of the test material showing items requiring the subject to find the necessary parts to complete squares, would appear also to have some relation to reading skill because the selection must often be made on the basis of small differences in shape and in the spatial orientation of the pieces or part of the pieces.

²³Ibid., p. 3.

Attempts were made to compare statistically the initial and final reading quotients for sub-groups of the total group divided according to sex, according to presence or absence of attendant speech or auditory confusion, and according to the diagnosed type or degree of difficulty. These sets of comparisons were made in an effort to discover whether any one of these variables, listed as 4, 5 and 6 in the third sub-hypothesis, was related to initial retardation or amount of improvement.

In each of these comparisons of sub-groups of the total group, statistical significance of apparent differences was tested using the formula $t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1}}}$. These comparisons were made only for Word Recognition in the total group.

Because the Grade I was significantly higher than one hundred per cent in Word Recognition, that grade was influencing strongly the statistical comparison when the total group was used. But most of the Grade I subjects were classed in the same two diagnostic groups and this diagnosis may have been inaccurate due to the lower chronological age and mental age at the time of diagnosis. Also the Word Recognition test at the Grade I level may not measure the same amount of confusion as the more advanced test, due to the lesser degree of deliberately similar and confusing configuration used in

the words selected for the lower test. Furthermore, the Grade I's were started from almost the very beginning with the special method and material while the subjects admitted from Grades II and III were already presumably handicapped by another method of training, by habitual error and by an already greater degree of retardation. Therefore a third grouping was formed for comparison. This group was made up of Grade II and Grade III subjects, counting in Grade II those who had already spent Grade I in the experimental group, but not including in Grade III those who had already spent Grade II in the experimental group. This group was called the combined II-III group.

This last group was then divided into diagnostic groups and statistical comparisons were made in the same manner as for the total group, and for both Word Recognition and Paragraph Reading. It did not appear to be of value to make comparisons of sex and of attendant speech or auditory confusion in this last group because, of the Grade I's who had been removed from this grouping, only one was a girl, and because the incidence of attendant speech and auditory confusion was very low in Grade I.

Before leaving this section of the report, mention should be made of some informal methods used to try to gain more insight into the nature of the improvement observed. Because the greatest reading error of the subjects in the

experimental group was of the reversal and inversion type, it appeared important to find out whether the ratio of reversals remained high, after the training had been completed and after a certain degree of success in word recognition and paragraph reading had been achieved. To the knowledge of the investigator no test exists which is specifically designed to measure the abnormal occurrence or ratio of reversals and inversions in letters, in words, and inside syllables of words or in order of syllables. Therefore, it was necessary to use the observations of teachers who heard the subjects read. Since no standardized material existed for which norms or reversal errors were known, all that could be used as a basis of comparison for observation was the experience of the teachers with many grades of children of approximately the same age and grade. The opinions of three listeners, the experimental class instructor, the teacher of the parallel regular grade, and a third teacher not immediately concerned with the pupils being observed, were summarized and will be mentioned in the description of the results.

Another item of information important in assessing the results of the experimental training, was knowledge about the progress of the child after he has left the special training and has rejoined the regular grade. It appeared desirable to know whether growth in reading skills continued parallel

to advancement in mental age, as he made his way to the other grades. Did the child continue to use the methods of word attack and the aids to word memory which had been used in the experimental training? If he did not, was he able to advance using the methods relying on sight training and good visual memory which were part of the regular training? Very few pupils in the experimental group had, during the time of the experiment, experience of a year or more after return to the ordinary grades, on which some observation could be based. For those who did spend at least a year after leaving the special group, the observations of several teachers with whom they came in contact were collected and summarized. It was not sufficient data upon which to base any more than the most cautious generalizations, but what seemed to be the pattern will be presented. Reading surveys used regularly by the school furnished a few objective items of information.

It was thought desirable to have information regarding the effect of the use of cursive writing rather than print-script writing. The school principal suggested the use of cursive writing by the regular Grade I classes for two consecutive years. The reading levels at the ends of the years were tested and compared to the results previously obtained at the time print-script was used. The results of this comparison will be presented.

It was clearly intended that the results of these three sets of observations should not be considered as scientific data but only as additional material to aid in the explanation and interpretation of the experimental results.

CHAPTER III

THE SELECTION AND DESCRIPTION OF THE EXPERIMENTAL GROUP

While it might have been desirable from a scientific point of view to provide two groups of children with the specific reading difficulty, and to teach one group by a method approximating that method generally in use in the regular classes, nevertheless, when children need special help and a possible aid is found, it must be given to all without regard to the experimental needs of the research worker. Therefore, it was decided to have just one group, an experimental group, and to compare improvement with the norms reached by a sample of the regular primary population.

The method of diagnosis and the selection of the pupils for the experimental group in this study is explained and certain variables which might be considered as related to reading performance are described as they were measured in the resultant group.

It appears to have been the custom, once reading retardation due to lower than average intelligence or due to known physical handicaps such as poor eyesight or muteness were screened out, to put all other cases into one group and to treat the children in the group for type of error rather than for cause of error. While remedial teachers have more

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recently concerned themselves with pupils who were poor readers due to lack of reading readiness caused by poor experiential background, or who had poor word attack due to little knowledge of word analysis or other similar conditions, to the knowledge of the investigator very little has been done on this continent to segregate those poor readers who are retarded because word recognition was unreliable due to directional confusion in word memory or word attack. There also has been more concern with the intermediate or senior pupil who is already one or more years retarded behind what might normally be expected for his mental age and grade, than with the beginning reader who, although he as yet is not very far behind, is experiencing difficulty in reading growth.

The present research was, as has been stated in the preceding chapter, aimed at that specific group of children who have normal or better intelligence, no physical deficiency of required organs, no experiential lack or personality problem, but who do evidence signs of confusion in word recognition due to orientation of letters and words. Furthermore, since this condition would make learning to read from the very beginning more than usually difficult, it seemed that the logical place to start treatment was near or at the beginning of the primary schooling. But, as far as was known to the investigator, no organized group existed in this country in which primary pupils had been segregated from the main stream because their habits of word recognition presented this particular pattern.

It was therefore necessary, in order to study the effects of the specified method, to organize such a group. One community, in the vicinity of Ottawa, saw the possibility of providing a special method of reading instruction for these children, and since, with the help of the consultant psychologist at the school, it was shown that possible candidates for the class were in the school, the School Board with the suggestion and co-operation of members of the Home and School Association, saw fit to make provision for such a class within the school.

It was decided at the beginning that candidates for the experimental class should be selected from Grades II and III with chronological ages seven to nine, with average to superior intelligence, with no physical difficulty which might impede reading performance and with no personality problem greater than what might be considered as due to frustration due to poor reading in the regular classroom situation. Later on, as will be discussed, it seemed advisable to add pupils from the Grade I class who showed several of the symptoms characterizing the specific reading problem. The school personnel who aided in the selection were the regular classroom teachers of the grades specified, the principal, the consultant psychologist, medical authorities where necessary, and in later stages of the diagnosis, the special reading instructor.

As was expected, the number of pupils which could be selected each year in the rather small community school was

few, and therefore, the experiment had to be repeated for three consecutive years in order to gain enough cases to justify even small sample statistical analysis. During the first month, September, of the new school term each year, the regular classroom teacher reported for observation, those children whose reading did not seem to measure up to what might be expected for the apparent ability of the child as shown in other areas of school endeavour. She, along with the principal and the previous teacher where possible, checked the reading progress record of the child and observed the type of error made in oral reading. They reported any likely candidates to the consultant psychologist.

The consultant psychologist administered an individual intelligence test to each of these children¹. She examined laterality patterns using the Harris Tests of Lateral Dominance², certain informal tests as well as the dynamometer. She also referred to Primary Mental Abilities³ profiles records of which tests were in the school for each pupil, and reading readiness tests⁴ which each child had been given at

¹Lewis M. Terman and Maud A. Merrill, Revised Stanford-Binet Scale, Form M, New York, Houghton Mifflin, 1937.

²Albert J. Harris, The Harris Tests of Lateral Dominance, New York, The Psychological Corporation, 1947.

³Thelma Gwinn Thurstone and L.L. Thurstone, SRA Primary Mental Abilities for Ages 5 to 7, and for Ages 7 to 11, Chicago, Science Research Associates, 1948, revised 1954.

⁴Department of Educational Research, The Dominion Tests, Group Test of Reading Readiness, Kindergarten and Grade I, Toronto, College of Education, University of Toronto, 1951.

the end of the kindergarten year. The psychologist consulted the school medical authorities about any possibility of poor acuity of eye or ear, and in doubtful cases, specialist medical examinations were referred to. An attempt at evaluation of the individual personality was made. With all this information at hand, the parent, or where possible, both parents of the candidate were interviewed and records were made of the child's development with special reference to growth in language skills. Where possible, the psychologist recorded information regarding any difficulty experienced by other members of the family in reading, spelling or other language skills.

When the consultant psychologist was satisfied that the child was of at least normal intelligence, had no lack of sensory acuity, and had no outstanding personality problem other than that which appeared to result from failure to learn to read satisfactorily, and where there was strong evidence of mixed or crossed dominance or poor perception of orientation in space, and where the reading performance did not appear to be up to the mental age, she referred the child to the reading investigator. The reading teacher, in turn, administered the Gates tests⁵ at the appropriate level and

⁵Arthur I. Gates, Gates Primary Reading Tests, Gates Advanced Primary Reading Tests, Bureau of Publications, Teachers College, Columbia University, 1943.

required a reading age at least six months below mental age in one or both of the sub-tests, Word Recognition or Paragraph Reading. This teacher also examined the child in oral reading where the child could read at all, to confirm or not, the original teacher's observations of confusions in orientation of letters, syllables and words.

Following the above described examination by the selection team, the candidate was admitted to the group if he had the following qualifications:

1. He was within the stated limits of age, grade and intelligence.
2. He showed a goodly number of reversals and inversions for his level of reading, in the judgment of the two teachers and the principal.
3. He showed evidence of one of: mixed dominance, crossed dominance, confused perception in space, immature perception.
4. He had no outstanding personality difficulties nor any lack of sensory acuity.
5. His history showed persistent difficulty in reading-readiness and learning to read.
6. His history showed at least one of: delayed speech development, poor speech patterns, confused auditory perception, motor confusion and slow development, other members of his family with history of difficulty in reading, spelling or language skills.
7. He was retarded at least six months behind mental age in either one or both of Word Recognition and Paragraph Reading.
8. Left handedness was recorded but was not in itself included as a criterion of selection.

During the first year of the experiment consistent patterns comprising points two to eight appeared. It was apparent also that from the child's point of view, it was desirable to admit the child thus handicapped at the earliest

possible level in his school career that diagnosis was possible. Even one year of failure to learn to read or of unusual difficulty in learning to read, might be for the child of average to superior intelligence a cause of dislike of school, distrust of teachers, loss of self-confidence, feelings of inadequacy and hopelessness, and of the formation of bad reading habits such as memorization and guessing. All these things required re-education after the child entered the experimental group, and might lessen or at least delay the effects of any method which might otherwise be helpful. Therefore it was decided during the second and third years of the experiment to admit children from Grade I who had a chronological age of six, and average to superior intelligence. In addition, three of the other criteria of selection were amended for the Grade I candidate as follows:

3. He showed evidence of two of mixed dominance, crossed dominance, confused perception in space, immature perception.

5. His test in Kindergarten showed reversal tendencies in drawings and words, and his first month's performance in Grade I showed no improvement in orientation of symbols and words.

6. His history showed at least two of: delayed speech development, confused speech pattern, confused auditory perception, other members of his family with history of difficulty in reading, spelling or other language skills.

The members of the selection team have been listed and the criteria of selection have been presented. A more detailed and statistical description of those candidates accepted in the special group will now follow.

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As a result of the selection procedure described, twenty-five pupils meeting the qualifications were chosen over a three year period. Nine of these were selected in Grade I. Thirteen were selected from Grade II and three pupils who had spent the Grade I year in the special group and whose reading performance had not yet reached the mental age level, continued the experimental training during the Grade II period. Three new candidates were accepted from Grade III and six who had been in the group during Grade II and who still had not quite reached reading levels adequate for mental age, spent a second year in the experimental group. Tables and statistical analysis given in this report will specify whether repeaters are included or not in each item of data reported.

These twenty-five children could not be considered as representative of the normal population. They were average to superior intelligence in a school where the mean intelligence quotient was in the above-average group. The socio-economic background was very much above average with all the pupils in the group coming from homes of professional men or business owners or senior officers of the services, or diplomatic corps. In order to make possible a comparison to the norms stated for samples of the normal population, it was necessary to convert all reading scores to reading age, and to consider all children at their mental ages rather than at the chronological ages.

The non-representative nature of the experimental population in intelligence and socio-economic background is readily admitted but it is argued that this is acceptable on the following grounds: the uniqueness of the class as one of a kind, and the uniqueness of the experimental reading method which was designed for children of at least average intelligence. Had children of under average intelligence been included although as it happened no such candidates were available in the school used, the method would have required a number of variations to suit the lower ability of children at this age level who could not be expected to deal meaningfully with symbols such as isolated letters. Regarding the high socio-economic background it was debatable where a socio-economic background would play much part in the present experiment, particularly at the primary level.

One other variable which might have influenced the results and is unaccounted for in the experiment is the teacher-pupil relationship and its effect on reading success. One teacher was used for all the cases. Whether the personal teaching success of this teacher was different from what might have resulted with a sample of teachers cannot be known. Because of the unique nature of the class, the problem of training teachers in the experimental method, and certification and other qualifications needed when such a class is carried out

inside a public school, it was impossible to use more than one teacher.

From these paragraphs it is clear that the group to be described is not a truly representative group but a group composed of all the diagnosed cases available in one school. Therefore, statistical data appearing in Table I describes only that group and, only in the sense that other cases exist in other schools can it be said to be representative of a larger population.

Because the amount of reading retardation was not so clearly a factor in the group admitted from Grade I, the description is repeated for the Grade II group and the Grade III group, including in Grade II three subjects who had spent Grade I in the experimental group but whose reading achievement was not equal to mental age at the end of the teaching period and who were thus retained in the experimental class, and in Grade III, six subjects who had spent Grade II in the special class and were retained for the same reason. The description of these two grade groups is shown in Table II.

The good intelligence of the selected group is seen in the examination of the means and ranges of scores obtained on the two intelligence tests used. The mean chronological age of the nine Grade I children was 74.4 months but the mean mental age was more than six months higher. The mean

Intelligence Quotients on the two tests administered were 108.4 and 109.1 and the range of scores extended from average to superior with several scores in the above average group.

In the Grade II group, whether considered as new entrants only or inclusive of all cases trained during the Grade II year, there is a difference of about a year between mental age and chronological age in favour of the former. The mean Intelligence Quotients were 112.3 for new entrants and 112.4 for the total Grade II group on the Terman test⁶ and 104.7 and 105.4 on the Thurstone test⁷. This difference which was also seen in the Grade III group, could have been due possibly to three factors. First the Thurstone test is a group test and it is not unusual for children, especially those who have not been succeeding in the group, to score lower in the group test than in a test administered individually. Secondly, the Thurstone test breaks down intelligence into several factors and the combined Intelligence Quotient takes all factors into consideration while the Terman test considers intelligence as a unit. Lastly, three of the factors considered in the Thurstone test, Motor, Space and Perception might conceivably be lower in children with the specific difficulty than in normal children. In fact, a

⁶Lewis M. Terman and Maud A. Merrill, Revised Stanford-Binet Scale, Form M.

⁷Thelma Gwinn Thurstone and L.L. Thurstone, SRA Primary Mental Abilities for Ages 5 to 7, and for Ages 7 to 11.

large number of the individuals being considered did indeed score lower in Space and Perception than in Verbal and Reasoning skills, and in some cases as much as two or three years lower. All these factors would combine to lower the scores on the Thurstone test. This difference was more apparent in mean than in range.

Similarly in the Grade III group, whether considered as new entrants or as total grade group, the difference in performance on the two intelligence tests was apparent. There was a difference of about a year between chronological age and mental age so that the Terman test showed mean Intelligence Quotients of 111.7 for the group of new entrants as well as for the total grade group, and there was some difference in the range of scores. However, in both Grade II and Grade III, the individuals who scored the highest on the Terman test scored equally high on the Thurstone, with one exception of a Grade III pupil whose Space score was so low that his total score was pulled down considerably.

When the Gates reading tests were administered, the reading ages thus obtained were compared to the mental ages on the Terman. The Terman test was chosen as the point of comparison because it seemed that that test was less influenced by the specific difficulty of the children than the Thurstone. Because a discrepancy of at least six months either in Word Recognition or in Paragraph Reading was required for selection,

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Table 1.-

Description of the Population used in the Experimental Group According to Number^a, Chronological Age^b, Mental Age^c, and Intelligence Quotient^d Measured by Two Tests at the Beginning of the Experimental Training Period, October First.

Grade	N	C. A.		M. A.		I. Q. (Terman)		I. Q. (PMA)	
		M	Range	M	Range	M	Range	M	Range
I	9	74.4	68-80	80.7	74-91	108.4	95-121	109.1	97-121
II	13	86.0	78-93	96.4	81-109	112.3	97-131	104.7	82-134
III	3	106.7	104-108	118.6	105-127	111.7	97-120	99.3	93-105

^aNumber in this table refers to those children who were admitted to the special group during the Grade year indicated. It does not include pupils who were spending a second year in the experimental group.

^bChronological age is considered as the number of months reached at the beginning of the experimental period, October first.

^cMental age in months as shown by the results of the Terman and Merrill Revised Stanford-Binet Scale, Form M.

^dIntelligence Quotient measured at the beginning of the training period on two scales: the Revised Stanford-Binet Scale and the Thurstone SRA Primary Mental Abilities.

Table II. -

Description of Grade Groups II and III^a According to Number, Chronological Age, Mental Age and Intelligence Quotient Measured by Two Tests at the Beginning of the Experimental Training Period.

Grade	N	C. A.		M. A.		I.Q. (Terman)		I.Q. (PMA)	
		M	Range	M	Range	M	Range	M	Range
II	16	86.2	78-93	96.9	81-109	112.4	97-131	105.4	82-134
III	9	106.0	89-115	118.4	105-127	111.7	97-121	101.4	93-120

^aGrade groups II and III mean the total groups of those grades including pupils who had spent already one year in the experimental group.

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the reading age and the mental age were compared. The apparent difference was tested to find if it was statistically significant.

Grade I children had received only a slight training in reading vocabulary, an acquaintance with about one hundred words in the last months of Kindergarten and the first month of Grade I. They all had been completely unsuccessful in this work, and this lack of success was one of the requirements of entrance into the special group. Therefore it was not possible to obtain any score on a reading test. Actually the tests were administered but all scores were so low that the correction factors made these scores minus quantities. These Grade I children therefore had to be credited with reading ages of six years, five months according to the Gates norms. For this reason, only comparisons of Grades II and III are given in Table III and IV.

When the results of the total Grade II group were examined, differences in means of 8.0 months and 11.4 months between reading age and mental age for Word Recognition and Paragraph Reading respectively, were found. The standard deviations and standard errors of the means were similar but the correlations between reading ages and mental ages were low, .28 and .06. Using the formula $t =$

$$t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1} - 2r_{12}\sigma_{M_1}\sigma_{M_2}}}$$

the significance of the differences between means was tested. The degrees of freedom, considered as $N-1$ require a t -value of 2.947 at the .01 level. The difference in means proved to be significant at the .01 level in Paragraph Reading and at the .02 level in Word Recognition. Since the number was so small and the variance so great a difference significant at the .02 level was considered to be adequate. For Word Recognition, the differences between reading age and mental age ranged all the way from plus eleven to minus twenty-eight. For Paragraph Reading, the range was from plus nineteen to minus thirty-four. But, as previously pointed out, each child was at least six months behind in either one or the other reading skill. In other words, for several children measurable reading performances in Word Recognition and in Paragraph Reading were widely different.

One explanation for this inequality of performance was found when children were asked to read test material orally after the test. Some children who already had gained some phonetic skill, particularly those who had spent the Grade I year in the special group, were able to find the correct word by a process of elimination after examining the first few letters of the various word choices although they were not necessarily able to read all the words. These children did quite well on Word Recognition tests but fell down when there was no picture for each word to help in the elimination as in the Paragraph

Table III. -

Comparison of Reading Age^a in Word Recognition and Paragraph Reading, and Mental Age for Grades II and III^b of the Experimental Group at the Beginning of the Training Period.

Grade Variable	M	M. A. σ	σ_M	M	R. A. σ	σ_M	D	r	t
II	96.9	9.37	2.42						
W. R.				88.9	9.4	2.45	8.0	.28	2.74
Par. R.				85.5	10.3	2.66	11.4	.06	3.27
III	118.4	6.42	2.27						
w. R.				104.8	10.2	3.60	13.6	.03	3.24
Par. R.				100.9	7.5	2.65	17.5	.11	5.32

^aReading Age in months based on the norms of the Gates Primary and Gates Advanced Primary Reading Tests.

^bEach of Grade groups II and III means the total number of pupils who received instruction in that grade, a total of sixteen in Grade II and nine in Grade III.

Table IV. -

Comparison of Reading Age in Word Recognition and Paragraph Reading, and Mental Age for the Combined II -III Group^a at the Beginning of the Training Period.

Grade Variable	M. A.			R. A.			D	r	t
	M	σ	σ_M	M	σ	σ_M			
II-III	100.6	13.23	3.41						
W. R.				88.4	8.8	2.28	12.2	.52	3.24
Par. R.				87.4	10.8	2.79	13.2	.20	3.33

^aII-III combined represents the group of children entering for the first time at these grade levels. Each child, although he may have spent both years in the experimental group is counted only once at the level of his entrance.

Reading test.

On the other hand, especially among those pupils who were entering the special group for the first time, habits of guessing at the whole meaning from recognition of some words and examination of the picture which was given to go with the paragraph enabled these individuals to acquire enough meaning to mark the pictures correctly although oral examination showed that they were not able to read many of the words in the paragraph. These children often did better on the Paragraph Reading tests than on the Word Recognition test.

In the total Grade III group, the differences were 13.6 months and 17.5 months respectively in Word Recognition and Paragraph Reading. The standard deviations were 10.2 and 7.5 and the standard errors of the means were 3.60 and 2.65. The correlations between reading ages and mental age were .03 and .11. In the Grade III group the t-value required for significance at the .01 level was 3.555 and the differences were significant at the .02 level in Word Recognition and at the .01 level in Paragraph Reading. The range of differences were very great, from plus six to minus twenty-nine for Word Recognition and from minus two to minus thirty for Paragraph Reading. The same reasons as were advanced for the great range of differences in Grade II, can be repeated here.

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Because of the influence, particularly on Word Recognition, of having spent a year in the special class although the required standards for leaving the group had not been met, and that it might be said to change the results to some extent, the scores of a combined group of II and III pupils who were entering the class for the first time, were examined. As shown in Table IV, the mean mental age, 100.6, was largely influenced by the mean mental age of the Grade II because there were only three Grade III pupils in this combined group. The mean reading ages for both Word Recognition and Paragraph Reading were lower than those of the Grade II group shown in the previous table because the combined group did not include those pupils who had been in Grade I in the special group and who had already made considerable improvement. The mean reading ages in the combined group were 88.4 and 87.4. However, the standard deviation in Word Recognition was 8.8. The differences between reading age and mental age were 12.2 and 13.2 for Word Recognition and Paragraph Reading, respectively. The correlation between Word Recognition and Mental Age was apparently higher, .52, in this combined group due to the lesser deviation of the scores. Both differences were significant at the .01 level, where the required t-value is 2.947.

From this examination of reading ages obtained at the beginning of the training period, it appeared that not

only was the amount of reading retardation which had been set arbitrarily as the requirement for acceptance in the experimental group present, but also that the differences in reading ages and mental ages were significant. It was therefore accepted for the present experiment, that the pupils in the grades reported above were not only apparently but actually behind in reading performance what might be expected for their mental ages. It was known to the reporter that the amount of difference usually required before a child is considered retarded is one year, but this amount has usually been prescribed at the junior or intermediate level, and it was argued that at the primary level, six months in either skill for each child, and a significant mean difference was sufficient. The pupil at the primary level has not spent sufficient time in school to become one year behind in order to be considered as not learning to read in the normal manner. The Grade I group, although having adequate mental age, could not be scored at all on the reading tests and had to be accepted on the basis of the diagnosis alone.

Analyses were made of initial reading quotients and their relationships to other variables but these statistics are best left to Chapter IV and its consideration of the experimental results.

CHAPTER IV

THE RESULTS OF THE EXPERIMENT

The experimental training in reading using the Phonetic-Kinesthetic method, which was begun in the selected grade groups at the beginning of October, was completed each term at the end of May. Immediately following the conclusion of the training, the subjects were retested in reading performance using the Gates Primary and Gates Advanced Primary Reading Tests, Form 2¹. This testing was done in the first week in June. This chapter will state the testing results and an attempt will be made to interpret these results within the framework of the hypotheses stated in Chapter II.

1. - The Testing Results

The second series of reading tests, both in Word Recognition and in Paragraph Reading, were examined first to see how much improvement had been made in reading performance in the three grades represented in the experimental group. This is shown in Table V. It is to be remembered that in each grade group each child had been taken from where he was in October

¹Arthur I Gates, Gates Primary Reading Test and Gates Advanced Primary Reading Test, New York, Bureau of Publications, Teachers College, Columbia University, 1943.

at the speed at which he as an individual could comfortably progress, to the point which he could reach at the end of the eight-months period. In other words training was continued into the work of the next grade once the child had reached the requirements demanded for his present grade. This is not uncommon in the teaching of reading especially to above-average children.

In the statistics about to be reported as well as in others in the remainder of this chapter, the term "total group" is used to mean the combined group of three grades, including each subject only at the year of his entrance into the group. The term "grade group" refers to the total number of children receiving training in the grade specified including some pupils who had received special training in the experimental class during the previous grade. When one grade is compared to another, grade groups as described above cannot be used, and so it is specified that the "selected grade group" contains only pupils who entered the class at the grade specified. The term "combined Grade II-III group" refers to the total of children receiving instruction in these two grades and therefore it includes in Grade II some who have spent the Grade I year in the experimental group, but it does not include in Grade III any already counted in Grade II.

Looking at Grade I results, the mean amount of improvement as measured by the tests had been 21.2 months in

Word Recognition and 19.1 months in Paragraph Reading. While it was not possible to compute statistically, due to differences in intelligence and age of subjects, whether the apparent small difference in means was significant, it is interesting to note how close were the means because it is often feared that letter methods and word analysis methods of teaching reading in the first year will make so-called word-by-word readers who do not gain much meaning from reading material. The ranges of improvement also were similar, being from twelve months to twenty-eight months in Word Recognition and from nine months to twenty-nine months in Paragraph Reading.

A mean improvement equal to almost two years at first appeared to be rather large, but when it was considered that the subjects were at the upper half of the intelligence curve and that some of them started the training with mental ages of seven to seven and one half years, it did not seem so surprising, but rather what was to be expected if the method were successful. Some of the subjects did not improve enough to perform at the mental age, as has already been mentioned. These were kept in the experimental group during the Grade II year. However, their performance was not sufficiently low nor were there enough of them to lower the mean results appreciably.

Table V.-

Amount of Improvement in Months in Reading Performance^a in Word Recognition (W.R.) and Paragraph Reading (Par.), in Grade Groups at the End of the Experimental Training, June First.

Grade	Variable	N	M	Range
I	W.R.	9	21.2	12 - 28
	Par.		19.1	9 - 29
II	W.R.	16	23.0	10 - 58
	Par.		25.2	1 - 57
III	W.R.	9	18.6	-3 - 38
	Par.		23.6	5 - 43

^aReading Performance measured on the Gates Primary and Gates Advanced Primary Reading Test, Form 2. Months are computed using the Gates norms.

The Grade II subjects were examined, including those who were doing the second year in the group, and the mean amount of improvement in Word Recognition was 23.0 months and in Paragraph Reading, 25.2 months. Again the mean amount of improvement was about two years but it was remembered that many of the subjects, those who came into the group for the first time in second grade, were almost non-readers so that in order to be successful, these children had to improve at least two years. The range of improvement in Word Recognition was from ten to fifty-eight months and from one to fifty-seven months in Paragraph Reading. The very large amounts of improvement were exceptions and in all cases belonged to the most intelligent pupils who had come to the group as non-readers and who managed to improve enough to read near the mental age level. However, the improvement of one month in Paragraph Reading also belonged to a subject of superior intelligence. He had scored slightly above his mental age on entering the class but had been very much lower in Word Recognition. As was pointed out at the beginning of the chapter on the selection of candidates, it appeared likely that, by being able to recognize a few of the words in the paragraph test, his superior intelligence had aided him to guess correctly the requirements of the item. His Paragraph Reading score

could not go much higher because it already was above his mental age, but his word Recognition skills improved considerably.

There were six subjects in the Grade II group who still could not meet the requirement of a reading age equal to mental age and these remained in the experimental group for Grade III. These six with the addition of three new subjects constituted the Grade III group. The new pupils were considerably retarded at the beginning and their great improvement plus the lesser improvement of the repeaters gave a mean improvement in performance of 18.6 months in Word Recognition and 23.6 months in Paragraph Reading for the Grade III group. It was true that most of these Grade III subjects who had been in the group during the Grade II year had stayed in the group because Paragraph Reading was low. They had been adequate in the recognition of single words but slow in reading sentences. This probably explained the apparently greater improvement in Paragraph Reading. The range of improvement in Word Recognition was from minus three months to thirty-eight months and in Paragraph Reading from five months to forty-three months.

As has been previously stated, individual differences in the subjects made it impossible to compute the significance of improvement when that improvement was stated in months only.

The next step, therefore, was to convert the final reading scores in months into reading quotients using the formula: reading age over mental age and the result multiplied by one hundred. Now if reading age were equal to mental age, which was considered as indicative of adequate reading performance for the individual child, the resultant expected quotient would be equal to one hundred.

Turning first to the total group of twenty-five subjects, as it is shown in Table VI, the difference between initial reading quotient and final reading quotient was examined. It should be noted that it was necessary to assign reading ages of six and one half to the Grade I subjects who scored zero at the beginning of the training in order to have reading quotients for comparison with the final results. This procedure had, of course, the effect of levelling off the resultant quotients in that part of the distribution and thus reducing the difference and the chances of correlation between the two sets of quotients. In other words, it was not possible that higher quotients could have existed for Grade I at the beginning but it was possible that lower ones could have existed. Therefore if the difference in the two means was still significant despite this handicap, and if the correlation was still significant, then the results would still stand if it were possible to assign lower more exact quotients.

On the other hand, it might be argued that in the total group of what, at the end of the experimental training, were considered as reading subjects, it was difficult to assess the degree of non-reading as anything other than a single state with a numerical value of six and one half years reading age by the selected norms, when compared with reading ages of subjects who were actually reading.

When the t-values were computed using the formula

$$t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1} - 2r_{12}\sigma_{M_1}\sigma_{M_2}}}, \text{ with a value of 2.797 required}$$

at the .01 level in order to indicate significance of the difference between obtained means with twenty-four degrees of freedom, it appeared that in Word Recognition, not only was the difference in the mean quotient between the initial and final tests 14.9 but this difference was significant at more than the .01 level. In Paragraph Reading the difference in mean quotients was 10.8 which was significant at more than the .01 level also. The first sub-hypothesis in the chapter on experimental design stated: The measurable reading performance of primary children with the described difficulty will not improve significantly with Phonetic-Kinesthetic training. This hypothesis was considered as null and it was accepted that the measurable reading performance of the experimental group did improve significantly.

At the same time, using the formula $t = r \sqrt{\frac{N-1}{1-r^2}}$

with twenty three degrees of freedom and a required value of 2.807 at the .01 level, there was a correlation significant at more than the .01 level between reading quotients in word Recognition at the beginning and at the end for the total group. These computations were of course subject to the error introduced by the possible inexactitude of the Grade I reading quotients at the beginning of the experiment. This correlation seemed to indicate that those whose reading quotients were low at the beginning of the experiment made less improvement than those whose reading quotients were comparatively higher. This would tend to endorse the argument that Grade I higher quotients at the end were related to the lesser retardation at the beginning.

The second sub-hypothesis stated in the second chapter was: If there is a significant improvement, the reading age indicating the measurable reading performance at the end of the training period will be significantly less than the expected reading age corresponding to the mental age. The mean reading quotients for the total group and for each Grade group were therefore compared with the arbitrary quotient of one hundred. For the purposes of this comparison the quotient

Table VI. -

Description of the Relationship between Reading Quotients at the Beginning (1) and at the End (2) of the Experiment for the Total Group.

Test	M	r	t_r	D	t
W.R. (1)	91.1	.65	4.09	14.9	7.14
W.R. (2)	106.0				
Par. (1)	90.4	.40	2.09	10.8	4.09
Par. (2)	101.2				

one hundred was an absolute one without deviation and therefore t was computed as $\frac{D}{\sigma_M}$. The statistical comparison thus

made possible is shown for the total group in Table VII. It had been argued in the second hypothesis formulated in designing the experiment that if t -values computed by comparing the final mean quotients with the expected quotient of one hundred indicated a significant difference in favour of the expected quotient, then the reading improvement could not be considered as adequate. If, however, there were no significant differences in favour of the expected quotient then the measurable reading performance must be considered as adequate for the mental age.

Examination of Table VII shows that a mean improvement of 23.1 months was achieved by the total group in Word Recognition, giving a mean actual reading quotient of 106.0 at the end of the training. Due considerably to the varying levels of the three grades represented the standard deviation was large, 11.02. The apparent difference of 6.0 with the required reading quotient of one hundred was significant at the .02 level where a value of 2.492 was required. Therefore, since there was no significant difference in favour of the expected reading quotient, it is probable that the Word Recognition skill of the total group as measured by the test

used, was adequate for the mental age. The seemingly higher performance indicated by the mean actual reading quotient may be considered as due to an advantage of the Grade I group which will be discussed presently.

A mean improvement of 22.6 months was made in Paragraph Reading yielding a mean actual reading quotient of 101.2. The difference of 1.2 was not significant and therefore it was considered that the reading skill in Paragraph Reading as measured by the test used, was not different from the required 100 and therefore was adequate.

There was a difference of 4.8 between the actual mean reading quotients in Word Recognition and in Paragraph Reading, and computing t as $\frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1} - 2r_{12} \sigma_{M_1} \sigma_{M_2}}}$, with twenty-

four degrees of freedom, the t -value of 2.53 indicated a significant difference in means at the .02 level where a value of 2.492 was required. This difference did not appear in the grade groups as will be shown, but, of course, with a larger number in the total group a lesser difference was required in order to show statistical significance. This possibility will be allotted more discussion in the second half of this chapter.

Turning to an examination of the grade groups considered individually as shown in Table VIII, it was seen first

Table VII. -

Description and Comparison of Actual Reading Quotients and Expected Reading Quotient of the Total Group at the End of the Experimental Training, June First.

Test	A ^a	M	σ	σ_M	D	t	D ^b (WR-Par.)	t
W.R.	23.1	106.0	11.02	2.25	6.0	2.67		
Par.	22.6	101.2	12.83	2.62	1.2	.46	4.8	2.53

^aA is mean amount of improvement in months.

^bD indicates difference between actual mean
(WR-Par.)
Reading Quotients in Word Recognition and Paragraph Reading.

that retesting of the Grade I group yielded a mean reading quotient of 111.3 in Word Recognition and of 109.2 in Paragraph Reading. The ranges were from 98-120 in both tests although the deviation was greater in Paragraph Reading than in Word Recognition. The differences between mean quotients and the expected quotient of 100 proved to be significant, using the formula $t = \frac{D}{\sigma_{M_1}}$, at better than the .01 level

where 3.355 was required in Word Recognition and at the .02 level where 2.896 was required in Paragraph Reading, but both of these statistical results were in favour of the actual mean quotients. The degrees of freedom in these two comparisons were eight. Since there were not t-values indicating significant differences in reading performance in favour of the expected quotient of 100, then it was considered that the stated hypothesis that actual reading age would be significantly lower than mental age is null, and the actual reading age was adequate. In fact there were t-values showing significant difference in Word Recognition, to indicate the possibility of reading quotients greater than the required 100.

However, before accepting that the Grade I group had surpassed in mean performance what could be expected for the

Table VIII. -

Comparison of Actual Reading Quotients and Expected Reading Quotients for the Grade Groups at the End of the Experimental Training.

Grade	Variable	N	M actual	Range	σ	σ_M	D	t
I	W.R.	9	111.3	98 - 120	6.84	2.42	11.3	4.67
	Par.		109.2	98 - 120	9.80	3.11	9.2	2.96
II	W.R.	16	105.4	90 - 126	10.65	2.75	5.4	1.96
	Par.		105.4	89 - 131	13.08	3.35	5.4	1.61
III	W.R.	9	96.0	87 - 114	7.63	2.69	4.0	1.48
	Par.		97.6	92 - 114	8.09	2.82	2.4	.85

mental age of the subjects, it was necessary to consider that the age norms used in the test were obtained in a standardizing population trained in methods in which the children were not necessarily given the tools of independent word attack at the Grade I level. Therefore, words encountered in the test which had not been met previously in the texts used in the grade might have been impossible for many children in the standardizing group to recognize. But in the experimental group pupils had been trained deliberately in phonetics which provided a key to independent word recognition and therefore these children did not have the same handicap. Therefore, it is possible that the reading age norms given by the test manual were not adequate and that the statistically significant difference in favour of the actual mean reading quotient did not really indicate that the subjects in the experimental group were in fact showing reading skills above their respective mental ages. For the purposes of the present experiment, the investigator considered only that since there was no significant difference between actual mean reading quotient and the expected reading quotient of 100, in favour of the latter, that the subjects must be considered as having reached a level of reading performance adequate for mental age. The apparently superior performance of the subjects in the experimental

group to that of the greater population sample was considered as providing some leeway for the admitted possibility that the experimental group had an advantage in preparation for the testing situation through knowledge of independent word attack.

The performance of the total Grade II group of sixteen subjects provided a mean actual reading quotient of 105.4 in both Word Recognition and Paragraph Reading. The range and deviation was larger than in the Grade I group. This was especially true in Paragraph Reading where the range was from a quotient of 89 to one of 131 and the standard deviation was 13.08. The t-values of 1.96 and 1.61 did not indicate significant difference in means at the required level. Therefore, since the mean reading quotients were not significantly different from the required reading quotient of 100, then it was probable that the reading performance indicated by the tests used was adequate. There were a few very high reading quotients such as the reading quotient of 131 in Paragraph Reading obtained by one subject. It cannot be argued in Grade II that the standardization population of the test were handicapped in independent word recognition skills because it is considered that even under the sight method, pupils, by the time that Grade II is finished, have developed considerably in independent word analysis techniques.

The few high reading quotients obtained had to be attributed to an extreme in the distribution of quotients or to some unknown factor in the experimental Grade II subjects which had not been accounted for.

In the Grade III group, reading quotients of 96.0 and 97.6 were obtained in Word Recognition and Paragraph Reading respectively. The ranges were similar: from 87 to 114 and from 92 to 114. The standard deviations and the standard errors of the means were not unlike. Neither differences in means yielded a t-value at the level required. Therefore, since the actual mean quotients were not significantly less than 100, it was considered probable that the reading performance indicated by the tests was adequate.

It appeared probable that the subjects in the three grade groups who at the beginning of the experimental training had shown mean reading quotients with significant differences from 100, required for adequate performance based in mental age, had at the end of the training reached a level of performance which was no longer significantly less than the level required. Therefore the second hypothesis stated in the chapter on experimental design, is null and the experimental group had reached a measurable reading performance level which could be considered as adequate for mental age.

There were apparent differences between the performance levels reached in Word Recognition and in Paragraph Reading in at least two of the three groups. The next step was to find if these apparent differences were real. The results of this comparison are found in Table IX.

There was no apparent difference in mean reading quotients between Word Recognition and Paragraph Reading in Grade II, although as shown in the previous table there were some differences in deviation. In Grades I and III the differences were 2.1 and 2.4 respectively and, using the formula

$$t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1} - 2r_{12} \sigma_{M_1} \sigma_{M_2}}}, \text{ the resulting } t\text{-values did}$$

not indicate significant differences in means. From these computations it was assumed, for the purposes of this experiment, that the obtained mean reading quotients in Word Recognition and Paragraph Reading were not really different, although in the total group it had appeared that some difference might be present.

One other comparison of results was made using reading quotients in both Word Recognition and Paragraph Reading. It was the comparison between the grades. This comparison was not made at the beginning of the experiment because it was not possible to compute exact reading quotients for Grade I pupils who were just beginning formal reading training. As

Table IX. -

Comparison of Reading Quotients in Word Recognition and Paragraph Reading for Grade Groups at the End of the Experimental Training, June First.

Grade	Variable	N	M	D	r	t
I	W.R.	9	111.3	2.1	.21	.54
	Par.		109.2			
II	W.R.	16	105.4	0.0		
	Par.		105.4			
III	W.R.	9	96.0	2.4	.53	.58
	Par.		97.6			

shown in Table X, at the end of the experimental training period Grade I had a mean reading quotient in Word Recognition apparently 5.9 greater than Grade II and 15.3 higher than Grade III. Using the formula $t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1}}}$

the former difference was not significant but the latter was at the .01 level for which a t-value of 2.921 is required for sixteen degrees of freedom. In Paragraph Reading the apparent differences in favour of the Grade I group were 3.8 compared with Grade II and 11.6 compared with Grade III. The latter difference of means was significant only at the .02 level where a t-value of 2.583 was required with sixteen degrees of freedom. Comparing Grades II and III, there were apparent differences in the mean reading quotients of 9.4 in Word Recognition and of 7.8 in Paragraph Reading. The former was significant above the .05 level where a t-value of 2.069 was required.

Before assigning importance to these somewhat significant differences, it was considered that in Grade I, where the greatest difference appeared to lie, special training had been begun before there was any possibility of great retardation while Grade II and even more so, Grade III, had had full opportunity to be, and indeed actually were significantly

Table X. -

Comparison of Actual Reading Quotients of the Three Grade Groups at the End of the Experimental Training, June First.

Test	Comparison	D	t
w.R.	M _I - M _{II}	5.9	1.61
	M _I - M _{III}	15.3	4.20
	M _{II} - M _{III}	9.4	2.43
Par.	M _I - M _{II}	3.8	.79
	M _I - M _{III}	11.6	2.58
	M _{II} - M _{III}	7.8	1.77

retarded behind the expected reading age to correspond with mental age, so that these latter two grades had started out with lower quotients. Also, Grade I subjects entered the special class without spending much time in the supposedly frustrating atmosphere of the regular classroom. On the other hand, the Grade II and Grade III subjects, with the exception of those subjects who had already spent Grade I in the experimental group had full opportunity for at least one year to develop those feelings of frustration and of inability to succeed, as well as poor reading habits of guessing and memorization that have been described in the chapter on the selection of the subjects. Therefore, before coming to the conclusion that the method had been more successful at the Grade I level than at the other grade levels it was necessary to consider both of these factors.

For most of the remaining statistical presentation the reading quotient in Word Recognition only was used. There were four reasons for thus limiting the computation. First, the specific difficulty of the children in the group and the method aimed at correcting it were concerned chiefly with word recognition skills. Secondly, there was doubt whether really significant differences were present between reading quotients in Word Recognition and Paragraph Reading. Thirdly there was a need to keep the statistical data within bounds that would

enable clear interpretation. Lastly both hypotheses dealing with significant reading improvement had been examined using both quotients so that for the remaining statistical examination used to search for possible relationships, there was no previously determined need to use both except where there was a possibility of gaining additional information.

Having shown that measurable reading performance did increase significantly, and that the final reading quotient was not significantly different from the expected quotient, at least, in favour of the latter, it was now possible to go on to a consideration of the third sub-hypothesis:

Differences in measurable reading performance at the beginning and at the end of the training are not related to:

1. Grade level and amount of time spent in the regular classroom before entering the experimental group.
2. Intelligence Quotient.
3. Quotients in Perception and Space.
4. Sex.
5. Presence or absence of speech or auditory confusion.
6. Diagnostic group.

These will be examined first in relation to the initial measurable performance.

As has been previously stated examination of the first factor listed was difficult at the beginning of training because it was not possible to assign exact reading quotients to Grade I entrants. Proceeding then to the second and third factors, the examination of these, using initial reading quotients, is given in Table XI.

Since reading age, for the purposes of these computations, had been made a ratio to mental age and thus considered as a percentage, it was now possible to compare reading skill to Intelligence Quotient. The correlation between Intelligence Quotient and measurable reading skill was actually a significant minus correlation of .53 at the beginning of the training, using the formula $t = r \sqrt{\frac{N-2}{1-r^2}}$. However, it

would obviously not be valid to argue from this that in the case of the specific disability, the lower the intelligence the better the reading. Rather, superior intelligence had not been sufficient to make superior reading. It was argued that the significant minus value had occurred probably because there was no possible absolute zero in the reading quotient. The lowest possible reading age was seventy-two months and therefore for the Grade I members of the group reading quotients much less than 100 for non-readers of average intelligence were few. Even non-readers of average intelligence in Grades II and III could not go very low in the scale. On the other hand, pupils with high mental age and superior intelligence but who read poorly could go much lower since the reading age was the numerator and the mental age was the denominator in the fraction. Of course it must be said that this difficulty was present in all comparisons using the reading quotient.

Table XI. -

Description of Correlations Between Reading Quotient and Other Variables: Intelligence Quotient, Quotients in Perception and Space on the Primary Mental Abilities Test for the Total Group at the Beginning of Training, October First.

Variable	r (R.Q.)	t
I. I.	-.53	2.95
P	.16	.78
S	.27	1.35

Because low scores in Perception and Space had been one of the features examined in the selection, and had been rather common to the individuals in the group, the possible relationships between quotients obtained in these factors and reading quotients were examined as shown in Table XI, and the correlations were found not to be significant. There was, of course, always the limitation of the reading quotient as a statistical element of comparison. However, while the lowness of quotients in Perception or in Space did not appear to be significantly related to the lowness of the reading quotient, seventeen of the twenty-five individuals were five or more points lower in quotient obtained in Perception than on the total test quotient and eleven individuals were five or more points lower in Space. No more than five showed this much difference in the negative direction of the other factors considered in the total test.

There were three other important variables which were not the same for all members of the experimental group. These were sex, the presence or absence of speech or auditory confusion and the diagnosed type or degree of difficulty. The total group was divided into sub-groups on the basis of each of these variables in turn, in an effort to discover whether any of the variables mentioned was related to the amount of

retardation in a manner sufficient to cause a significant difference between the performances of two sub-groups. The reading quotient was used rather than the reading age to minimize the effects of age and intelligence.

As shown in Table XII, there were seventeen males and eight females, and the difference in mean reading quotients at the beginning of the experiment was only 1.2 which was not significant. The standard deviations were 10.05 and 10.17 in the two sub-groups.

When the total group was examined for the presence of auditory or speech confusion, ten were found who could be classified into this category. It is to be remembered that all of these had been examined by suitable specialists and none of them were lacking in auditory acuity. However, when speaking, a child in this category mixed up the order of words in his sentences, omitted many words, reversed the order of syllables in words, and had general difficulty in expressing himself. In all of these cases except one, the mother reported that the child had begun to speak only after about three years of age, and had developed in this area very slowly. The child in this group had difficulty in repeating words and sentences spoken to him by another person. There was a noticeable wait while he apparently tried to put together the

Table XII. -

Comparison of Reading Quotients of the Total Group divided According to Sex, at the Beginning of the Experimental Training, October First.

Sex	N	M	σ	σ_M	D	t
Male	17	90.8	10.05	2.51	1.2	.26
Female	8	92.0	10.17	3.85		

symbols in intelligible order before repeating them. It would seem that this would be a serious handicap in learning to read, but when the two sub-groups, one with speech and auditory confusion and the other without it, were compared, the differences in mean reading quotients was only .2 and of course this was not significant. This is shown in Table XIII.

Next the total group was divided into three groups based on the diagnosis. One group of eight pupils had no fixed dominance or preferred use of either left or right hand or eye as far as could be determined by the laterality test. There was a tendency in the testing situation to hesitate, shifting back and forth from one side to the other before deciding on the side to use, and to choose sometimes one side and sometimes the other. Other symptoms such as confused speech patterns, poor perception in space and immature motor control were present in varying amounts. For the purpose of this experiment, this group was labelled as Mixed Dominance although no theory was offered as to whether this confusion was at the motor or neurological level. A second group contained nine subjects who had definitely preferred hand and eye but the preferred hand was opposite to the preferred eye: left hand and right eye or right hand and left eye. Other

Table XIII. -

Comparison of Reading Quotients of Sub-groups of the Total Group Divided According to Presence or Absence of Speech or Auditory Confusion at the Beginning of the Experimental Reading Training, October First.

Sub-Group	N	M	$\bar{\sigma}$	σ_H	D	t
with	10	91.3	12.88	4.29	.2	.04
without	15	91.2	7.82	2.09		

symptoms were also present in varying degree. For the purposes of this experiment this group was called Crossed Dominance. The third group contained all the rest of the children who did not appear to have either mixed or crossed dominance. Four out of the eight members of this group were left-handed and all manifested various combinations of confused perception, especially in space, poor visual memory, poor motor control, delayed speech development or speech or auditory confusions. This group was named simply "others". It was admittedly possible that some of the subjects in this group actually may have belonged to the first two groups, but that habit had provided simulated dominance.

As shown in Table XIV, there was a difference in the means of 7.5 between Mixed Dominance and Crossed Dominance groups and of 9.4 between the Mixed Dominance group and the group of "others". There was a difference of 1.9 between the Crossed Dominance group and the group of "others". None of these differences were significant but there was a trend towards a lower mean for the Mixed Dominance group and this, coupled with the fact that very large differences are needed for statistical significance, was considered sufficient to warrant further examination at the end of the training period.

Table XIV. -

Description and Comparison of Reading Quotients of Sub-groups of the Total Group Divided According to Diagnosis: Mixed Dominance (M.D.), Crossed Dominance (C.D.) and Others (O.), at the beginning of the Experimental Reading Training, October First.

Diagnostic Group	n	M	σ	σ_H	D	t
M.D.	8	85.5	9.28	3.52	7.5	1.51
C.D.	9	93.0	10.00	3.53	1.9	.40
O.	8	94.9	8.32	3.15	9.4	2.00
M.D.	8	85.5	9.28	3.52		

It was understood by the investigator that the influence of the Grade I reading quotients, inexact as they had to be at the beginning of the training period, could not help but cloud the issue and prevent perhaps the emergence of significant differences. But since the total group was to be examined at the end of the training, a preliminary description of the effect of these variables in the total group seemed desirable. Later on, as will be shown, the Grade I group was removed with certain differences in results.

Thus, while at the beginning of the training period the measurable reading performance was retarded behind what would ordinarily be expected according to the mental age, this retardation did not show any relation to intelligence, to sex, or to the presence or absence of attendant speech and auditory confusion. Neither was there any correlation with quotients in Perception or in Space although a large proportion of the subjects had low scores in these two areas. There was no sufficiently significant difference in the mean performance of groups based on diagnosis, that is Mixed Dominance, Crossed Dominance and the group called "others", but the possibility of trends was admitted. After eight months of special reading training in which the reading performance improved significantly until at the end, there was no significant difference between the actual mean reading quotient and the expected

quotient, another set of comparisons was made between measurable reading achievement and six factors mentioned in the third sub-hypothesis.

The apparent differences among the performances at the three grade levels has already been mentioned and it has been demonstrated that these differences were not significant with the possible exception of the Grade I performance.

It was possible, also, to regroup the subjects of the total group according to the amount of time they had spent in the regular classroom before entering the special class. In this way, the influence not only of attitudes and habits established before the beginning of the experimental training, but also of the amount of reading skill at the beginning of training were being taken into consideration. The results of this comparison using the total group of twenty-five subjects including each child only at the year of his entrance into the special class, are shown in Table XV. The numbers in the three groups are different from the numbers in the grade groups because some children missed promotions in the regular classes due to lack of reading skill. It appeared that while there was no statistical difference in the mean reading quotients at the end of the training between those who had spent up to one year in the regular class and those who had spent one to two years, there was a significant difference in favour of

those who had entered the special group after Kindergarten and one month in Grade I. The computation of $t = \frac{D}{\sqrt{\frac{\sigma_1^2}{N_1-1} + \frac{\sigma_2^2}{N_2-1}}}$

yields a value of 4.19 which with twelve degrees of freedom indicated a significant difference at more than the .01 level.

There will be further discussion presented in the second half of this chapter on this point but it did appear that some reservations should exist in attaching significance to the higher quotients obtained in Grade I at the end of the experiment. It was possible that these differences were due not necessarily to the greater efficiency of the method at the Grade I level but also possibly to the lesser chance of retardation at the beginning and to the effect of lesser time spent in the regular classes before beginning the special training.

Correlation coefficients were computed for the final reading quotients and each of Intelligence Quotient and quotients in Perception and in Space in an attempt to find out if improvement was related to any one of these variables. The results of the computations are shown in Table XVI.

There were apparent negative correlations between final reading quotient and Intelligence Quotient and between reading quotient and quotient in Space but, using the formula

Table XV. -

Comparison of Final Reading Quotients in Word Recognition of Sub-groups of the Total Group Divided According to Amount of Time Spent in Regular Grades Before Admission to the Experimental Group.

Time in Months	N	M	σ	σ_H	D	t
0 - 1	8	112.5	6.36	2.41	6.5	1.48
1 - 10	11	106.0	11.55	3.65	9.0	1.96
10 - 20	6	97.0	6.31	2.83	15.5	4.19
0 - 1	8	112.5	6.36	2.41		

$t = r \sqrt{\frac{N-k}{1-r^2}}$, neither of these were significant. The

small apparent positive correlation between reading quotient and Perception was not significant either. Thus it appeared that the amount of retardation in Space and in Perception was not directly related to improvement in reading performance as quantified in the final reading quotient. There was not a correlation between Intelligence Quotient and reading quotient.

Yet, quotients in Space and in Perception lower than the full scale Intelligence Quotients on the Thurstone test were common in the group. When an arbitrary figure of minus five or greater below the full scale Intelligence Quotient was selected as the basis of division of the total group into two sub-groups, there were significant differences in final reading quotients. That is to say that the group of subjects whose quotients in Perception were lower by five or more than the full Intelligence Quotients had significantly lower reading quotients at the end of the training. The same was true of those subjects scoring lower in Space. The figure, five, was an arbitrary one and shows very little difference from the full scale Intelligence Quotient when the standard deviation is considered so that this result cannot be given too great importance except to show that subjects who tended to be lower

Table XVI

Description of Possible Relationships Between Reading Quotients and Intelligence and Quotients in Perception and Space for the Total Group at the End of Training, June First.

Variable	r R.Q.	t
I.Q.	- .21	1.62
P.	.19	.93
S.	- .11	.53

in these two factors of intelligence tended to show lesser reading performances. There did seem to be a possibility which will receive more consideration at the end of this chapter that low scores in Space and Perception did in some way impede improvement in reading, if not by a direct quantitative relationship.

A further consideration related to Intelligence Quotient which received attention in the total group was whether there was a relationship between the amount of reading improvement in months and the mental age at the beginning of the experimental training. As is seen in Table XVII the mean mental age at the beginning of training was 93.4 in the total group and the mean amount of improvement was 23.1 in the eight months training period. The correlation between amount of improvement and initial mental age was .23 and was not significant. Therefore it seemed that higher mental age at the beginning of training did not increase the progress, but of course it must be remembered that a correlation of this nature does not take into account the reading age already achieved at the beginning of the training.

Following the outlined list of possible related variables, at the beginning of the training, an effort was made to find if there was any relationship in the total group between the initial reading quotient and any of the following

Table XVII. -

Description of the Relationship Between Reading Improvement in Months at the End of Training and Mental Age for the total Group.

Variable	M	r	t
M.A.	93.4		
Reading Improvement	23.1	.23	1.12

factors: the presence or absence of speech or auditory confusion, sex, or type or degree of diagnosed difficulty.

These possible relationships were all studied again at the end of the experimental training period. It was thought that if a relationship was found at the end, since there was none at the beginning, there would have to be some relationship between these variables and the amount of improvement during the special training.

When the total group was divided according to sex as shown in Table XVIII, the apparent difference in means was only .2 and this was not significant.

Table XIX shows the comparison in final reading quotient of two sub-groups: those with auditory or speech confusion and those without. The apparent difference in means was only .8 and this of course was not significant in the group of twenty-five subjects. But there appeared to be more variability in the final quotients among those with speech or auditory confusion than those without.

At the beginning of the training, the eight subjects who had been diagnosed as Mixed Dominance cases and the nine subjects who had been diagnosed as Crossed Dominance cases were compared with each other and with the others who did not fall definitely into either of these categories. At the

Table XVIII. -

Comparison of Final Reading Quotients of Sub-groups of the
Total Group Divided According to Sex.

Sex	N	M	σ	σ_n	D	t
Male	17	105.9	11.16	2.79	.2	.05
Female	9	106.1	9.66	3.66		

Table XIX. -

Comparison of Final Reading Quotients of Sub-groups of the Total Group Divided According to the Existence of Speech or Auditory Confusion.

Variable	N	M	σ	σ_n	D	t
with	10	105.4	12.57	4.19	.8	.16
Without	15	106.3	9.14	2.44		

time it was pointed out that these categories could not be absolute since there existed no diagnostic instrument with undisputed validity. When the apparent diagnostic groups were compared in reading quotients at the end of the experimental training, as shown in Table XI, the differences in the means were very small and there appeared to be no significance at the required .01 level.

It appeared that as far as the present experiment could determine there was no connection between the diagnostic group and the amount of retardation at the beginning nor the amount of improvement at the end of the experiment as quantified in the final reading quotient. However, before leaving the problem, one more facet of it deserved consideration. All of the Grade I subjects had been diagnosed as Mixed Dominance or Crossed Dominance cases. Yet the Grade I group had a mean performance significantly higher in word Recognition than the expected quotient of one hundred. But final reading quotient in word Recognition was the criterion being used for comparison. Also there had been a significantly greater improvement in favour of those who had come directly into the experimental group from Grade I without having spent several months in the regular grades. But because it is known from the literature that reversals are common at the Grade I level and because it is possible to have delays in development of perception and

Table XX.-

Description and Comparison of Final Reading Quotients of Subgroups of the Total Group Divided According to Diagnosis: Mixed Dominance, Crossed Dominance and Others.

Diagnostic Group	N	M	σ	σ_M	D	t
A. D.	8	101.2	9.70	3.67		
C. D.	9	108.8	8.17	2.88	7.6	1.63
O.	8	107.5	13.05	4.94	1.3	.23
B. D.	8	101.2	9.70	3.67	6.3	1.00

of orientation in space as well as motor confusion in direction due to lack of experience, all of which can easily extend into the Grade I period, and because it is possible that some uncertainty of preference might normally still exist in the inexperienced six-year old, there was a possibility that a diagnosis of Mixed Dominance at that early stage might be inaccurate, or at least difficult to make with exactness except in the most severe cases. Although any of the factors just mentioned would have been sufficient for admission to the group, it was easy to understand how a combination of some or all of these conditions might give an appearance of mixed or crossed dominance which was in fact not that but only delayed development. The inclusion of even a few subjects in a diagnostic category to which they did not belong could easily influence the statistical comparison in such a small sample.

On the other hand, if the diagnosis had been accurate, the Grade I group still differed from the other two grades in that retardation could not exist to any great extent at the beginning of learning to read, and the group had had seemingly helpful training from almost the very beginning of formal reading instruction. Therefore attitudes and habits detrimental to reading progress had not had time to develop.

Another possible explanation of the apparent difference in improvement of the Grade I group is that the two reading tests used may have measured somewhat differently. That is, perhaps the Primary Test used at the Grade I level did not screen as effectively poor reading performance due to reversals and like confusions, as did the Advanced Primary Test used at the Grades II and III level. The two tests are supposed to be continuous in measurement but it is true that the specific error being studied was not especially taken into consideration in the standardization of the tests.

Whatever the correct explanation, it seemed clear that the Grade I group was not quite similar to the others and for the sake of a complete examination of the relationship between reading performance and the various factors which might contribute to its level, it was decided to make a last examination omitting the Grade I group. For the purposes of the next group of statistics to be reported, the group consisted of Grades II and III combined. Included in Grade II were subjects who had spent the Grade I year with the experimental class, but those Grade III subjects who had spent the Grade II year in the class were, of course, not included twice and were counted only as Grade II subjects. It would have been possible to use this new group for re-comparing sub-groups divided according to sex and according to presence or absence of speech or auditory confusions but the differences had been

so small in the total group, there were so few girls, and the presence of the above mentioned confusion was so evenly distributed in the total group that it was decided unnecessary to make these two sets of computations. However, the combined Grade II and III group was sub-divided on the basis of diagnosis since it was the most questioned factor in the Grade I group. This sub-division placed six in the so-called Mixed Dominance group, five in the Crossed Dominance group and eight in the group called "others". The results of the comparisons appear in Tables XXI, XXII, and XXIII. The comparisons were made for the reading quotients in both Word Recognition and Paragraph Reading and at both the beginning and the end of training. Large apparent differences in means were found but large values of t were required for significance at the .01 level because of the very small numbers.

From these statistical comparisons, the group of Grades II and III pupils making up the sub-group given the diagnostic name of Mixed Dominance emerged as a relatively homogenous group which achieved an apparently lower reading performance at the beginning of the experimental training and improved to a lesser amount during the course of the training than did the other two groups. The mean reading quotient in Word Recognition at the beginning of the experiment was 81.7

Table XXI. -

Comparison of Diagnostic Variables M.D. and C.D. Using Reading Quotients in both word Recognition and Paragraph Reading at Both the Beginning (1), October First and the End (2), June First of Training, for Sub-groups of a Combined Group of Grades II and III, Divided According to Diagnosis: Mixed Dominance, Crossed Dominance and Others.

Test	Diagnostic Group	N	M	σ	σ_M	D	t
W.R. (1)	M.D.	6	81.7	5.60	2.50	11.7	1.56
	C.D.	5	93.4	14.12	7.06		
W.R. (2)	M.D.		94.8	5.14	2.29	12.4	2.35
	C.D.		107.2	9.49	4.74		
Par. (1)	M.D.		78.0	5.35	2.39	14.6	1.46
	C.D.		92.6	20.27	10.14		
Par. (2)	M.D.		94.3	4.38	1.95	9.7	1.94
	C.D.		104.0	9.17	4.58		

Table XXII. -

Comparison of Diagnostic Variables M.D. and O. Using Reading Quotients in Both Word Recognition and Paragraph Reading at Both the Beginning (1) and the End (2) of Training for Diagnostic Sub-groups of a Combined Grades II and III Group.

Test	Diagnostic Group	N	M	σ	σ_n	D	t
*R.(1)	M.D.	6	81.7	5.60	2.50	13.2	3.28
	O.	8	94.9	8.30	3.14		
*R.(2)	M.D.		94.8	5.14	2.29	12.7	2.42
	O.		107.5	12.49	4.73		
Par.(1)	M.D.		78.0	5.35	2.39	13.6	3.08
	O.		91.6	9.80	3.52		
Par.(2)	M.D.		94.3	4.38	1.95	15.6	3.60
	O.		109.9	14.25	5.40		

Table XXIII. -

Comparison of Diagnostic Variables C.D. and O. Using Reading Quotients in Both Word Recognition and Paragraph Reading at Both the Beginning (1) and the End (2) of Training for Diagnostic Sub-groups of a Combined Grades II and III Group.

Test	Diagnostic Group	N	M	σ	σ_M	D	t
W.R. (1)	C.D.	5	93.4	14.12	7.06	1.5	.19
	O.	8	94.9	8.30	3.14		
W.R. (2)	C.D.		107.2	9.49	4.74	.3	.04
	O.		107.5	12.49	4.73		
Par. (1)	C.D.		92.6	20.27	9.80	1.0	.09
	O.		91.6	10.14	3.52		
Par. (2)	C.D.		104.0	9.17	4.58	5.9	.85
	O.		109.9	14.25	5.40		

and in Paragraph Reading was 78.0. Standard deviations and standard errors of the means were small for such a limited group of six subjects. At the end of the experiment, final reading quotients were 94.8 and 94.3 in Word Recognition and Paragraph Reading respectively and again the group was quite homogenous. Compared with the group called Crossed Dominance, there were apparent large differences of ten or more in mean reading quotients both at the beginning and at the end but in order for these differences in means to be significant, with only nine degrees of freedom, the required t-value of 3.250 was large. As a result only the difference of 12.4 in mean reading quotients in Word Recognition at the end of training was significant, and this only at the .05 level, where 2.262 was required.

It should be pointed out that in the use of the t-ratio one of the things which prevented the emergence of large values was the very large deviation in the Crossed Dominance group. The unusual heterogeneity of that group and the possibility of significant differences emerging in a perhaps purer diagnostic group will be discussed at the end of this chapter.

In the comparison of the so-called Mixed Dominance group and the group labelled "others", the differences in mean reading quotients which emerged were again apparently large and this time, perhaps due to the slightly larger number, and the somewhat lesser heterogeneity of the "others" group, the differences in means were significant at the .01 level for Word Recognition at the beginning of training, and

for Paragraph Reading at both the beginning and the end. The required t-value was 3.055 with twelve degrees of freedom. The difference in means in Word Recognition at the end of the training was significant at the .05 level, for which a value for t of 2.179 was required.

Both the group called Crossed Dominance and the group called "others" showed very great variability. The mean reading quotients were very close at all times with no significant difference. The reasons for the seemingly great heterogeneity, both in relation to diagnosis and to performance of individuals will receive further attention.

As was mentioned in the chapter on experimental design, efforts were made to learn as much as possible about the performance of the pupils in the experimental group after they had left the group to return to the regular grades. Six were discharged after the first year and ten after the second year in the group. Three others who had reached the upper limits of age and grade were let go after the first year although it was felt that all three might have profited from further help. Other discharges have been made but too late to be included in the present report. Of the nineteen who could have been reported, nine have moved out of the school, mostly to other countries and their performance grades were not

available. Of the ten remaining pupils, two were reported by at least three teachers concerned with their school work to be achieving adequately high to be considered "good". Three have been reported as "average"; two as "poor" and three have been failures in the regular grades. Two of the three failures were those who were let go upon achieving the upper age and grade limits without having completely satisfied the leaving requirements. It is to be remembered in examining these reports of progress in the regular grades of the school, that the mean standards of the school are extremely high because the average ability in the school as a whole is measured as superior on the group intelligence tests used.

Despite the not completely satisfactory general performance of these children on re-entering the regular classrooms, the reading performances of all except three are still close to the Mental Age levels as indicated by the regular reading surveys conducted in the school.

The complaints of teachers working with these individuals and the problems which have been encountered by the children will receive a little discussion. Although the small amount of evidence submitted here was not considered to be either adequate or completely scientific, the experiences of these

pupils and their teachers may help to shed light on the continuing effects of the experimental reading method used.

It was also mentioned in the experimental design that the use of cursive writing rather than print-script introduced the possibility of another variable. The teacher of the regular Grade I class used cursive writing with two different Grade I years and the practise was continued in Grade II without any noticeable difference in the final reading achievement. It was observed, however, that at the beginning stages, the learning of four different forms for each letter slowed down the learning process until the children had become familiar with the differences. Again no comparable results are available but her experience would help to indicate that the use of cursive writing did not favour the experimental group in their learning and therefore could not readily be considered as having a positive effect on performance on standardized reading tests.

2. - The Interpretation

The statistical results have been presented and certain comments have been made. It is now appropriate to sum up these results and to endeavour to interpret them in the light of the problems presented in this report.

At the beginning of the experiment, tests in Word Recognition and Paragraph Reading administered to an experimental group of twenty-five children who were representative of a sample of the specific reading difficulty in the narrowed sense described, showed that the reading age was significantly below the mental age.

At the end of the training period, the subjects in the experimental group were re-examined in Word Recognition and in Paragraph Reading, thus providing a second set of reading ages and reading quotients for comparison. The means obtained from these scores were examined in the light of the first two sub-hypotheses which had been formulated at the beginning of the experiment.

a) The measurable reading performance of primary children with the described difficulty will not improve significantly with Phonetic-Kinesthetic training.

b) If there is significant improvement, the reading age indicating the measurable performance at the end of the training period will be significantly less than the expected reading age corresponding to the mental age.

Examination of the amounts of improvement and comparison of the mean reading quotient at the end with that at the beginning indicated that the first hypothesis, that measurable reading performance would not improve significantly with Phonetic-Kinesthetic training, did not hold. Therefore, it was considered that the reading performance at the end of the eight months experimental period was significantly higher

than at the beginning, and that improvement had actually taken place.

By converting final reading ages into reading quotients based on mental ages and comparing the mean of the resultant quotients with the expected quotient of 100 which would be obtained if reading age and mental age were equal, the second hypothesis that final reading age would be significantly less than mental age, was shown not to hold. Comparisons were made for both the whole group and the grade groups. It seemed that, considering the mean performance, reading age at the end of the training period was not less than mental age. Of course some individual cases remained lower as evidenced by the fact that some children were required to remain in the group for a second year.

It appeared then that a method had been found which could help children at the primary level who were of average to superior ability but who suffered from the specific reading disability, to learn to read adequately. But there was a great variability in amount of improvement and in final level of performance. It was necessary to search for factors related to improvement which might account for the differences in reading growth.

During the preliminary survey of the literature, certain factors with possible influence on the amount of

initial retardation and on the amount of improvement to be expected in any remedial programme, had been considered and these had been gathered into a third sub-hypothesis. The various factors listed in the third sub-hypothesis were considered in relation to initial and final measurable reading performances. When reading quotient was compared to Intelligence Quotient there appeared to be no positive relationship. In other words, the presence of above average or of superior intelligence did not appear to help these children to be better readers in the way that it is generally expected that higher intelligence will affect reading progress. It is so customary to consider reading ability as related to mental ability that reading tests, even the ones used in the present report, base norms on mental age. Therefore, the fact that this agreement did not appear to be present in the experimental group pointed to the presence of some significant factor which cancelled out the expected effect of intelligence.

In an effort to isolate this factor which appeared to be cancelling out the effect of intelligence on reading skill at any given level, attempts were made to compare mean reading quotients of sub-groups divided according to sex and again according to the presence or absence of observable speech or auditory confusion. In neither did there appear

to be any significant differences. Because the possible effects of physical and emotional problems and of social and economic differences in cultural backgrounds had been eliminated in the selection, the question still remained as to what was the nature of the factor influencing reading performance. While it was clearly intended that this was not a study of diagnosis, it appeared necessary to enter the field of diagnosis in order to search out the unknown related variable.

In selecting the candidates for the group, the persons concerned with selection had attempted, using certain dominance tests and tests of perception, and perception in space, to classify the subjects into categories. These categories seemed to represent various theories which had been presented in the literature on the cause of the specific difficulty. Two categories, those of apparent mixed dominance and of apparent crossed dominance were sufficiently represented to form two separate groups, and in the remainder of subjects there was evidence of various degrees of delayed development of perception and orientation in space, of delayed motor development, of left handedness and other similar characteristics which could be grouped into one group called "others". None of these children appeared to have sufficient

evidence of mixed dominance or of crossed dominance to be thus classified but the performance of the group was quite heterogenous and it was admittedly possible that some of the children might have belonged indeed in one of the other two classifications. Such were the imperfections of the diagnostic instruments that it was equally possible that some of those classified as either mixed or crossed might have presented these characteristics merely because of delayed establishment of dominance and thus might have been wrongly classified too. However, an attempt was made to compare the mean reading quotients of the three groups classified as well as could be done with the testing results available. In the resultant comparison no significant differences appeared at the beginning of the training. However, there was a trend towards lower achievement by the so-called Mixed Dominance group and by the so-called Crossed Dominance group. The considerable variability of performance inside each group made the emergence of significantly large differences difficult. The results of the comparisons based on diagnostic groups were considered with some reservation due to the difficulty of diagnosis at such an early stage of development, and with such limited tools, and also due to the heterogeneity of the groups thus obtained.

At the end of the training period comparisons similar to those made at the beginning of the training period were again attempted. Since there appeared to be no significant difference at the .01 level between final reading quotients in word Recognition and in Paragraph Reading in any one grade group, and because word recognition had been the chief concern of the method, many of the comparisons made in the attempt to find variables related to amount of improvement, used only the reading quotient in word Recognition. An interesting point was noted in this respect. It has often been feared that children taught by word recognition methods rather than by whole and so-called more meaningful methods, would be considerably lower in paragraph skills than in recognition of single words. This did not appear to be the case, in any one grade group. There was a difference, significant at the .02 level, in the total group but this was not considered sufficient to be labelled a considerable difference in favour of Word Recognition.

Because it had appeared that Grade I improvement had been significantly greater than improvement made by the other two grade groups, special attention was paid to the possible causes of this difference. One of the factors which was different for the Grade I group was that children in this grade had spent very little time in the supposedly frustrating environment of the regular classroom and thus had not had much opportunity to develop feelings of inadequacy, or habits of

guessing and memorisation in reading. When the total group was sub-divided according to the amount of time spent in the regular classroom before entering the special group, it appeared that there was indeed a significant difference between the final performance of those who entered at the beginning of the Grade I year and those who entered in the third year of schooling. But before this difference can be given too much significance it must be taken into account that the latter group were much more retarded behind expected performance at the beginning of the training than the former group were, and thus the latter group had more to make up. Other possible reasons will be discussed in later paragraphs.

Once again, the mean reading quotient of the total group of 25 subjects was compared to mean Intelligence Quotient and to quotients in Perception and Space and no significant correlations were found. It appeared then that the relative improvement of each child indicated by the reading quotient indicative of his final performance, was not related to his degree of intelligence, nor to his mental age, nor to his amount of retardation in development in Perception or Space, although most of the group scored five or more below the full Intelligence Quotient in these last two items.

When the total group was sub-divided according to sex, and according to presence or absence of auditory or

speech confusion, no significant differences appeared. Again the investigator was faced with an improvement in reading performance which on the average was significant and was great enough to approach the desired level of mental age, and yet showed great variability and this variability did not appear to be related to intelligence, to mental age, to low scores in two of the factors of intelligence which had been considered to be important in the specific disability, to sex or to accompanying speech or auditory confusion. The investigator was thus led to turn away for a second time from the main subject of the investigation, method, to the field of diagnosis.

When the whole group was again sub-divided into three groups: Mixed Dominance, Crossed Dominance and "others" on the basis previously indicated, and the resultant mean quotients compared, there were no significant differences between the means of the sub-groups although the mean of the sub-group, Mixed Dominance remained lowest just as it had been at the beginning. It was noted that the variability of each sub-group was large and that there was now little difference in the final mean quotients of the two sub-groups Crossed Dominance and "others".

Out of the nine Grade I's who appeared in the total group at that level because they had entered in that grade,

six did not appear again in the grade groups of higher levels. Of these six subjects, two had been classified as Mixed Dominance and four had been classified as Crossed Dominance. But the performance of the Grade I group had been shown to be higher than that of the other two grade groups in Word Recognition. Furthermore, the reading quotients of those who entered at or near the beginning of the Grade I year had been significantly better than those who entered at Grade III. Was it possible that the Grade I group, lacking initial great retardation, feelings of inadequacy and poor reading habits, had improved in a manner different from the others? On the other hand, Grade I pupils were measured by a different test at the end of the training due to the lower level of their achievement. There was a possibility that the two tests did not really measure the same thing and that the Primary Test was not as sensitive to errors due to directional confusion as was the Advanced Primary Test.

One other possible consideration remained. Most of the Grade I group had been diagnosed as either in the Mixed Dominance or in the Crossed Dominance groups. But according to many authors reported in the literature, considerable tendencies to reversals and inversions are usual in the six to seven age group. Also wide differences in motor development

can occur. It might have been possible that apparent indecision in handedness which had been called mixed dominance, and apparent opposing dominance of eye and hand, were due to delayed motor development and decision. Therefore, it seemed possible that with the relatively inadequate instruments of diagnosis presently available, and the known differences in maturity not only of perception and spatial orientation, but of motor decision, that diagnosis at this early level could be inexact. In that case, some of the subjects categorized as Mixed Dominance or Crossed Dominance might indeed have belonged in the group of delayed perception and other related factors, which had been labelled "others".

In any case, the group, Grade I did not appear to fit as well as the other grade groups in the total picture. Therefore, a new group was made composed of Grade II and Grade III and including all those who had received training at either of these grade levels. This meant that three of those included at the II level had actually spent the Grade I year in the experimental group, but as each subject was included only once, none of those at the Grade III level had spent the previous year in the special group.

When this new and smaller group was sub-divided according to diagnostic category, a small, relatively homogenous group of Mixed Dominance emerged. The mean reading quotients

of these new sub-groups were compared in both Word Recognition and Paragraph Reading and at both the beginning and at the end of the experimental training. The group called Mixed Dominance which remained rather homogenous in performance through all the comparisons measured less than the so-called Crossed Dominance group in Word Recognition at the end, and the difference in means was significant at the .05 level. The Mixed Dominance group was significantly less than the group labelled "others" in Word Recognition at the beginning, and in Paragraph Reading at both the beginning and at the end, all at the .01 level and was less than the group of "others" in final reading quotient in Word Recognition at the .05 level.

There were no significant differences between the mean reading quotients of the two groups Crossed Dominance and "others". However, it was observed that in both these latter groups the variability of achievement was very great with standard deviations reaching as high as twenty points. It seemed possible, then, that several causes might be represented in these two groups and that some of the subjects might even belong in the so-called Mixed Dominance group.

It is not suitable for an investigation of a method for aiding all primary children with the reversal and inversion difficulty, to pursue further the field of diagnosis

and cause. However, in the interests of possible further investigation, some ideas appropriately may be presented. These are not considered as scientific conclusions due to the smallness of the sample and to the lack of sufficient data. It does appear that some factor related to reading level and amount of possible improvement exists which has the power to partially cancel out the effect of intelligence and other usually significant factors.

Looking back at the several theories of causation presented in the survey of the literature, is it possible that for different children, different theories of causation might have been true? There is a small amount of evidence here to point to a group called Mixed Dominance which does not respond as readily to training as the others. Whether this confusion occurs at the neurological or at the motor level, that is, at the level of the engram or at the level of visual word attack, there is no evidence from which to argue. It might be possible that the method used did not cure the subjects in this category but merely gave them some way of getting around a permanent difficulty, and that with the confusion remaining, the performance remained lower. The availability of a reading test designed for primary children, which would be adequately sensitive to reversal errors would help to clarify this point.

In the observations of the experimental instructor and of other classroom teachers hearing these children read, the following points were noted. These pupils needed constant review of letters and combinations in order to remember them. The reversals and inversions of complimentary letter forms remained to a very large extent, making it necessary for the individual to try out both possible letters in attacking words, even at the end of the training. There was little permanent sight vocabulary achieved. These pupils found it necessary to re-analyse words again and again at each time of meeting them. As a result, oral reading was not fluent and was slow. All of these children found it helpful to use a moving finger or pointer even at the Grade III level. These rather casual observations were unique to this one sub-group.

Considering now the two sub-groups labelled Crossed Dominance and "others", there is no evidence to show whether these are really one group or are several groups of causes. It is possible that the reading method used did, if not cure these subjects, at least provide them with a consistent directional approach. If crossed dominance is a real factor existing at the motor level, then consistent directional attack would tend to become a habit despite opposing eye and hand. In the case of delayed development of perception of differences, and of orientation in space, it is possible that the

Phonetic-Kinesthetic training provided some help until the desired level of development was reached. For those who might have been handicapped by poor visual memory, phonetics could have provided the necessary avenue to word recognition. For those who were simply left-handed, consistent left-to-right sequence could have helped develop a habitual direction of word attack.

It appears from the present investigation that the only variable which shows some possibility of being directly related to the specific reading problem is the one of diagnosed cause and it is probable therefore that the next area of study should be in the field of differential diagnosis. Some reservations remain at present, about the possibility of accurate diagnosis at the Grade I level.

The not entirely satisfactory performance of pupils who left the group to enter the regular classes has been mentioned. The failures and the ratings of "poor" all were given to pupils in the so-called Mixed Dominance group, with the exception of one who had been included in the Crossed Dominance group. Measurable reading performance fell behind mental age in three pupils and in the others who were low in achievement, the teachers complained that the reading of arithmetic problems and regular assignments in English, social studies

and other content subjects was so slow as to handicap the children. Questioning of teachers and of all the subjects who left the group to go to regular classes in the school indicated that use of phonetic analysis was retained but no pupil continued to make use of kinesthetics to help remember word forms. This of course is due partly to the fact that the method was not used by the teachers concerned in dealing with these pupils.

Thus a further field of possible investigation regarding permanence of effect and continuance of special methodology into higher grades, is pointed out.

The investigator has tried to present the statistical analysis of the data, as well as the remarks resulting from observations, to interpret these, and to present the arguments leading to the conclusions which must now follow.

CONCLUSIONS

In stating the conclusions drawn from the experiment in training by a Phonetic-Kinesthetic method primary pupils who were either retarded in reading or were likely to be so retarded due to a directional difficulty in word attack or in word memory, it is appropriate, first of all, to look back to the beginning of this report, to the survey of the literature. In writing about the descriptions of the reversal and inversion difficulty given by various authors and in quoting their opinions as to why the difficulty occurred, several theories were singled out for presentation. First there were the theories of mixed dominance with the disagreement as to whether the resultant confusion occurred at the neurological or at the motor level. Secondly, there was the theory of crossed dominance with the opposing tendencies in direction whether of basic movement pattern or in habits formed by the individual. Then there were the theories of left-sidedness, of developmental lag in perception, especially of orientation in space, of poor visual and auditory memory span, and the theory that the specific difficulty was not specific at all but just one of the many aspects of poor reading.

In this investigation the last-mentioned theory was put aside and the other theories were grouped into three: mixed dominance without any attempt to justify either the neurological or the motor explanation, crossed dominance, and others which included all those who presented the symptoms but could not be labelled specifically as mixed or crossed dominance cases.

In surveying the attempts at training children handicapped by the specific symptoms, two methods stood out: the phonetic method and the kinesthetic method. This experiment attempted to combine the two because neither one seemed by itself to be sufficient to provide the primary child with a system of independent word recognition and experience with a reading vocabulary which would enable him to return to the regular classes.

In reconsidering the reading instructional method and materials used in the present experiment certain areas might be pointed out which require further study. It has been admitted that the order of presentation of phonetic elements contained in the material prepared for pupil use, was not the only possible sequence but that it was chosen for apparent convenience in word and sentence building. It would be advisable to consider several other sequences and probably other forms of presentation in order to find out the most efficient.

Similarly, in considering the kinesthetic part of the method, certain tracing materials such as sandpaper and rough drawing paper provided more or less resistance to the tracing finger. Was this resistance necessary or would a smoother medium have been equally efficient? Tracing was carried out in different sizes varying from a large form involving the large arm muscles to small handwriting size involving the small muscles of the hands and fingers. Would it have been better to confine the tracing patterns to one size with a consistent muscle involvement? Further investigation may find an answer.

In the literature there appeared to be a lack of data on experimental attempts to train these children, and of data on the differences in improvement made by different groups or categories of children, and of data on the permanence or lack of permanence in improvement. This report attempted to provide such data for an admittedly limited number of children.

The limitations of the experimental group were caused by the availability of diagnosed candidates. It was possible to form one such group in one school. The primary level was chosen because it appeared that since the specific difficulty made itself felt in the area of word recognition and this skill

belonged to the primary level, it was necessary to find a method of helping the children at this stage in their school career.

The experimental group thus selected was not truly representative, not only in the manner of selection but also because the subjects tended towards the higher end of the intelligence scale and of the socio-economic scale. Since it is one function of this report to point out other areas where further investigation is needed, one topic can be mentioned here. How effective might the results of the training have been in a group of children who tended more towards the average or lower end of the intelligence or socio-economic scale? Insofar as intelligence is concerned it is quite possible that with those of below average ability who still are sufficiently high to learn a little reading, the method might not have been suitable, because in order to deal effectively with abstract symbols such as letters, a certain mental level is required. Another point requiring further investigation is whether the same method might have been used with retarded readers of higher grades who showed the same symptoms. There is no evidence in this report to indicate that the Phonetic-Kinesthetic method presented here would prove either effective or ineffective. It is probable that further consideration would have to be given to adequate motivation if these materials were to be used with an older age group.

Other variables concerned with the group situation are not accounted for. One very important factor in dealing with children in the six-to-nine age group is the teacher-pupil relationship. Only one teacher was used. Was there something in this one relationship which had an over-riding effect on the success of the pupils or would the method have succeeded equally well in the hands of any teacher who handled it carefully and with understanding? What was the effect of the individual method of presentation of training as a factor in itself apart from the methods and materials of training? What was the effect of the small group as different from the usual class of thirty children? Competition had been removed fairly well from the learning situation and this in itself may have had a considerable effect which could not be measured. All these factors are areas for further investigation and since their effects could not be measured here their presence must be considered as part of the method, for the purposes of the results presented.

Proceeding now to the conclusions which may be suggested from the statistical evidence and other arguments made in the latter part of this report, a brief summary of these deductions will be attempted in the following paragraphs.

Training using the Phonetic-Kinesthetic method appears to have made significant improvement in the measurable reading

performance of children selected in Grades I, II and III, whether considered as a whole group or as grade groups. Furthermore, the measurable reading performance reached at the end of the eight-months training period does not appear to be significantly different from the mental age and thus must be considered as adequate reading performance insofar as it has been accurately measured. This appears to be true for both Word Recognition and Paragraph Reading.

Neither the initial retardation nor the amount of improvement appears to be related to intelligence, or to sex, or to the presence or absence of accompanying auditory or speech confusion. There is no direct relationship to scores in Space or Perception although low scores in these areas are common to the group. In the selection of the subjects, most of the other possible related factors such as physical handicaps, severe personality problems, poor social, economic and cultural backgrounds, and non-academic intelligence levels have been ruled out.

In the total group, no significant difference in reading performance has been found among the three diagnostic groups: Mixed Dominance, Crossed Dominance and others. With Grade I eliminated from the total group, the diagnostic group of so-called mixed dominance has stood out as a rather homogeneous group making significantly less progress. The children

in this group also tended to be more retarded than the others at the beginning of the special training and to retain some symptoms of reversal and inversion at the end of the training.

It is suggested that the real factor making differences in achievement among the cases of reversal and inversion difficulties may be the difference in the cause of the symptoms. In this connection, it is suggested also, that various theories of causality stated in the literature may not be opposed to each other but may be true as applied to different groups of children. Since the so-called mixed dominance group appears to be initially more retarded and retains its difficulties to some extent after treatment, it is possible that this is the group of children who reached clinics and this would tend to explain why there has been more preoccupation with this diagnosis in clinics. The other two groups which tend to improve more quickly and to become relatively free of reversal symptoms may have made up the major part of the classroom reversal cases in which some authors admitted no specific difficulty.

The problem of accurate diagnosis of cause is pointed out. This difficulty applies particularly to the Grade I group. There is danger of labelling a child with the terms mixed or crossed dominance when he is exhibiting merely the signs of delayed development in the intellectual and motor

factors of reading readiness. There are possible differences also in the performance of the Grade I group due to early admission to the special instruction before adverse attitudes and reading habits have been developed. The possibilities of test differences is admitted.

It is thought that the reading instruction given operated with different effect on different groups. While some may have been helped to permanent directional habits and others aided while a developmental lag was caught up, it is conceivable that some achieved no permanent cure but merely found a way to partially work around a lifelong handicap.

The need for better instruments of diagnosis is pointed out with reservations as to whether there is a possibility of developing completely satisfactory tests at the six-year old level.

The investigator submits that initial steps have been made in the direction of finding an instructional method for children suffering from what has been considered, for the purposes of this investigation, as a specific difficulty. It remains now to develop and improve the Phonetic-Kinesthetic approach in the directions of materials, methodology, greater permanence of effect, and possible differentiation on the basis of more accurately diagnosed cause.

BIBLIOGRAPHY

Barger, William Calvin, "An Experimental Approach To Aphasic and to Non-reading Children" in American Journal of Orthopsychiatry, Vol. 23, No. 1, issue of January, 1953, p. 158-170.

A novel attempt using a double prism device to correct for the reversal and inversions of his experimental group is described. A good amount of success is reported but there is not adequate discussion of just how the transfer is made from reading with the device to reading without it.

Bender, Laretta, "Research Studies from Bellevue Hospital on Specific Reading Disabilities", a resume in Bulletin of the Orton Society, Vol. 6, issue of April, 1956, p. 1-2.

It is apparent that the author differs somewhat from the position of most Ortonians in that she argues that while the specific reading disabilities have an organic flavour they do not show the characteristic symptoms of true organic cases and she interprets their deviation as evidence of a developmental lag or immaturity of the central nervous system.

Berman, Arthur, "The Influence of the Kinesthetic Factor in the Perception of Symbols in Partial Reading Disability" in Journal of Educational Psychology, Vol. 30, No. 3, issue of March, 1939, p. 187-198.

This is a description of an experimental attempt in training children retarded in reading, to read and reproduce nonsense syllables and geometric figures using motor and non-motor methods. Although significant differences were not present, the author calls attention to the necessity of giving the retarded reader the use of every possible sensory avenue. He also underlines the often neglected fact that a kinesthetic method is not just that, but a combination of visual, auditory and motor methods.

Bond, Guy L. and Eva Bond, Teaching the Child to Read, New York, MacMillan, 1945, p. x-345.

A description of the reading readiness and beginning reading levels is given with suggested remedies for various reading levels where problems and inadequacies exist. These latter give help in understanding the individual aspects of early reading training.

-----, and Miles A. Tinker, Reading Difficulties, Their Diagnosis and Correction, New York, Appleton-Century-Crofts, 1957, p. viii-477.

This book contains a comprehensive list of errors to be found in poor reading, including inappropriate directional habits in word recognition. However, when the authors come to discuss this error, they limit their explanation to a suggested lack of adequate or suitable instruction in directional approach to reading especially during reading-readiness training.

Cole, Louella, The Improvement of Reading, New York, Farrar and Rinehart, 1938, p. 267-269.

Cole mentions on these three pages the child with a poor visual memory and says that he will not learn to read by a visual method but must have phonetic and kinesthetic drill from the very beginning. It is not clear how this child is going to be discovered at the very beginning.

Coleman, James C., "Perceptual Retardation in Reading Disability Cases" in Journal of Educational Psychology, Vol. 44, No. 8, issue of December, 1953, p. 497-503.

The author found a significant correlation between perceptual retardation and reading disability and argued that this perceptual retardation was cumulative. It is not clear whether he regarded perceptual retardation as a cause in itself or as a symptom of some greater cause.

Crossland, H.R., "Superior Elementary School Readers Contrasted with Inferior Readers in Letter Position, 'Range of Attention' Scores" in Journal of Educational Research, Vol. 32, No. 6, issue of February, 1939, p. 410-427.

It is inferred that left eye dominance has something to do with poor reading because the superior readers excelled in the left visual field and the inferior in the right visual field. Most of the inferior readers were left-dominant.

Davidson, Helen P., "A Study of Reversals in Young Children" in Journal of Genetic Psychology, Vol. 45, No. 2, issue of December, 1934, p. 452-465.

This article criticizes the writings of exponents of crossed and mixed dominance as causes of reading failures saying that the implications of their findings are limited by the restrictions of their samples - severe clinical cases compared with normal school children. Her findings that reversal errors are general in kindergarten and Grade I especially among boys, are limited too in their application because

they do not take into account the cases which do not clear up at the end of Grade I.

-----, "A Study of the Confusing Letters B, D, P and Q" in Journal of Genetic Psychology, Vol. 47, No. 2, issue of December, 1935, p. 458-468.

It is suggested that there is a genetic theory of form perception and perception of spatial position and that inversions disappear before reversals. In this study the testing stopped at Grade I and so it is not known how the author interpreted the continuance of reversals and inversions into later grades.

Dolch, Edward William, Psychology and the Teaching of Reading, Champagne, Garrard, 1951, p. vii-513.

The author's belief that learning to read is a phase of child development is expounded. Good definitions of the stages of reading development are given.

Dubrow, Helene C., "Teaching the Strophosymbolic, I - At the Primary Level" in Bulletin of the Orton Society, Vol. 6, issue of April, 1956, p. 17-19.

A method of screening children likely to be confused in learning language skills is suggested and the kinesthetic method is urged as the basis of their training from the very beginning. Unfortunately there is no attempt to discriminate between those children who truly suffer from a directional handicap of either the motor or neurological type and those who exhibit only delayed development.

Durrell, Donald B., Improvement of Basic Reading Abilities, Yonkers-on-Hudson, World Book, 1940, p. 283.

The author discounts very briefly the importance of reversal tendencies, mixed laterality and similar theories as factors in retarded reading. Evidently tendencies to reversals and inversions are to him just an aspect of poor reading in general.

Fernald, Grace M., Remedial Techniques in Basic School Subjects, New York, McGraw-Hill, 1943, p. xv-330.

While failing to pinpoint exactly the cause of difficulty, although she says that it seems to have something to do with brain disfunction and visual imagery, Fernald gives in detail her kinesthetic-experience method which appears to have worked very successfully in her clinic.

French, Edward L., "Kinesthetic Recognition in Retarded Readers" in Educational and Psychological Measurement, Vol. 13, No. 4, issue of winter, 1953, p. 636-654.

The author repeats the theory that the kinesthetic approach makes the difference in learning to read for these children. His arguments are based on a theory of motor disfunction.

Gates, Arthur I. and Guy L. Bond, "Relationship of Handedness, Eye-sighting, and Acuity Dominance to Reading" in Journal of Educational Psychology, Vol. 27, No. 6, issue of September, 1936, p. 450-456.

The authors present data to show that there is no consistent tendency to eye dominance, single eye superiority, hand dominance nor any combination of these which is related to achievement in reading, its oral pronunciation or reversals errors. However, it should be pointed out that the comparisons were made in a group in which the subjects were not selected for type of error.

-----, The Improvement of Reading, New York, MacMillan, 1939, p. 140-172.

Gates feels that Dearborn's theory and Orton's theory are inadequate and speculative. This author consistently regards reversals and inversions not as specific difficulties but as just one aspect of poor reading.

Gilkey, Beulah G. and Frank W. Parr, "An Analysis of the Reversal Tendency of Fifty Selected Elementary School Pupils" in Journal of Educational Psychology, Vol. 35, No. 5, issue of May, 1955, p. 284-292.

In this group of pupils who made the most reversal errors a large proportion of the subjects were ambidextrous, mixed or crossed in dominance. Of the various factors studied, reading retardation and emotional difficulties were common and the point was made that children with all degrees of intelligence seem to be subject to the reversal tendency.

Gillingham, Anna, "The Prevention of Scholastic Failures Due to Specific Language Disability" in Bulletin of the Orton Society, Vol. 6, issue of April, 1956, p. .

This author discusses the motor intergrade theory of Orton and stresses that language difficulties arising due to this handicap cannot be cured, but only that these children can be taught to work around them. She is inclined to attribute all reading difficulties other than those due to low intelligence to this one cause.

Hampbright, Hope, "The Prevention of Scholastic Failure Due to Specific Language Disability, Part II" in Bulletin of the Orton Society, Vol. 6, issue of April, 1956, p. 32-36.

The author describes the Gillingham programme in the Parker school, Chicago. In describing the method of Kinesthetics and phonics used, she argues from the rather impossible point that the two methods of sight recall and word-building are mutually exclusive.

Harding, Lowry W., "Assumptions Underlying Methods of Beginning Reading" in Educational Administration and Supervision, Vol. 37, No. 1, issue of June, 1951, p. 26-37.

A simplified analysis of philosophical and psychological assumptions upon which various methods of beginning reading instruction have been based. The description of these notions helps to show why various methods of teaching reading have come into popularity through the years.

Hildreth, Gertrude, "The Development and Training of Hand Dominance" in Journal of Genetic Psychology, Vol. 75, second half, issue of December, 1949, pp. 197-220, 221-224, 255-275, and Vol. 76, first half, issue of March, 1950, pp. 39-100 and 101-144.

A comprehensive survey of developmental tendencies in handedness and various problems sometimes associated with handedness. In relation to reading achievement, Hildreth states that eye and hand dominance have little to do with reading difficulties but that in extreme cases left-handedness or crossed dominance might have been a pre-disposing factor.

Ilg, Frances L. and Louise Bates Ames, "Developmental Trends in Reading Behaviour" in Journal of Genetic Psychology, Vol. 76, No. 2, issue of June, 1950, p. 291-312.

The authors present the disappearance of reversals as a developmental sequence and say that it is the result of specific learnings rather than of general tendencies. No account is taken of persistent cases.

Jastak, Joseph, "Interferences in Reading" in Psychological Bulletin, Vol. 31, No. 4, issue of April, 1934, p. 244-272.

A summary of the research on reading difficulties up to that time, this article is concerned mainly with research on directional confusion in reading. The author seems to favour the Ortonian theory and states that all studies on reading difficulties in which analysis of error has been attempted, point to the strephosymbolic error pattern.

Kennedy, Helen, "Reversals, Reversals, Reversals!" in Journal of Experimental Education, Vol. 23, No. 2, issue of December, 1954, p. 161-170.

This article reports on a study made in 1934 and shows that the gradual disappearance of reversals seems to follow a developmental sequence. Exceptionally persistent cases are not ruled out but no explanation is given for them.

Kirk, Samuel A., "A Study of the Relation of Ocular and Manual Preference to Mirror Reading" in Journal of Genetic Psychology, Vol. 44, No. 1, issue of March, 1934, p. 192-205.

The author suggests that mirror reading may be linked with low intelligence but offers no proof. The fact that a fairly large number of these difficulties occur in the below average intelligence group may be an argument in favour of the relationship between immaturity and reversals.

Lord, Elizabeth E., Leonard Carmichael and Walter F. Dearborn, Special Disabilities in Learning to Read and Write, Harvard Monographs in Education, Series 1, Vol. 2, No. 1, Cambridge, Graduate School of Education, Harvard University, 1925, p. 3.

This is the initial presentation of the Dearborn theory that reading difficulties can be caused by the normal right-to-left tendencies of the left-handed individual. The number of cases is small and there is no evidence whether the tendency persists after some training in the opposite sequence.

Lund, F. H., "The Dependence of Eye-Hand Co-ordinations upon Eye Dominance" in American Journal of Psychology, Vol. 44, No. 4, issue of October, 1932, p. 756-762.

The author found that explanations of right-to-left observations patterns, lack of attention, and confused laterality were not sufficient to explain various patterns in reading development. However, his suggestion that learning to read with a consequent reduction of errors is a developmental phenomenon with wide individual variation is too general.

Mintz, Alexander, "Reading Reversals and Lateral Performance in a Group of Intellectually Subnormal Boys" in Journal of Educational Psychology, Vol. 37, No. 8, issue of November, 1946, p. 487-501.

This writer suggests that reversals are caused by persistence of infantile space orientation because he found no correlation with weak or inconsistent lateral dominance. If both could be causes it is not surprising that there is no correlation in his sample which might easily include many boys with infantile space orientation.

Munroe, Marion, Methods for Diagnosis and Treatment of Cases of Reading Disability, Genetic Psychology Monographs, Vol. 2, No. 445, October-November, 1928, p. 333-456.

A descriptive list of tendencies seen in the retarded reader with emphasis on reversal tendencies. One of the first suggestions of phonetic and kinesthetic training for these people is given.

-----, Children who Cannot Read, Chicago, University of Chicago Press, 1932, p. xvi-201.

Descriptions are given in this book of various types of reading difficulties; suggestions are made for differentiated training and descriptions of the amount of improvement to be expected are given. The important point is made that to a great extent effective remedial work depends on the supervision and teaching efficiency of the instructor.

Mouly, George J. and Virginia F. Grant, "A Study of the Growth to be expected of Retarded Readers" in Journal of Educational Research, Vol. 4, No. 6, issue of February, 1956, p. 461-465.

Suggests the use of a linear Equation to estimate the amount of improvement to be expected: $Y = 1.6476 + .0359X$, where Y is the estimated monthly gain and X is the retardation in months. His formula has been criticized because there is lack of correction for change.

Orton, Samuel T., "The 'Sight-Reading' Method of Teaching Reading as a Source of Reading Disability" in Journal of Educational Psychology, Vol. 20, No. 2, issue of February, 1929, p. 135-143.

An indictment of the "sight" method as a way of eradicating difficulties of the reversals type and a charge that use of the method may actually cause some cases. All arguments are based on the author's own opinion that the cause of the specific difficulty is a neurological one.

-----, Reading, Writing and Speech Problems in Children, New York, Norton, 1937, 200 p.

This is a summary of Orton's attack on the visual method of reading instruction and of his case for developmental alexia or strephosymbolia as a major cause of reading

difficulty. The argument which has been advanced for many years as a criticism of his work is that his whole theory is based on a hypothesis which he cannot prove.

Robinson, Helen M., "Treatment of Severe Cases of Reading Disability" in Journal of Educational Research, Vol. 82, No. 7, issue of March, 1939, p. 531-535.

The author describes the method of treatment of severe reading disability at the Orthogenic School at the University of Chicago. She stresses that the methods used are in general those used in good first teaching.

-----, Why Pupils Fail in Reading, Chicago, University of Chicago Press, 1949, p. xii-249.

The author describes the various causes of reading failure including congenital alexia although she admits that the latter has never been proved. In a discussion of thirty cases of reading difficulty treated in her clinic, she illustrates the varying degrees of visual and auditory confusion which can cause reading retardation. Except for true alexia due to injury these various confusions appear to her to be in amount rather than in kind.

Schilder, Paul, "Congenital Alexia and its Relation to Optic Reception" in Journal of Genetic Psychology, Vol. 65, No. 1, issue of September, 1944, p. 67-88.

The author suggests that Orton may be right but is incomplete. He states that there is a primary disturbance in optic perception or imagination, and that this disturbance is limited to language symbols.

Teergarten, Lorene, "Test for the Tendency to Reversal in Reading" in Journal of Educational Research, Vol. 27, No. 2, issue of October, 1933, p. 81-97.

This article describes the author's test to measure the strength of the tendency to reverse and confuse letters. The author suggests that this test will help to screen pupils who need help due to immaturity, lack of experience and directional confusion.

Weber, C. O., "Strophosymbolia and Reading Disability" in Journal of Abnormal and Social Psychology, Vol. 39, No. 3, issue of July, 1944, p. 356-361.

Weber lists the arguments of investigators who have cast doubt on the Ortonian Theory. He quite correctly indicates that much of the evidence given by his critics has been based on massed averages from all types of reading problem cases while Orton's work has been based on a selected group of difficulties.

Wechsler, David and Myrtle I. Pignatelli, "Reversal Errors in Reading: Phenomena of Axial Orientation" in Journal of Educational Psychology, Vol. 28, No. 3, issue of March, 1937, p. 215-231.

The authors suggest that not only reversals about the vertical axis but inversions about the horizontal and depth axes as well must be considered. It would seem that they feel that the difficulty is in the area of perception of spatial orientation.

Weston, Ralph C. and J. Wesley Scheyer, "The Neurological Background of Nine Severely Retarded Readers" in Journal of Educational Research, Vol. 49, No. 6, issue of February, 1956, p. 455-459.

The authors plead for a re-examination of the possible neurological implications in reading disability, giving evidence from a variety of workers in different fields in different countries. As they say, truth cannot be measured by counting research conclusions but might be reached by a broader attack than has generally been made.

Aile, Ira S. and Rose Davis, "A Study of Failures on the Stanford-Binet in Relation to Behaviour and School Problems in Journal of Educational Psychology, Vol. 32, No. 4, issue of April, p. 275-284.

Working with a sample of some one hundred school children with problems, the authors stated that 72 per cent had definite reversals and kindred problems. These appeared to be linked to poor perception, memory and association. An attempt was made to link these difficulties to eye and hand dominance.

Wilson, Frank T., Cecile White Flemming, Agnes Burke and Charlotte Garrison, "Reading Progress in Kindergarten and Primary Grades" in Elementary School Journal, Vol. 36, No. 6, issue of February, 1938, p. 444-449.

This report emphasizes the interest that children have in letters and the fact that children who know best the letter forms and sounds, tend to read first and best. On the other hand, it is pointed out that many children taught to read by non-phonetic methods tend to learn and use the letters in spite of the methods of instruction. These two points are in contradiction to the often expressed opinion that children who are letter conscious at an early stage do not read as fluently as those who learn to read by total configuration.

----- and Cecile White Flemming, "Reversals in Reading and Writing Made by Pupils in the Kindergarten and Primary Grades" in Journal of Genetic Psychology, Vol. 53, No. 1, issue of September, 1938, p. 3-31.

The suggestion is made that reversals and inversions disappear gradually during the primary grades and that those which persist until Grade III are probably due to habit and poor training rather than to innate tendency. It is interesting to note that these authors consider the whole subject of reversals as more a matter of habit than of personal tendency.

-----, "Grade Trends in Reading Progress in Kindergarten and Primary Grades" in Journal of Educational Psychology, Vol. 31, No. 1, issue of June, 1940, p. 1-13.

The report of a study at the Horace Mann school in which the Kindergarten and Grade I letter abilities of young children were reported. A fairly high relationship was said to exist between beginning reading and giving letter sounds, naming small letters, and a lesser relationship with writing capitals. The authors point out the technical aspects of letter consciousness not frequently mentioned in articles on early reading.

Witty, Paul A. and David Kopel, "Factors Associated with the Etiology of Reading Disability" in Journal of Educational Research, Vol. 29, No. 6, issue of February, 1936, p. 449-459.

Little if any relationship is reported between reversals and mixed eye-hand dominance or left dominance although poor readers did make more reversals. This is another report using a group of poor readers not selected for specific type of error.

Wolfe, Lillian S., "Differential Factors in Specific Reading Disability: Laterality of Function" in Journal of Genetic Psychology, Vol. 58, No. 1, issue of March, 1941, p. 45-56.

An attempt was made to find out whether various combinations of eye and hand dominance were linked to reading difficulties, but no one function was sufficiently characteristic to be regarded as causative. The groups were rather small for significant differences to show up.

-----, "An Experimental Study of Reversals in Reading" in American Journal of Psychology, Vol. 52, No. 4, issue of October, 1939, p. 533-551.

This article describes experiments varying the physically controllable aspects of reading direction with eighteen boys of primary level who were at least two years retarded in reading. The writer concluded that eye and hand dominance are not related to reading disability on the basis of a rather small comparison of experimental and control groups.

APPENDIX I

GATES PRIMARY READING TESTS, TYPE 1, WORD RECOGNITION AND
TYPE 3, PARAGRAPH READING, AND GATES ADVANCED PRIMARY READ-
ING TESTS, TYPE 1, WORD RECOGNITION AND TYPE 2, PARAGRAPH
READING, FORMS 1 AND 2.

GATES PRIMARY READING TESTS

For Grade 1 and Grade 2 (First Half)

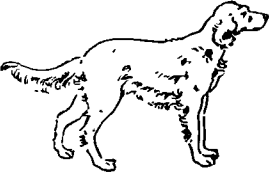
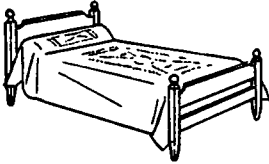
Type 1. Word Recognition


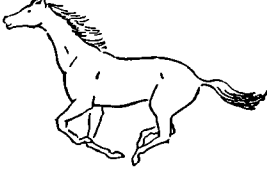
FORM 1

Write your name here

When is your birthday?..... How old are you?.....

Date School Grade

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	dog	two
	be	bed
	bag	she



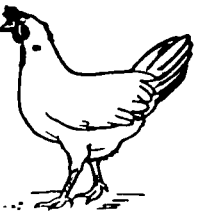


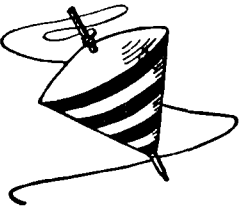


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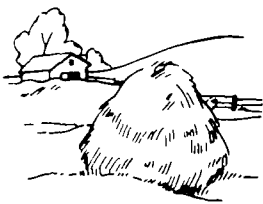
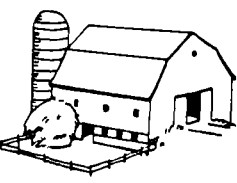
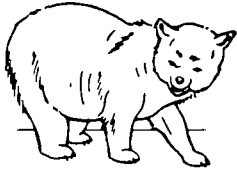
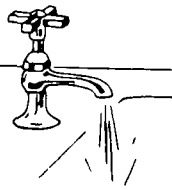


To the Examiner: 1. See that each child has a pencil. 2. Distribute papers. 3. Have children fill in blanks at the top of the page (with your help). 4. Instructions to children: "I want you to look at the first picture, this one up here (holding up your copy and pointing to the picture of the dog). Next to it there are some words. One of the words goes with the picture. You are to draw a ring around that one word that tells about the picture. Put your finger on the word that belongs with the picture. What is it? (Let one child answer.) 'That's right, 'dog.' The four words are 'did,' 'egg,' 'dog,' and 'two' (pointing to the words on your own copy and making sure children look up at your copy). We are going to draw a ring around the word 'dog' because that's the one that tells the most about the picture. Everyone find the word 'dog' on your paper and draw a ring around it. (Check to make sure children have marked the correct word.) Now look at the box right underneath that one. Find the word there that goes with the picture. What is it? (Let a child answer.) 'That's right, 'bed.' The four words are 'be,' 'bed,' 'bag,' and 'she.' We are going to draw a ring around the word 'bed' because that's the one that tells us the most about the picture. Everyone find the word 'bed' and draw a ring around it. (Check to make sure that each child has marked the correct word. Continue in the same way for the third and fourth boxes. When you are illustrating with your copy ask children to look up if need be.)

Do not open your books until I tell you to. Now I am going to show what we are to do next. On the inside of the book are some more pictures and words. (Examiner holds up copy of the test showing the inner pages.) You are to do the first one, then the next one below it, etc. (Examiner points down first column, then second, etc., and also demonstrates order on all three pages.) As soon as you have drawn a ring around the one word for one picture, go right ahead and do the next one. Now remember, first you are to look at the picture, then at the words next to the picture, then find the one word that goes best with the picture and make a ring around that one word. Make a ring around one word only for each picture. Do you understand? All right. Open your books and BEGIN. Go ahead." 5. Inspect the work of each child; see that each works from top to bottom of columns and that each follows the pages in order. Urge children individually to try the examples in order but *do not tell them the answers.* Discourage dawdling over difficult problems; tell them to try the next. Watch for children who make rings indiscriminately and tell them to make only one ring for each picture. 6. The signal STOP is given at the end of 15 minutes. Collect papers immediately. 7. The score is the number of exercises marked correctly minus one-third the number incorrect. If more than one word in an exercise is marked, that exercise is scored as incorrect. For further details see the Manual of Directions.

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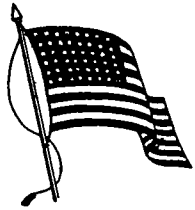
Copyright, 1943, by Arthur I. Gates

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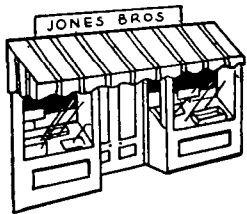
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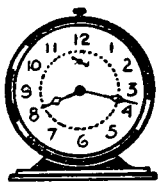
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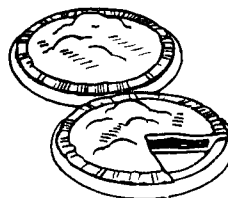
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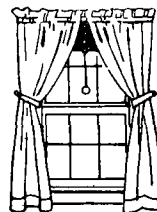
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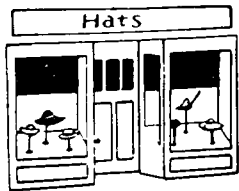
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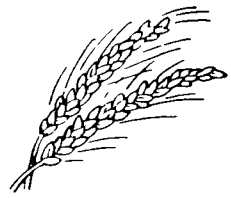
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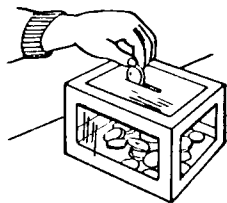
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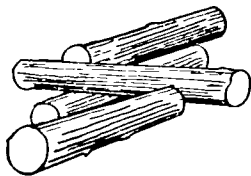
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bark band
bank thank



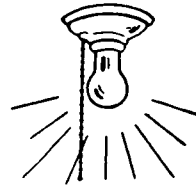
wore wood
fork word



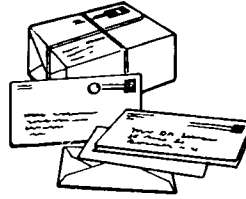
smile smell
while mile



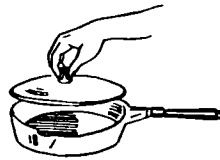
last take
like lake



light lost
fight lifts



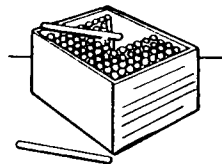
mile maid
mail nail



corner cover
river cocoa



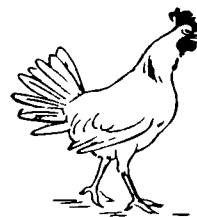
took roof
room root



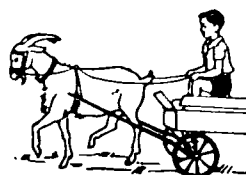
change talk
cluck chalk



lies lady
lily only



rock cock
rook colt



drive dirty
live divide

GATES PRIMARY READING TESTS

For Grade 1 and Grade 2 (First Half)

Type 3. Paragraph Reading

FORM 1

Write your name here

When is your birthday?..... How old are you?.....

Date School Grade



1. Put an X on the ball.



3. Draw a line under the little book.



2. Put an X on the milk bottle.



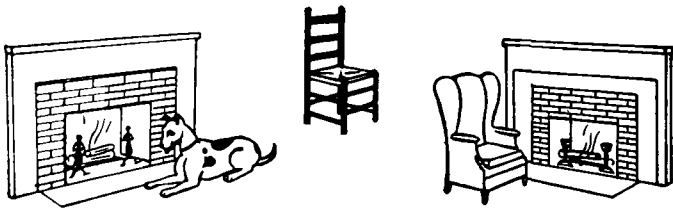
4. Draw a line from the pig to the tree.

To the Examiner: 1. See that each child has a pencil. 2. Distribute papers. 3. Have children fill in blanks at the top of the page. 4. Instructions to children: "We are going to see how well you can read. Do you see the stories and pictures on the front page of your booklet? Everyone look at the first story—up here (illustrating with your own copy). What does it say to do? (Have child answer.) That's right, put an X on the ball. Everyone find the ball and put an X on it. Be sure you put it right on the ball. (Check to see that they all have marked it correctly.) Now look at the box right under that one. What does this story tell you to do? (Have child answer.) That's right, put an X on the milk bottle. Everyone find the milk bottle on your paper and put an X on it. Be sure to put it on the bottle exactly as the story asks you to. (Check to make sure it is done correctly.) Now look at the first box on the next side—up here (illustrating with your own paper). What does the story say to do? (Have pupil answer.) That's right, draw a line under the little book. Be sure you find the little book, and be sure you draw the line under it exactly as the story asks you to. (Check to make sure papers are marked correctly.) Now look at the box under that one. What does this story ask you to do? (Have pupil answer.) That's right, draw a line from the pig to the tree. Do it on your paper. Be sure it goes from the pig to the tree exactly as the

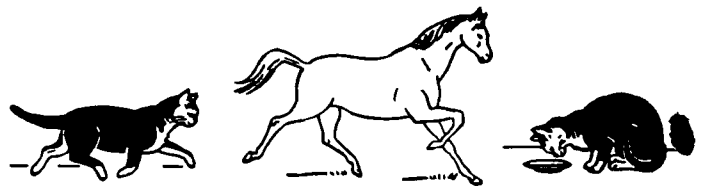
story asks you to. (Check to make sure it is done correctly.) Do not open your books until I tell you to. Now I am going to show you what we are to do next. On the inside of the book are some more pictures and stories. (Examiner holds up a copy of the test showing the inner pages.) You are to do No. 1 (Examiner points to it on his own copy), then go on and do No. 2, then do the next one, and the next one, etc. (Examiner points down first column, then second, etc., and also demonstrates order on all three pages.) As soon as you have finished one story, you must go right ahead and do the next one right below it. Now remember, first, you are to read the story below the picture; then you are to take your pencil and do *exactly* what the story tells you to do. Do you understand? All right. Open your books and BEGIN. Go ahead." 5. Inspect the work of each child; see that each works from top to bottom of columns and that each follows the pages in order. Urge the children individually to try the examples in order but *do not tell them the answers*. Discourage dawdling over difficult problems; tell them to try the next. 6. The signal STOP is given at the end of 20 minutes. Collect papers immediately. 7. The score is the number of directions which are followed correctly. The mark made *must be* the one which is specified in "the story" to be correct. For further details with respect to this test see the Manual of Directions.

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COLUMBIA UNIVERSITY, NEW YORK

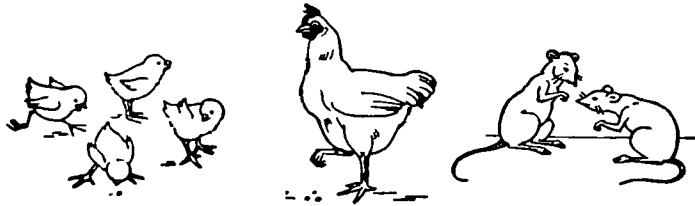
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1. Put an X on the dog.



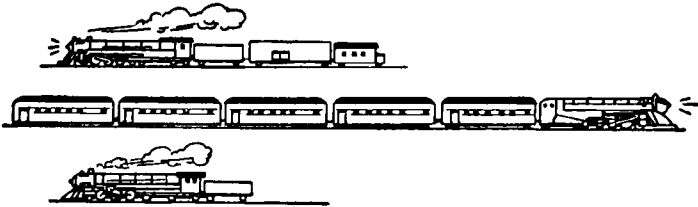
6. Draw a line under the cat that is running.



2. Put an X on the hen.



7. Put an X on one of the rats.



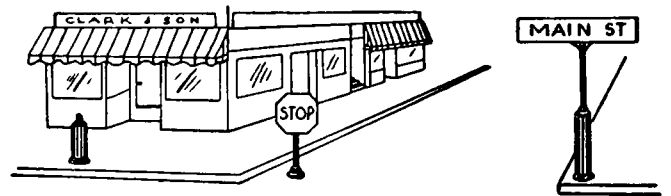
3. Draw a line under the long train.



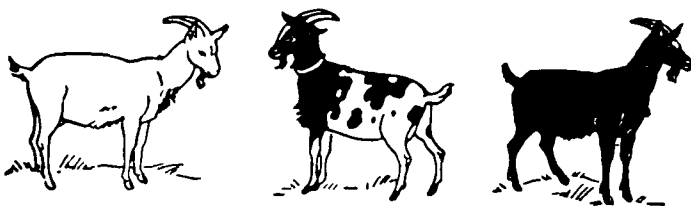
8. Draw a line under the table the cat sits on.

2 3 2

4. Put an X on the big two.



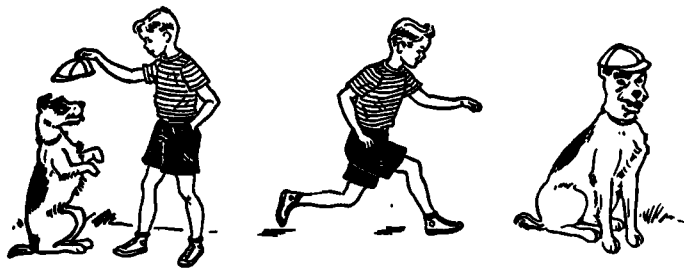
9. Put an X on the name of the street.



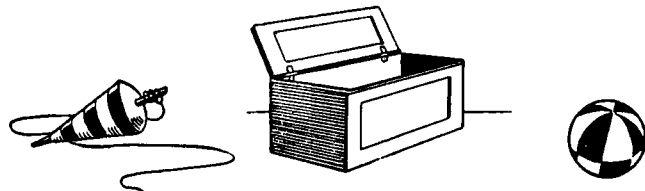
5. Draw a line under the white goat.



10. Draw a line under the fat bear with the dish.



11. Put an X on the boy who is holding his cap over the dog's head.



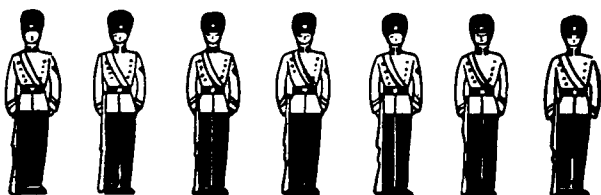
15. The mother told the boy to put his ball in the box. Draw a line from the ball to the box.



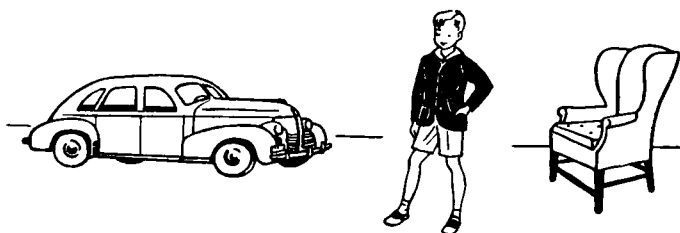
12. One of these three things can tell you the time. Draw a line under it.



16. What would a little child go under if it rained? Put an X on the place where the little child would go.



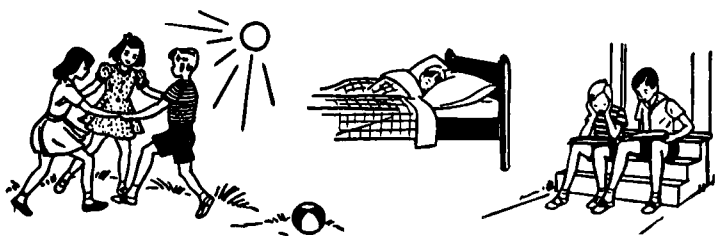
13. Here are seven little soldiers. Draw a line under the feet of four of these soldiers.



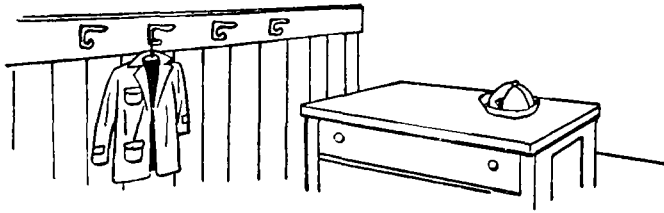
17. A mother told her boy to jump into the car and stay there. Draw a line from the boy to the car.

cat cat eat

14. Here are three ways of writing "cat." Draw a line under the one you think is poor writing.



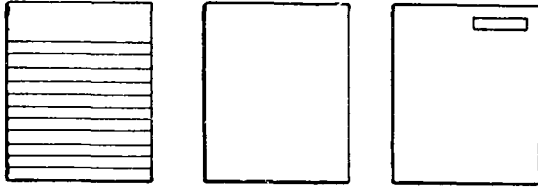
18. Three children are playing a game. They are playing in the sun. Draw a line from one of these children to the ball on the ground.



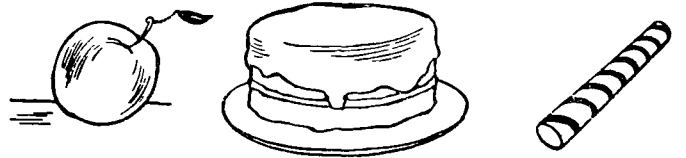
19. "Put your hat next to the coat," said Mother to the boy. Draw a line from the hat to a hook on the wall where the hat may be hung.



23. Father should have his coat cleaned. He dropped some butter on it when he was eating. Make an X on the store to which he would go to have his coat cleaned.



20. A boy was told to write his name on the first line of the paper. Look for the place where his name should be, and put an X on it.



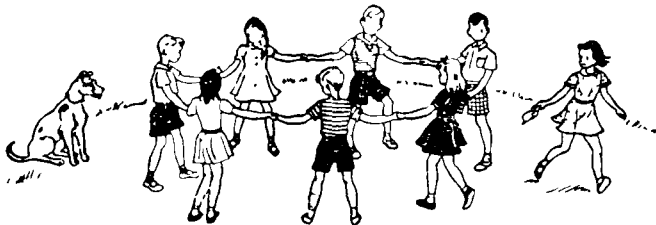
24. A boy had five cents. He went to buy some candy. On the way to the store he saw some big apples. He got an apple. Draw a line under the thing the boy got with his money.



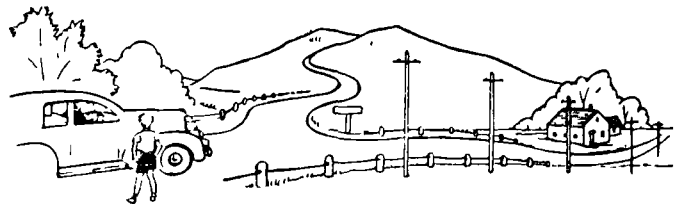
21. Here is a bed in a room. A child sleeps in the bed. The window is closed. It should be open. Put an X on what should be open.



25. You must not cross the street when you see the word, "Stop." You may cross the street when you see the word, "Go." Make an X on the word that tells you it is time to cross the street.



22. The children are playing a game. They hold hands and make a ring. The child who is "it" is out of the ring. Draw a line under the child who is "it."



26. "Which road shall I take?" asked the man. "Take the road that goes by the house," said a boy. "Do not take the road that runs up the hill." Draw a line showing which road the man was told to take.

GATES PRIMARY READING TESTS

For Grade 1 and Grade 2 (First Half)


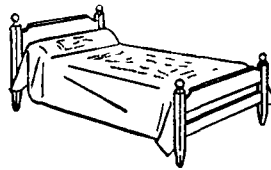
Type 1. Word Recognition


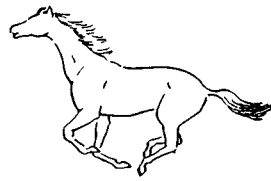
FORM 2

Write your name here

When is your birthday?..... How old are you?.....

Date School Grade

	did	egg
	dog	two
	be	bed
	bag	she

	may	make
	come	milk
	horse	play
	hose	house

To the Examiner: 1. See that each child has a pencil. 2. Distribute papers 3. Have children fill in blanks at the top of the page (with your help). 4. Instructions to children "I want you to look at the first picture, this one up here (holding up your copy and pointing to the picture of the dog). Next to it there are some words. One of the words goes with the picture. You are to draw a ring around that one word that tells about the picture. Put your finger on the word that belongs with the picture. What is it? (Let one child answer) That's right, 'dog.' The four words are 'did,' 'egg,' 'dog,' and 'two' (pointing to the words on your own copy and making sure children look up at your copy). We are going to draw a ring around the word 'dog' because that's the one that tells the most about the picture. Everyone find the word 'dog' on your paper and draw a ring around it. (Check to make sure children have marked the correct word.) Now look at the box right underneath that one. Find the word there that goes with the picture. What is it? (Let a child answer.) That's right, 'bed.' The four words are 'be,' 'bed,' 'bag,' and 'she.' We are going to draw a ring around the word 'bed' because that's the one that tells us the most about the picture. Everyone find the word 'bed' and draw a ring around it. (Check to make sure that each child has marked the correct word. Continue in the same way for the third and fourth boxes. When you are illustrating with your copy ask children to look up if need be)

Do not open your books until I tell you to. Now I am going to show what we are to do next. On the inside of the book are some more pictures and words. (Examiner holds up copy of the test showing the inner pages.) You are to do the first one, then the next one below it, etc. (Examiner points down first column, then second, etc., and also demonstrates order on all three pages) As soon as you have drawn a ring around the one word for one picture, go right ahead and do the next one. Now remember, first you are to look at the picture, then at the words next to the picture, then find the one word that goes best with the picture and make a ring around that one word. Make a ring around one word only for each picture. Do you understand? All right. Open your books and BEGIN. Go ahead" 5. Inspect the work of each child; see that each works from top to bottom of columns and that each follows the pages in order. Urge children individually to try the examples in order but *do not tell them the answers.* Discourage dawdling over difficult problems; tell them to try the next. Watch for children who make rings indiscriminately and tell them to make only one ring for each picture. 6. The signal STOP is given at the end of 15 minutes. Collect papers immediately. 7. The score is the number of exercises marked correctly minus one-third the number incorrect. If more than one word in an exercise is marked, that exercise is scored as incorrect. For further details see the Manual of Directions.

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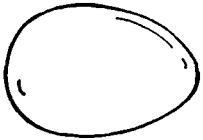
saw run
man met



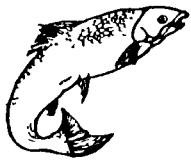
bird bring
fire hard



made ball
play baby



had egg
eat not



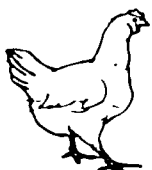
wash fish
find miss



call walk
back cake

2

who two
own ten



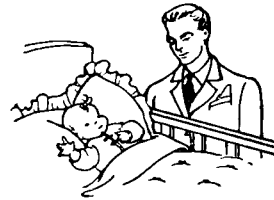
hit hen
rat pig



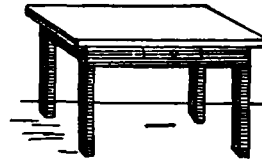
these draw
dress grass



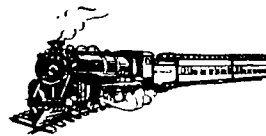
help will
been bell



father matches
fanning winter



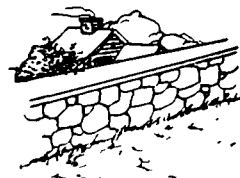
water table
takes little



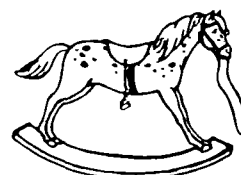
tree draw
again train



bear help
road head



wall want
talk roll

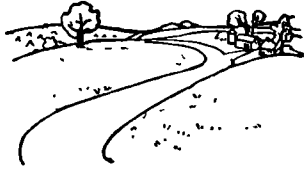


hot ten
toy lay



digs dish

miss wish



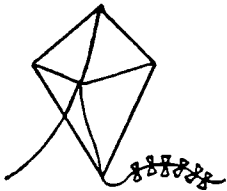
road roll

head read



kind wind

ring wing



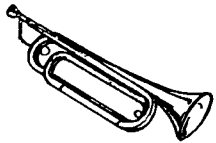
hits king

kite write



snow know

show soap



horn corn

hour word



bite wishes

wing write



raining river

hiding riding



doll roll

rope real



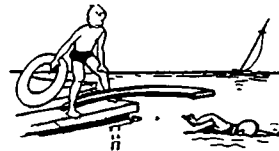
hand lays

fans land



cook took

roof clock



drum swim

swing sews



frog from

drop flag



bump turn

burn brown



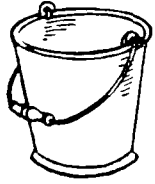
cart went

pens cent



march bark

church marks



pair pail

mail pull



field need

feed feel



skate gate

skips state



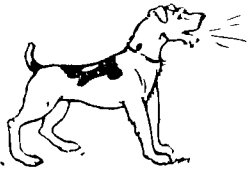
saw sew

sea few



family fair

pairs fairy



dark bark

bank barn



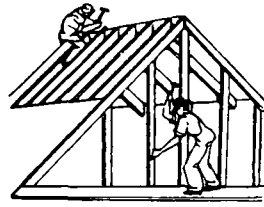
rooster cover

rings river



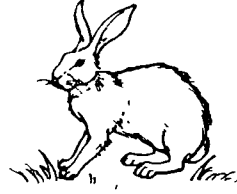
mouth south

march month



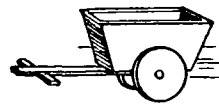
bumps band

build child



right rabbit

robin rather



card can't

part cart



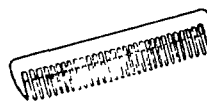
care page

clang cage



flour four

fold hour



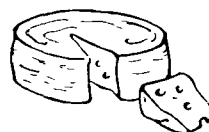
comb camp

come lamb



napkin pumpkin

pumping punches



cherry geese

cheese change

GATES PRIMARY READING TEST

For Grade 1 and Grade 2 (First Half)

Type 3. Paragraph Reading

FORM 2

Write your name here

When is your birthday?..... How old are you?.....

Date School Grade



1. Put an X on the ball.



3. Draw a line under the little book.



2. Put an X on the milk bottle.



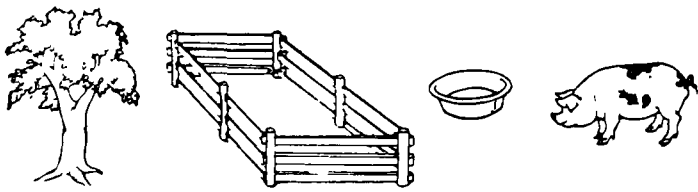
4. Draw a line from the pig to the tree.

To the Examiner: 1. See that each child has a pencil. 2 Distribute papers. 3. Have children fill in blanks at the top of the page. 4. Instructions to children: "We are going to see how well you can read. Do you see the stories and pictures on the front page of your booklet? Everyone look at the first story—up here (illustrating with your own copy). What does it say to do? (Have child answer.) That's right, put an X on the ball. Everyone find the ball and put an X on it. Be sure you put it right on the ball. (Check to see that they all have marked it correctly.) Now look at the box right under that one. What does this story tell you to do? (Have child answer.) That's right, put an X on the milk bottle. Everyone find the milk bottle on your paper and put an X on it. Be sure to put it on the bottle exactly as the story asks you to. (Check to make sure it is done correctly) Now look at the first box on the next side—up here (illustrating with your own paper). What does the story say to do? (Have pupil answer) That's right, draw a line under the little book. Be sure you find the little book, and be sure you draw the line under it exactly as the story asks you to. (Check to make sure papers are marked correctly.) Now look at the box under that one. What does this story ask you to do? (Have pupil answer.) That's right, draw a line from the pig to the tree Do it on your paper. Be sure it goes from the pig to the tree exactly as the

story asks you to. (Check to make sure it is done correctly) Do not open your books until I tell you to Now I am going to show you what we are to do next. On the inside of the book are some more pictures and stories. (Examiner holds up a copy of the test showing the inner pages.) You are to do No. 1 (Examiner points to it on his own copy), then go on and do No. 2, then do the next one, and the next one, etc. (Examiner points down first column, then second, etc., and also demonstrates order on all three pages) As soon as you have finished one story, you must go right ahead and do the next one right below it. Now remember, first, you are to read the story below the picture; then you are to take your pencil and do *exactly* what the story tells you to do. Do you understand? All right. Open your books and BEGIN Go ahead." 5. Inspect the work of each child; see that each works from top to bottom of columns and that each follows the pages in order. Urge the children individually to try the examples in order but *do not tell them the answers*. Discourage dawdling over difficult problems, tell them to try the next. 6. The signal STOP is given at the end of 20 minutes. Collect papers immediately 7 The score is the number of directions which are followed correctly. The mark made *must be* the one which is specified in "the story" to be correct. For further details with respect to this test see the Manual of Directions.

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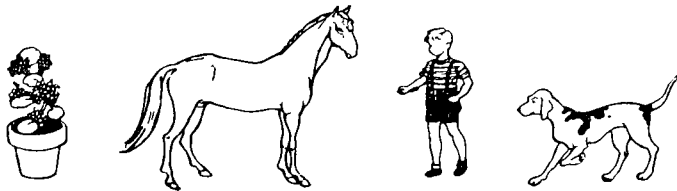
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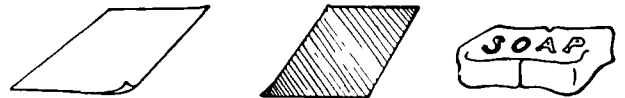
1. Put an X on the pig.



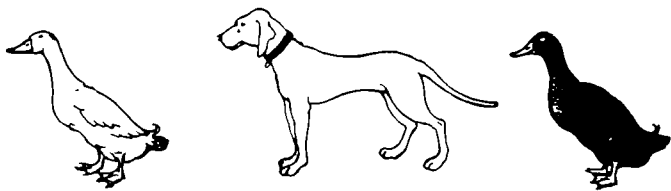
6. Draw a line under the house on the hill.



2. Put an X on the boy.



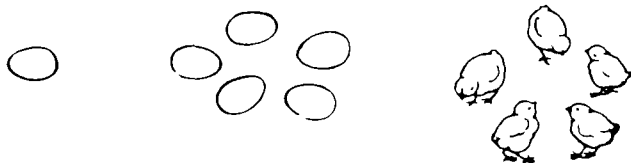
7. Put an X on the piece of white paper.



3. Draw a line under the white duck.



8. Put an X on the boy who is drinking.



4. Draw a line under the five eggs.



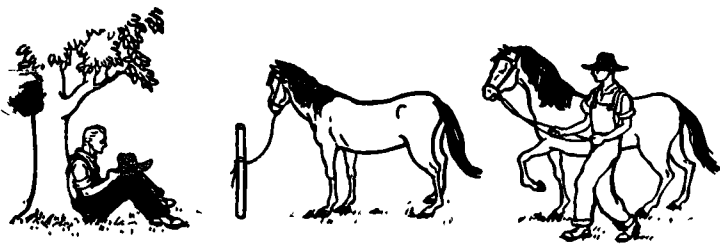
9. Put an X under the boat that has a flag.



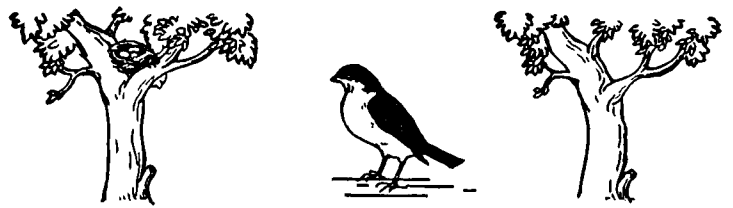
5. Draw a line under the big bag.



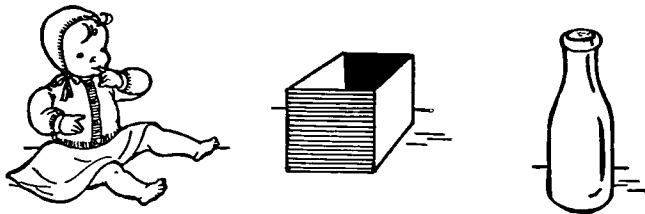
10. Draw a line under the ten that is big.



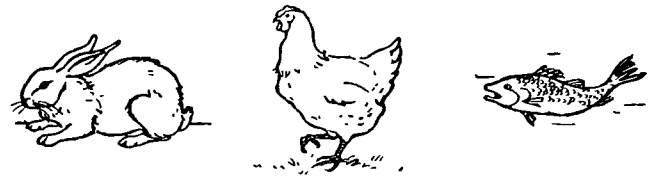
11. Put an X on the farmer who is walking by the side of his horse.



15. Draw a line from the robin to its nest. You will find the nest in the tree on the left side of the picture.



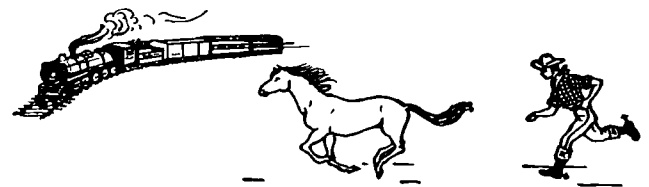
12. The baby likes milk to drink. Draw a line from the baby to the milk.



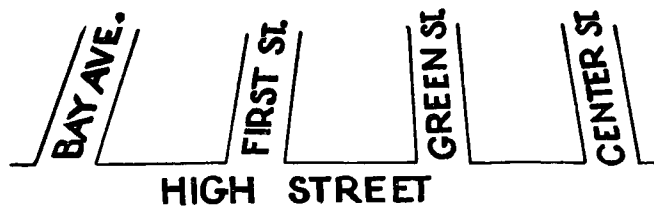
16. The rabbit and the hen live on the land. The fish lives in the water. Draw a line under the one that lives in the water.



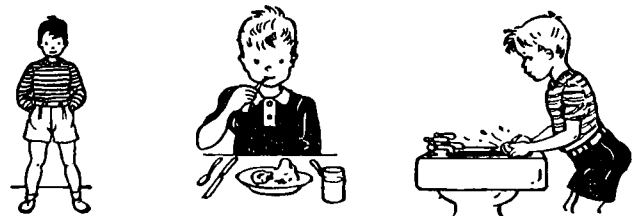
13. One of these dolls has lost her leg. Look for the leg, and make an X on it.



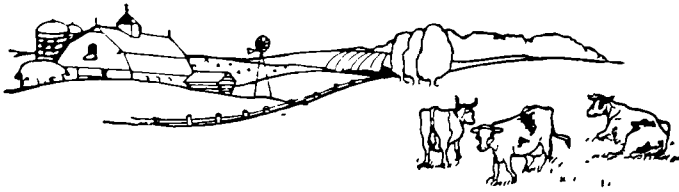
17. A train goes faster than a horse, and a horse goes faster than a man. Make an X on the train. It goes the fastest.



14. The school is on High Street between First Street and Green Street. Put an X where the school is.



18. "Always wash your hands before eating," said Mother. Draw a line under the boy who is doing what Mother told him to do.



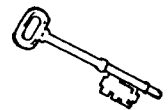
19. Every morning the cows leave the big barn. They go to the fields to eat grass. Look for the barn in the picture. Draw a line under it.



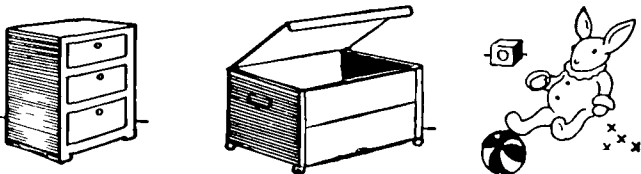
23. A father was looking for a house to live in. He passed many houses. One house had "House to Let" near it. He went into this house. Draw a line under the house into which the father went.



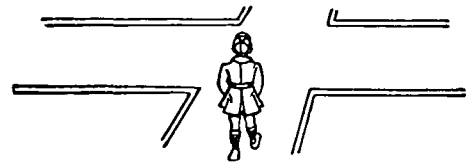
20. If you hold a paper in a fire, it will burn. A pan will not burn if it has water in it. Sand will put out a fire. Put an X on the thing that will burn.



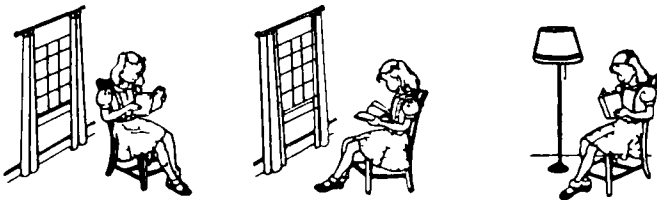
24. A little girl was crying. "Why are you crying?" asked a woman. "My mother gave me some money to buy milk and I lost it," she said. Find the thing the little girl lost, and mark it with an X.



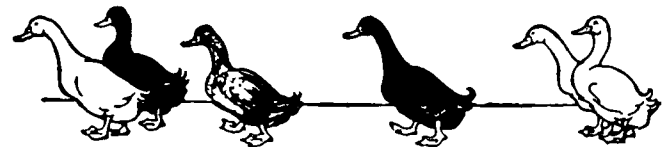
21. The little girl was playing with her toys. Mother said, "Put the toys away in the box." Draw one line from the toys to the place where Mother said they should be put.



25. A boy was walking down the street. He did not know which way to turn to go to the store. He asked a man. The man said, "Turn to your left." Draw a line showing which way the boy turned.



22. Sister is reading a book. She should sit with her back to the window. Then she will not hurt her eyes. Put an X on the picture which shows how sister should sit.



26. Some ducks were walking to the lake. A white duck and a black duck came first. Then came a brown duck and a black duck. Two white ducks came last. Draw a line under the ducks that came last of all.

GATES ADVANCED PRIMARY READING TESTS

For Grade 2 (Second Half) and Grade 3

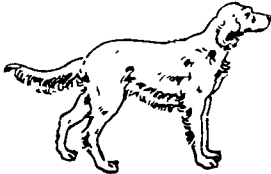
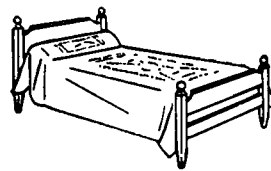
Type 1. Word Recognition


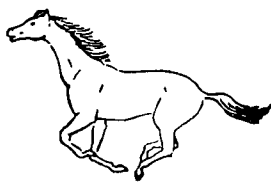
FORM 1

Write your name here

When is your birthday? How old are you?



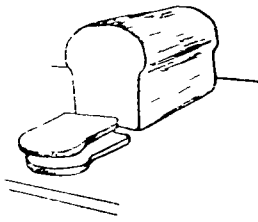





Date Grade School


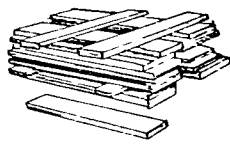
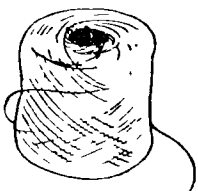


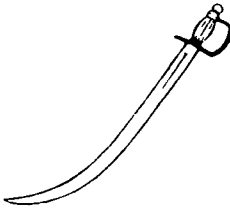
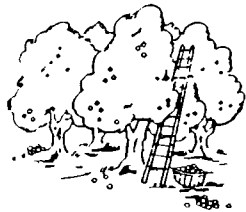

	did	egg
	dog	two
	be	bed
	bag	she


	may	make
	come	milk
	horse	play
	hose	house

To the Examiner: 1. See that each child has a pencil. 2. Distribute papers. 3. Have children fill in blanks at the top of the page (with your help). 4. Instructions to children: "I want you to look at the first picture, this one up here (holding up your copy and pointing to the picture of the dog). Next to it there are some words. One of the words goes with the picture. You are to draw a ring around that one word that tells about the picture. Put your finger on the word that belongs with the picture. What is it? (Let one child answer.) That's right, 'dog.' The four words are 'did,' 'egg,' 'dog,' and 'two' (pointing to the words on your own copy and making sure children look up at your copy). We are going to draw a ring around the word 'dog' because that's the one that tells the most about the picture. Everyone find the word 'dog' on your paper and draw a ring around it. (Check to make sure children have marked the correct word.) Now look at the box right underneath that one. Find the word there that goes with the picture. What is it? (Let a child answer.) That's right, 'bed.' The four words are 'be,' 'bed,' 'bag,' 'she.' We are going to draw a ring around the word 'bed' because that's the one that tells us the most about the picture. Everyone find the word 'bed' and draw a ring around it. (Check to make sure that each child has marked the correct word. Continue in the same way for the third and fourth boxes. When you are illustrating with your copy ask the children to look up if need be.)

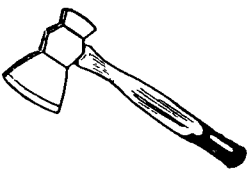
Do not open your books until I tell you to. Now I am going to show what we are to do next. Inside the book are some more pictures and words. (Examiner holds up copy of the test showing the inner pages.) You are to do the first one, then the next one below it, etc. (Examiner points down first column, then second, etc., and also demonstrates order on all three pages.) As soon as you have drawn a ring around the one word for one picture, go right ahead and do the next one. Now remember, first you are to look at the picture, then at the words next to the picture, then find the one word that goes best with the picture and make a ring around that one word. Make a ring around one word only for each picture. Do you understand? All right. Open your books and BEGIN. Go ahead." 5. Inspect the work of each child; see that each works from top to bottom of columns and that each follows the pages in order. Urge children individually to try the examples in order but *do not tell them the answers*. Discourage dawdling over difficult problems; tell them to try the next. Watch for children who make rings indiscriminately and tell them to make only one ring for each picture. 6. The signal STOP is given at the end of 15 minutes. Collect papers immediately. 7. The score is the number of exercises marked correctly minus one-third the number incorrect. If more than one word in an exercise is marked, that exercise is scored as incorrect. For further details see the Manual of Directions.

	paper	apple
	land	been
	floor	gold
	part	draw
	only	before
	bread	great
	lost	food
	man	fire
	green	horse
	woman	world
	valley	village
	snow	settle
	doctor	finger
	dinner	ocean
	plate	stamp
	swim	stair


	orange	carriage
	occupy	secret
	lumber	recover
	lover	button
	grind	throat
	string	stroke
	knee	ring
	hang	knew
	notice	forget
	stream	forest
	loose	swift
	worse	sword
	period	forehead
	organ	orchard
	insect	merit
	inquire	author




gross greedy
prisoner grocer




jacket hatch
hatchet hateful




distant meadow
frost merchant



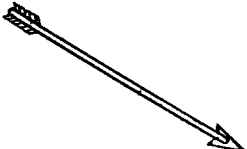
harbor annual
anchor appetite




onion onward
opinion ourself




slender slipper
closet supper




arrange arrow
owner hero



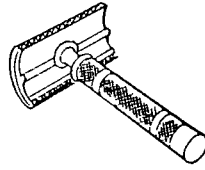
veil vigor
rail vice




stubborn trample
stumble stately



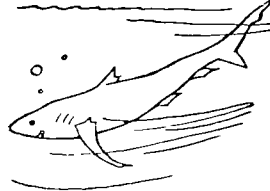
chirp chip
chill sharp




raisin realize
razor labor



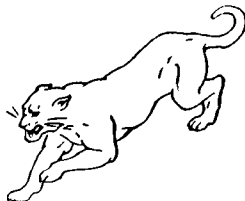
fast mast
task mask



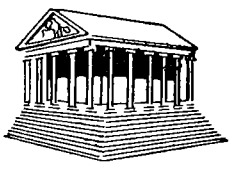
shamble shark
sheer hark



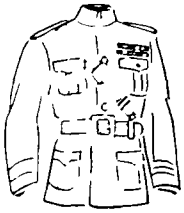
strike paint
study farm



final knife
fierce success



thread temple
needle thorn



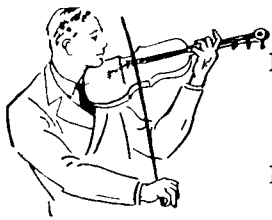
weave military

mystery mirror



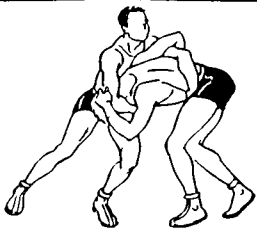
gymnasium grassy

gurgle gypsy



musician physician

museum mysterious



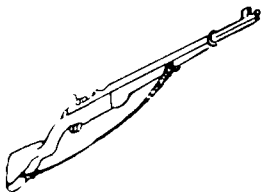
wriggle nestle

wrestle wringer



dragon dying

feeble dwelling



weapon weave

poison modest



statue slumber

glitter slope



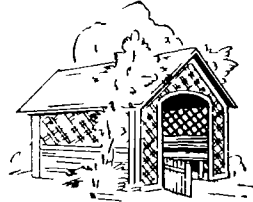
advertise admiral

moral affirm



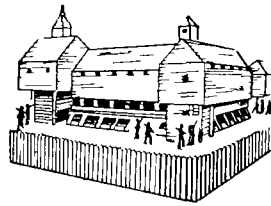
medical medal

model meddle



arbor argue

harbor apron



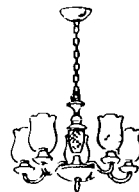
glimmer garrison

comparison garter



doughnut drawbridge

dormitory donation



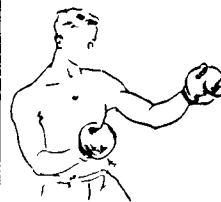
chocolate chandelier

chimpanzee chiffonier



equality epaulet

equestrian questioner



pulverize pursuer

puppet pugilist



rheumatic rhythmic

rhetorical rickety

GATES ADVANCED PRIMARY READING TESTS

For Grade 2 (Second Half) and Grade 3

Type 2. Paragraph Reading

FORM 1

Write your name here

When is your birthday? How old are you?

Date Grade School



1. Put an X on the ball.



3. Draw a line under the little book.



2. Draw a line around the milk bottle.



4. Draw a line from the pig to the tree.

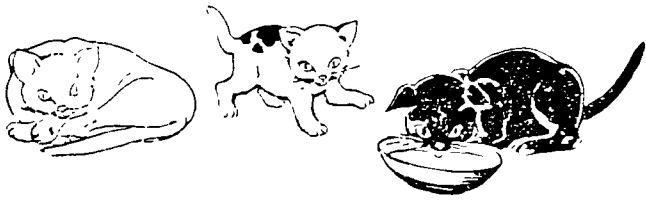
To the Examiner: 1. See that each child has a pencil. 2. Distribute papers. 3. Have children fill in blanks at the top of the page. 4. Instructions to children: "We are going to see how well you can read. Do you see the stories and pictures on the front page of your booklet? Everyone look at the first story—up here (illustrating with your own copy). What does it say to do? (Have child answer.) That's right, put an X on the ball. Everyone find the ball and put a cross on it. Be sure you put it right on the ball. (Check to see that they all have marked it correctly.) Now look at the box right under that one. What does this story tell you to do? (Have child answer.) That's right, draw a line around the milk bottle. Everyone find the milk bottle on your paper and draw a line around it. Be sure to put it all around the bottle exactly as the story asks you to. (Check to make sure it is done correctly.) Now look at the first box on the next side—up here (illustrating with your own paper). What does that story say to do? (Have pupil answer.) That's right, draw a line under the little book. Be sure you find the little book, and be sure you draw the line under it exactly as the story asks you to. (Check to make sure papers are marked correctly.) Now look at the box under that one. What does this story ask you to do? (Have pupil answer.) That's right, draw a line from the pig to the tree. Do it on your paper. Be sure it goes from the pig to

the tree exactly as the story asks you to. (Check to make sure it is done correctly.) **Do not open your books until I tell you to.** Now I am going to show you what we are to do next. On the inside of the book are some more pictures and stories. (Examiner holds up a copy of the test showing the inner pages.) You are to do No. 1 (Examiner points to it on his own copy), then go on and do No. 2, then do the next one, and the next one, etc. (Examiner points down first column, then second, etc., and also demonstrates order on all three pages.) As soon as you have finished one story, you must go right ahead and do the next one right below it. Now remember, first you are to read the story below the picture; then you are to take your pencil and do *exactly* what the story tells you to do. Do you understand? All right. Open your books and **BEGIN.** Go ahead." 5. Inspect the work of each child; see that each works from top to bottom of columns and that each follows the pages in order. Urge the children individually to try the examples in order, but *do not tell them the answers.* Discourage dawdling over difficult problems; tell them to try the next. 6. The signal **STOP** is given at the end of 25 minutes. Collect papers immediately. 7. The score is the number of directions which are followed correctly. The mark made *must be* the one specified in "the story" to be correct. For further details with respect to this test see the Manual of Directions.

BUREAU OF PUBLICATIONS, TEACHERS COLLEGE
COLUMBIA UNIVERSITY, NEW YORK

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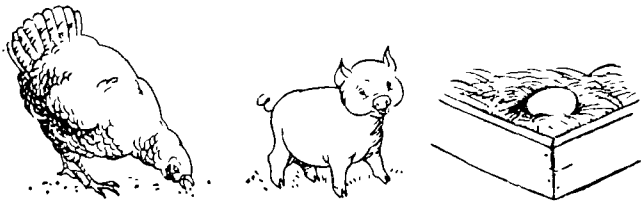
Printed in U. S. A.



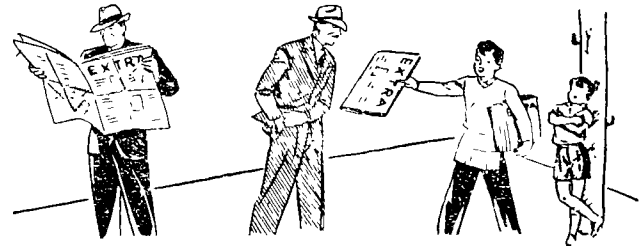
1. Put an X on the little white kitten with black spots on his back.



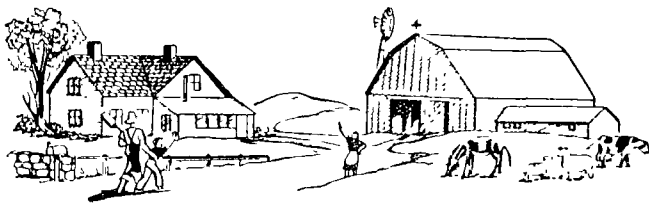
5. Nuts grow on trees. Draw a line from the squirrel to what he must climb to get his food.



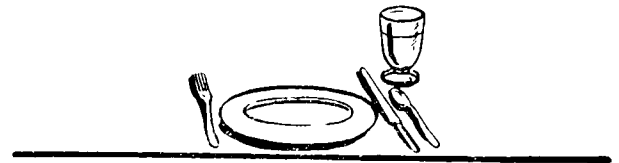
2. The hen has just laid an egg. Draw a line from the hen to her egg.



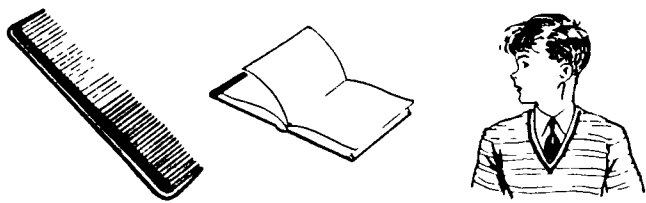
6. People buy newspapers. They like to read the news. Draw a line under the boy who has newspapers to sell.



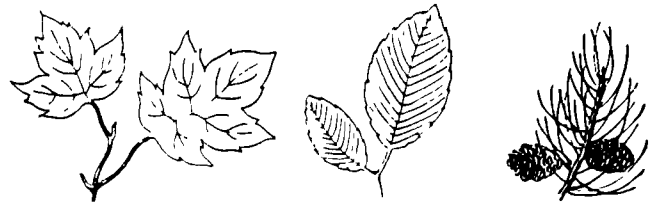
3. People live in houses. Animals live in barns. Put an X on the place where the animals live.



7. Mother set the table. She forgot the napkin at this place. It belongs next to the fork. Mark an X where the napkin belongs.



4. Every morning this boy combs his hair. Draw a line from the boy to what keeps his hair neat.



MAPLE

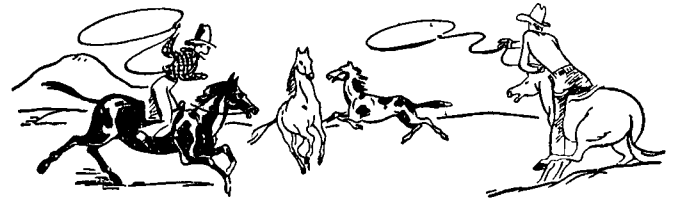
ELM

PINE

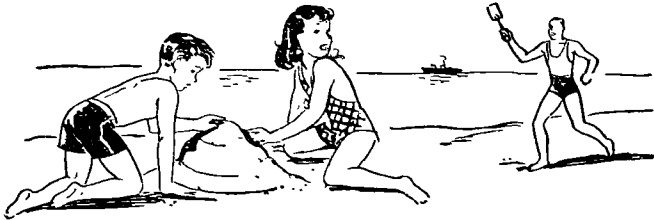
8. In the fall the maple trees lose their leaves. The pine is green all winter. Draw line under name of tree which does not lose its leaves.



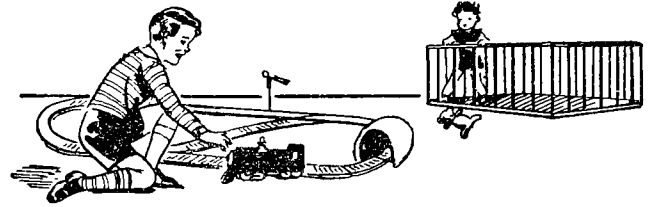
9. In this quiet village the church bells ring on Sunday morning. All the people go to church. Put an X on the place where the people go on Sunday morning.



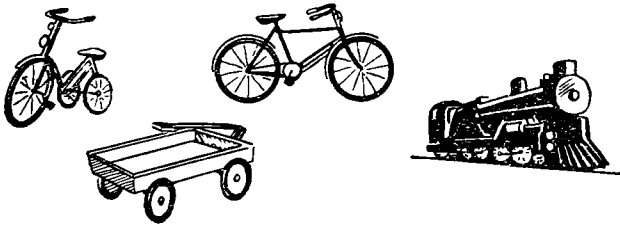
13. In the West some wild horses still live on the plains. Once a year men ride out to catch them. Find a picture of a horse that has not been tamed. Put an X on him.



10. Some children are playing on the beach. They want to dig in the sand. Father is bringing them something to use. Draw a line from it to the children.



14. Baby is playing in his pen. He has dropped his toy. Brother will get it for him. Look for the toy. Draw a line from the toy to the one who dropped it.



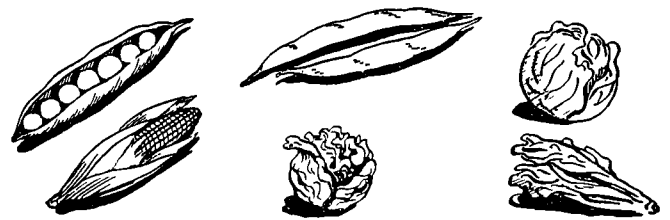
11. A bicycle has two wheels. Wagons and cars have four wheels. Engines often have six or eight. Draw a line under something that has two wheels.



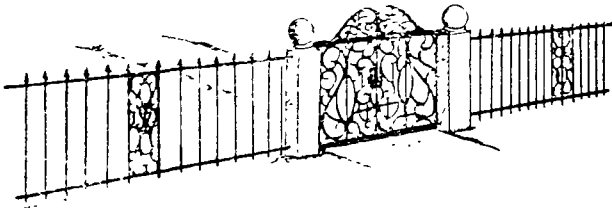
15. We had a big Thanksgiving dinner. First came soup and then turkey with vegetables. Last came pie and cheese. Make an X on the picture of the first thing eaten.



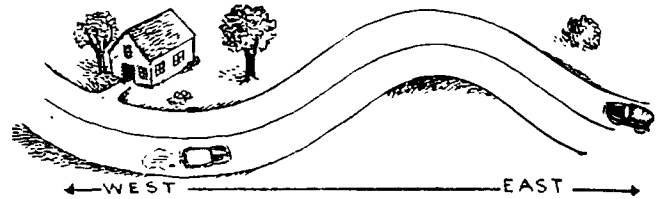
12. In the early days of our country people had to hunt in the woods for their food. They shot deer, rabbits, and even bears. Draw a line from the hunter's gun to something he shot in the woods.



16. Peas, beans, cabbage, and lettuce are green vegetables. Corn is a vegetable too, but it is yellow or white. Draw a line under a vegetable that is not green.



17. Arthur Brown lives on a large estate. Once a year his gardens are open to the public. Then the entrance gates are opened wide and the people drive in. Draw a line under the high fence which surrounds this estate and mark an X on what is opened to the public once a year.



21. This road has a dangerous curve in it. If people were warned of the curve there would be fewer accidents. Mark X where you would put a sign to warn cars traveling east. Mark O on the road to show where you would put a sign to warn cars traveling west.



18. Fans have long been in fashion. Thousands of years ago palm leaf fans were waved in Egypt. Beautiful ladies once carried feather fans to balls. Today we have electric fans whose blades are rubber. Put an X on the feather fan. Draw a line around the modern fan.

TRAIN	TRACK		REMARKS
NO. 42	NO. 18	ARRIVES	ON TIME
NO. 110	NO. 30	DEPARTS	11:42 A.M.
NO. 14	NO. 6	ARRIVES	10 MIN. LATE
NO. 7	NO. 26	DEPARTS	1 P.M.

22. Railway stations post arrivals and departures of trains on blackboards similar to the one above. If you wish to meet Train No. 42, it will arrive on time, coming in on Track No. 18. Draw a line around the number of the train that will be ten minutes late. Place an X on the track number of the train departing at 11:42 A.M.



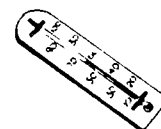
19. Our five senses — seeing, hearing, smelling, tasting, and touching — are represented by the pictures above of an eye, an ear, a nose, a mouth, and a hand. Which picture represents the sense of touch? Mark an X on it. Which picture represents the sense of smell? Draw a line around it.



23. From the stalks of the blue-flowered flax plant the ancient Egyptians wove linen to wrap their dead. Linen is still made from flax, but of greater importance is the oil from its seeds, used in making paint. Put an X on the part of the plant used for linen. Draw a line around the picture showing the use of a modern product of flax seeds.



20. Mary is making an apron. She is going to trim it with lace and ribbons. The lace will go around the edge of the apron and a bow of ribbon will go on each pocket. Draw a line from each bow to its place on the apron. Mark an X on what will go around the edge of the apron.



MERCURY
DEGREES
ZERO
EXPANDS
CONTRACTS

24. A thermometer measures temperature. Mercury, enclosed in a glass tube, rises when heat increases and contracts when heat decreases. We read the temperature in degrees above and below zero. Put an X on the word that tells how mercury acts when it grows colder. Draw a line under the word that tells in what form temperature is read.

GATES ADVANCED PRIMARY READING TESTS

For Grade 2 (Second Half) and Grade 3

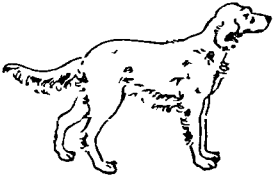
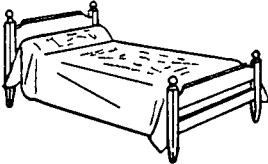
Type 1. Word Recognition


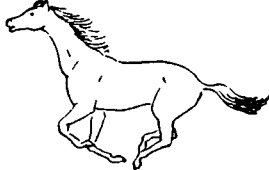
FORM 2

Write your name here

When is your birthday? How old are you?

Date Grade School

	did	egg
	dog	two
	be	bed
	bag	she

	may	make
	come	milk
	horse	play
	hose	house

To the Examiner: 1. See that each child has a pencil. 2. Distribute papers. 3. Have children fill in blanks at the top of the page (with your help). 4. Instructions to children "I want you to look at the first picture, this one up here (holding up your copy and pointing to the picture of the dog). Next to it there are some words. One of the words goes with the picture. You are to draw a ring around that one word that tells about the picture. Put your finger on the word that belongs with the picture. What is it? (Let one child answer) That's right, 'dog.' The four words are 'did,' 'egg,' 'dog,' and 'two' (pointing to the words on your own copy and making sure children look up at your copy). We are going to draw a ring around the word 'dog' because that's the one that tells the most about the picture. Everyone find the word 'dog' on your paper and draw a ring around it. (Check to make sure children have marked the correct word.) Now look at the box right underneath that one. Find the word there that goes with the picture. What is it? (Let a child answer.) That's right, 'bed.' The four words are 'be,' 'bed,' 'bag,' 'she.' We are going to draw a ring around the word 'bed' because that's the one that tells us the most about the picture. Everyone find the word 'bed' and draw a ring around it. (Check to make sure that each child has marked the correct word. Continue in the same way for the third and fourth boxes. When you are illustrating with your copy ask the children to look up if need be.)

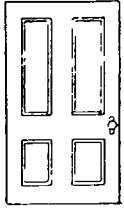
Do not open your books until I tell you to. Now I am going to show what we are to do next. Inside the book are some more pictures and words. (Examiner holds up copy of the test showing the inner pages.) You are to do the first one, then the next one below it, etc. (Examiner points down first column then second, etc., and also demonstrates order on all three pages.) As soon as you have drawn a ring around the one word for one picture, go right ahead and do the next one. Now remember, first you are to look at the picture, then at the words next to the picture, then find the one word that goes best with the picture and make a ring around that one word. Make a ring around one word only for each picture. Do you understand? All right. Open your books and BEGIN. Go ahead." 5. Inspect the work of each child, see that each works from top to bottom of columns and that each follows the pages in order. Urge children individually to try the examples in order but *do not tell them the answers.* Discourage dawdling over difficult problems, tell them to try the next. Watch for children who make rings indiscriminately and tell them to make only one ring for each picture. 6. The signal STOP is given at the end of 15 minutes. Collect papers immediately. 7. The score is the number of exercises marked correctly minus one-third the number incorrect. If more than one word in an exercise is marked, that exercise is scored as incorrect. For further details see the Manual of Directions.

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water mother
round morning



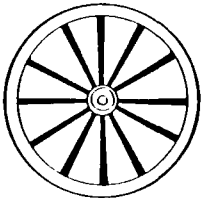
deep king
door paper



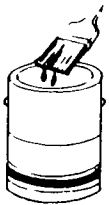
plant person
front come



picture people
country change



whom fellow
wheel mail



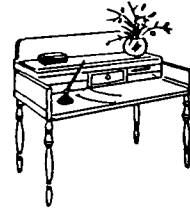
farmer party
inch paint



dance fence
date prince



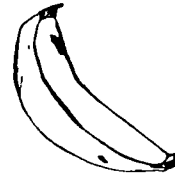
shoulder travel
finish finger



check desk
flesh desert



sparrow sparkle
squirrel reveal



bacon beware
banana innocence



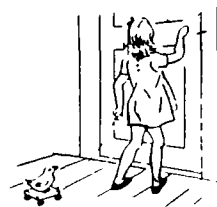
room friend
warm field



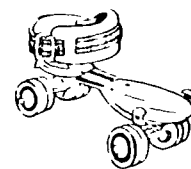
shake smoke
weak smile



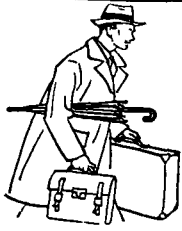
smooth steal
smell vessel



knight folk
knock nurse



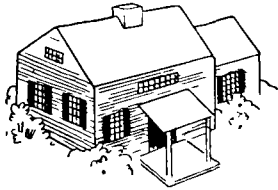
skirt skate
shriek slain



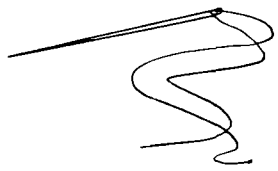
trick traveler
 prisoner treasure



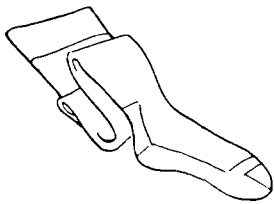
overcoat overthrow
 overhead oyster



central manage
 cottage seldom



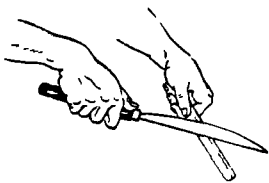
neglect saddle
 needle seldom



blessing stranger
 shepherd stocking



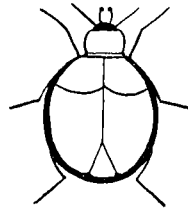
cloudy cluster
 closet differ



shatter shave
 sharpen serpent



pantry launch
 laundry lavish



beetle beguile
 beet bridle



bald badge
 beau ridge



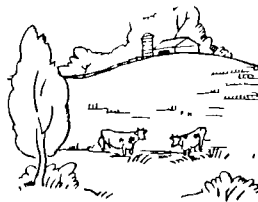
housewife holiness
 housetop hemisphere



remorse reindeer
 reprove rooster



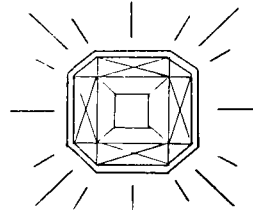
banjo bandage
 blanket bandit



message material
 swallow meadow



religion warrior
 author weave

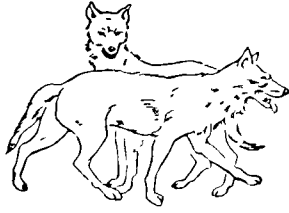


joint local
 jewel compel



goodly good-by

address goddess



wizzard wove

wolves whereof



secrecy seasick

sexton seashore



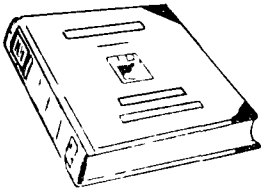
foam fowl

fatal frail



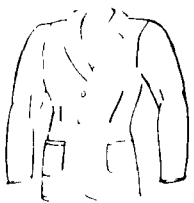
settlement ordinary

innocent ornament



virtue vote

volume pasture



garment instant

govern benefit



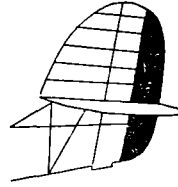
footman formal

foliage marriage



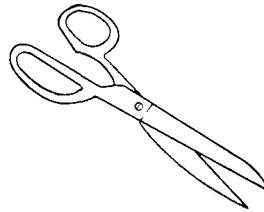
kennel kernel

kimono knuckle



ruddy rumple

rudder rocker



cutlass cuticle

cutthroat cutlery



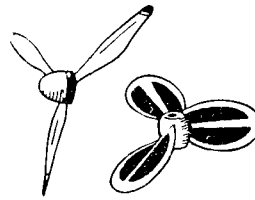
battery poultice

posterior pottery



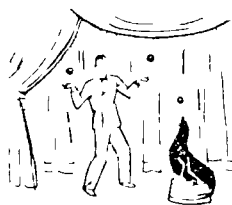
symposium syndicate

symphony sycamore



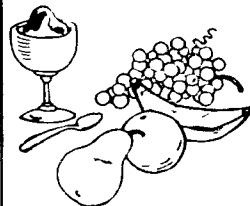
propellers promoters

projectiles profiles



vaporous velocipede

vanguard vaudeville



palatial palatable

parchment perfumery

GATES ADVANCED PRIMARY READING TESTS

For Grade 2 (Second Half) and Grade 3

Type 2. Paragraph Reading

FORM 2

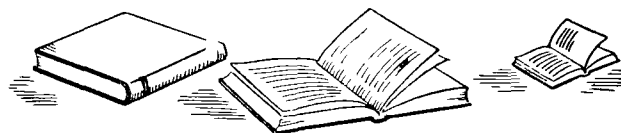
Write your name here

When is your birthday? How old are you?

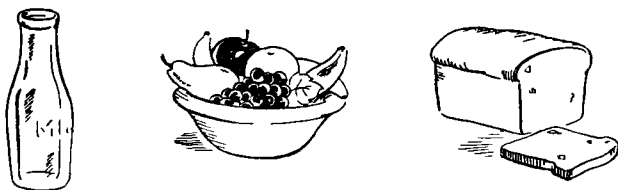
Date Grade School



1. Put an X on the ball.



3. Draw a line under the little book.



2. Draw a line around the milk bottle.



4. Draw a line from the pig to the tree.

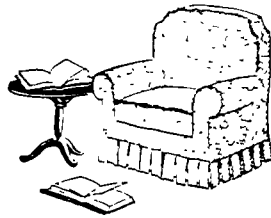
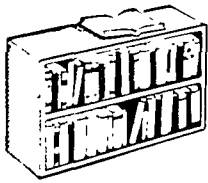
To the Examiner: 1. See that each child has a pencil. 2. Distribute papers. 3. Have children fill in blanks at the top of the page. 4. Instructions to children: "We are going to see how well you can read. Do you see the stories and pictures on the front page of your booklet? Everyone look at the first story—up here (illustrating with your own copy). What does it say to do? (Have child answer.) That's right, put an X on the ball. Everyone find the ball and put a cross on it. Be sure you put it right on the ball. (Check to see that they all have marked it correctly.) Now look at the box right under that one. What does this story tell you to do? (Have child answer.) That's right, draw a line around the milk bottle. Everyone find the milk bottle on your paper and draw a line around it. Be sure to put it all around the bottle exactly as the story asks you to. (Check to make sure it is done correctly.) Now look at the first box on the next side—up here (illustrating with your own paper). What does that story say to do? (Have pupil answer.) That's right, draw a line under the little book. Be sure you find the little book, and be sure you draw the line under it exactly as the story asks you to. (Check to make sure papers are marked correctly.) Now look at the box under that one. What does this story ask you to do? (Have pupil answer.) That's right, draw a line from the pig to the tree. Do it on your paper. Be sure it goes from the pig to

the tree exactly as the story asks you to. (Check to make sure it is done correctly.) Do not open your books until I tell you to. Now I am going to show you what we are to do next. On the inside of the book are some more pictures and stories. (Examiner holds up a copy of the test showing the inner pages.) You are to do No. 1 (Examiner points to it on his own copy), then go on and do No. 2, then do the next one, and the next one, etc. (Examiner points down first column, then second, etc., and also demonstrates order on all three pages.) As soon as you have finished one story, you must go right ahead and do the next one right below it. Now remember, first you are to read the story below the picture; then you are to take your pencil and do *exactly* what the story tells you to do. Do you understand? All right. Open your books and BEGIN. Go ahead." 5. Inspect the work of each child; see that each works from top to bottom of columns and that each follows the pages in order. Urge the children individually to try the examples in order, but *do not tell them the answers*. Discourage dawdling over difficult problems, tell them to try the next. 6. The signal STOP is given at the end of 25 minutes. Collect papers immediately. 7. The score is the number of directions which are followed correctly. The mark made *must be* the one specified in "the story" to be correct. For further details with respect to this test see the Manual of Directions.

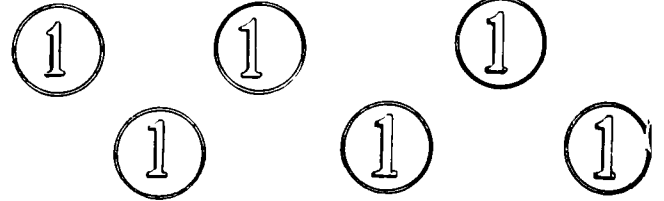
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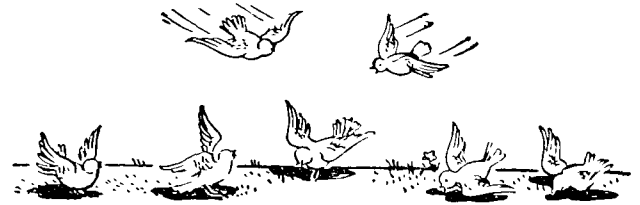
1. Put an X on the book that is lying on the little table near the big chair.



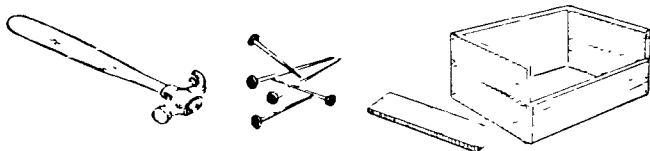
5. Here are six pennies. Five of them will make a nickel. Draw a line around enough pennies to make one nickel.



2. Children like to drink milk. Draw a line from the boy's cup to the bottle.



6. Seven baby robins are learning to fly! Draw a line around the robins that have left the ground.



3. You need a hammer to pound nails into wood. Draw a line from the hammer to the nails.



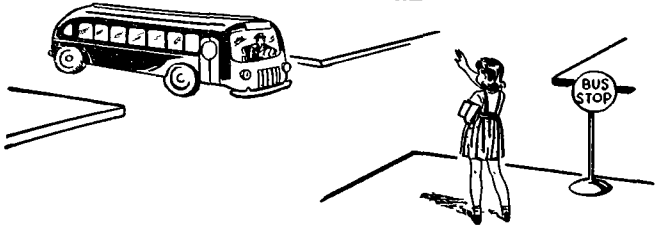
7. Do you like to go camping? It is fun to sleep in a tent. Draw a line under something you might take on a camping trip.



4. Here are shoes, slippers, rubbers, and boots. Put an X on the best thing to wear for walking in deep snow.



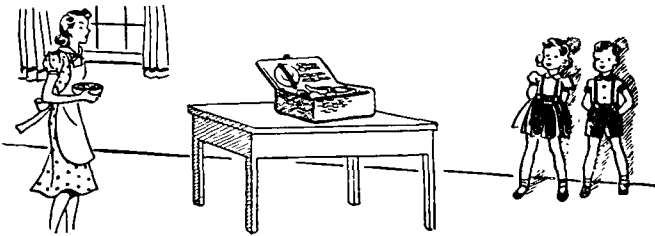
8. Five o'clock and it's time for tea! Milk and sugar are ready. The tea is in the pot. Draw a line from the tea to the place it will be poured.



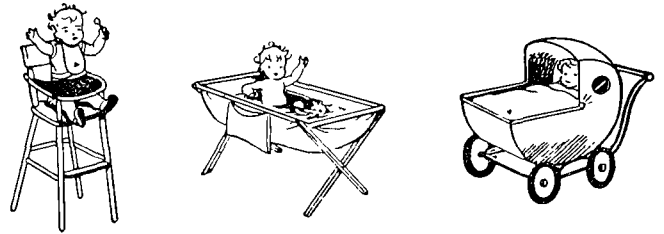
9. This little girl is waiting for the big bus. It is bringing her sister home. Look for the driver of the big bus. Draw a line from him to the little girl.



13. A pumpkin with a funny face stands for Hallowe'en and a lighted tree for Christmas. Easter brings Bunny with her basket of eggs. Put X on what stands for Hallowe'en:



10. The children want to have a picnic. Mother will pack their basket with sandwiches, fruit, and milk. Draw a line from the basket to the one who will pack it.



14. Every morning Mother gives Baby a bath in his own little tub. He laughs and splashes. Look for Baby's tub and draw a line around it.



11. A carpenter wanted to cut a board. He went to his tool box for his saw. Draw a line from the tool box to the one who is going to saw the board.

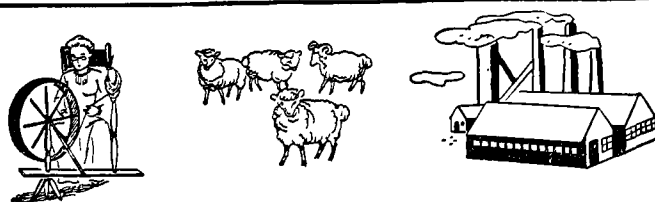
APRIL

FRIDAY

AUGUST

FEBRUARY

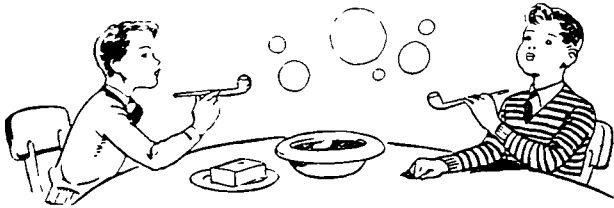
15. February, April, and August are the names of three months. Friday is the name of a day of the week. Draw a line under the word that is not the name of a month.



12. Long ago people used spinning wheels to spin wool into thread. Now wool goes straight from the sheep's back to the factory. Put X on a picture that shows the old way of making wool thread.



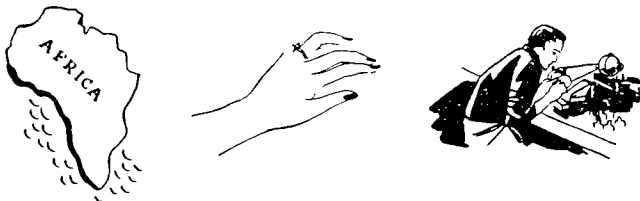
16. The children get up at seven to be ready for breakfast at eight. They are home for lunch by twelve. Draw a line under the clock which tells when breakfast starts.



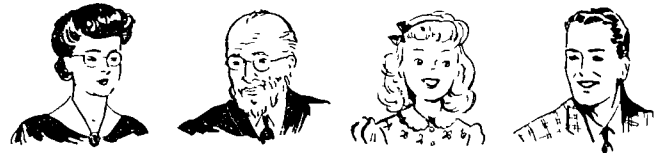
17. Dick and David spent the afternoon blowing bubbles. First they collected their clay pipes, soap, and some water. Then they began to blow. Their biggest bubble touched the ceiling before it broke. Put an X on the biggest bubble and draw a line under the things the boys used.

FEBRUARY						
SUN	MON	TUES	WED	THUR	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

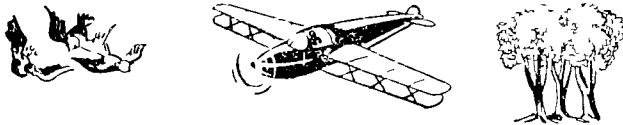
21. February is the shortest month of the year. It contains only twenty-eight days. There are two important holidays in February. Washington's birthday falls on Sunday, the twenty-second, and Lincoln's just ten days earlier. Draw a line around the date of Lincoln's birthday, and mark an X on Washington's.



18. The white, glittering stone that you see in a mother's ring is a diamond. The best diamonds are found in Africa. They are mined like coal and must be polished. Draw a line around the man who is polishing a diamond. Put an X on the name of the place where it was found.



22. Under the provisions of old Mr. Brown's will, his middle-aged daughter inherited the plantation on which he had lived most of his life. The largest part of his estate, however, went to his nephew Charles, with only small sums to charities. Put an X on the heir who received the largest share. Draw a line under the one who received the plantation home.



19. Elm trees sometimes get "Dutch Elm Disease." To prevent this disease from spreading, many states send men in airplanes over the country looking for it. They inform the owner who must cut down his diseased tree. Draw a line under what gets "Dutch Elm Disease." Put an X on what spots it.

GLASSES
REGISTER
LICENSE
FEE

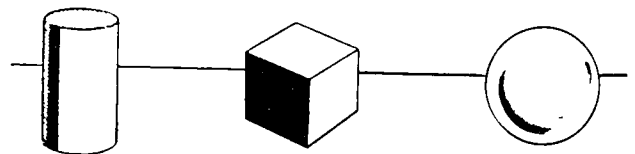
STATE
FEDERAL
TOWN
COUNTY

23. Every car must be registered with the state in which its owner resides. For the payment of a fee, he receives a license plate. To drive, the owner must pass the required tests for a driver's license. Draw a line around the word that tells with what cars must be registered. Put an X on the word that tells what every driver must obtain.

LONDON
NEW YORK
ROME

UNITED STATES
ITALY
ENGLAND

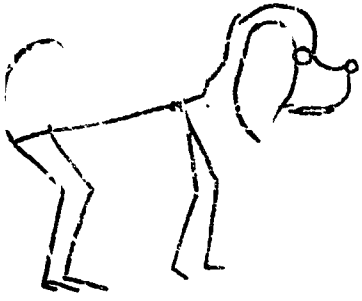
20. The largest and most important city is usually the capital of the country. London is the capital of England and Italy has the city of Rome for its capital. Draw a line from England to its capital. Put an X on the country that has Rome as its capital.



24. The cylinder, the cube, and the sphere are solids. If sections were cut down through the center of each of these three solids, the resulting sections would be a rectangle, a square, and a circle. Draw a line under the solid that produces the circle when cut. Put an X on the solid that produces the rectangle when it is cut.

APPENDIX II

SAMPLES OF WORK SHEETS DESIGNED FOR USE IN TEACHING BY THE
PHONETIC-KINESTHETIC METHOD DESCRIBED IN THIS REPORT

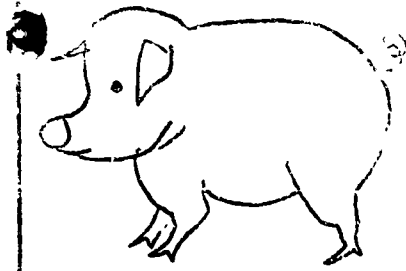


D

D d

d

ad	ad	ad
lad	lad	lad
mad	mad	mad
nad	nad	nad
rad	rad	rad
sad	sad	sad
bad	bad	bad
pad	pad	pad
kad	kad	kad



P p

P
P
P
P

pen

pick

put

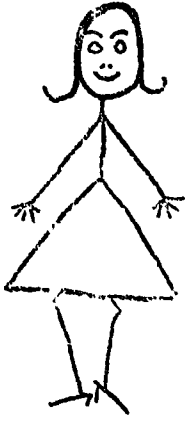
paddle

put on the

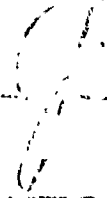
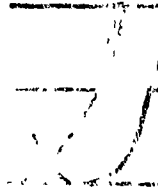
put in the

put on the

put on the



G g



ot

apple
apple

apple

must

will

sat

grill

hunter

cannot

gets

hunts

cup

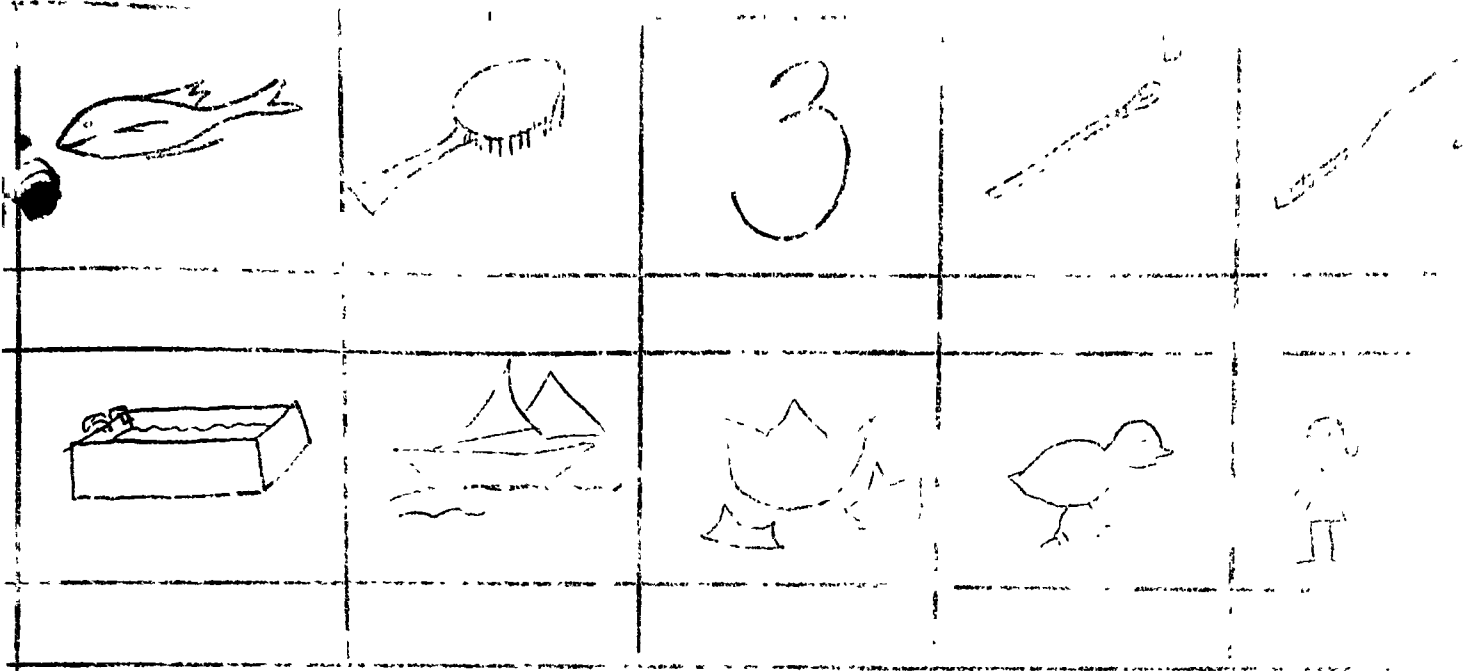
supper

verse

etern

clipper

spots



sh ch th sth

op	pic	mu
em	su	de
cut	re	me
ten	an	it
mon	mi	au
st	mov	is
wh	nd	la

1. One stick is long; the other is _____.
2. The wind make him _____.
3. I can see _____.
4. A man can hit with a _____.
5. This cut has a hand _____.
6. A dress is made of _____.
7. A little hen is a _____.

fish
stick
snow
cloth
short
chicken

e + — e		o + — e	
l + — e		u + — e	
saf —	tabl —	cu —	stur —
mak —	tam —	us —	quit —
nam —	hat —	pi —	tiu —
lat —	car —	mil —	nos —
plat —	juv —	li —	nos —
mad —	bit —	bus —	bu —
gav —	dim —	ful —	com —
cam —	not —	vir —	don —
pal —	hop —	tit —	alov —
flam —	rob —	li —	li —
rod —	refus —	si —	si —
to —	confus —	si —	si —
ho —	bid —	si —	si —
hom —	wir —	not —	dis —
mul —	dik —	si —	na —
tub —	car —	si —	si —
tun —	rip —	si —	si —
duk —	mil —	si —	slip —
cur —	rat —	si —	pi —
pur —	wir —	si —	bi —
glu —	rod —	si —	gap —
su —	mut —	si —	am —
flut —	mul —	si —	cut —
du —	not —	si —	li —
	hol —	si —	li —

u + e

= ue

some of the

ew

has the u-sound

blue

flue

glue

due

Sue

new

few

pew

dew

mew

stew

blew

flew

stew

chew

threw

drew

screw

strew

news

news paper

jewel

1. Jim has a new _____. (gun, bugle, drum)
2. The elephant is _____. (dusty, hungry, huge)
3. The _____ ran away. (bunny, mule, bug)
4. It was an _____ story. (funny, cunning, amusing)
5. Mother put _____ into the water.
(ice cubes, brush, rug)

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. The _____ went ashore at Halifax. 2. The wind had _____ the leaves. 3. The smallest puppy _____ to be the largest dog. 4. In the morning there is _____ on the grass. 5. Always _____ your food very well. 6. Bob _____ a picture for his story. 7. In winter, the wind _____ the snow. 8. James _____ the ball farther than any other boy. 9. There are just a _____ candies left 10. I like to eat beef _____. | <p>crew</p> <p>strew</p> <p>drew</p> <p>screw</p> <p>chew</p> <p>threw</p> <p>withdrew</p> <p>grew</p> <p>stew</p> <p>screws</p> <p>jewel</p> <p>flew</p> |
|--|---|

Change <u>y</u> to <u>i</u> Add <u>es</u>	Add <u>ly</u>	Add <u>ing</u>
lily _____	near _____	love _____
fairy _____	hard _____	go _____
berry _____	clear _____	swim _____
city _____	dear _____	like _____
sky _____	soft _____	help _____
hurry _____	year _____	trap _____
candy _____	sweet _____	plan _____
carry _____	main _____	keep _____
fry _____	exact _____	smoke _____
dry _____	loud _____	save _____

1. On stormy days the _____ are grey. (sky)
2. Lane always _____ to do her work well. (try)
3. In the middle of the forest is a glen where the _____ dance. (fairy)
4. Sally picked _____ in June. (strawberry)
5. _____ are not good for teeth. (Candy)
6. There were _____ in church at Easter. (city)

1. Tell me _____ what happened. (exact)
2. Father will _____ meet you at the station. (just)
3. The crow cawed _____. (loud)
4. The clock chimes _____ (hour)
5. Louise skipped _____ down the street. (gay)
6. The tree was _____ in front of him. (square)

1. I like to go _____ in summer. (swim)
2. Timmy was _____ to school for the first time. (go)
3. Miss Smith is just _____ to read the story. (begin)
4. Are you _____ a letter to Aunt Mable? (write)
5. Last night we saw a _____ star. (fall)
6. The exhibition is _____ today. (close)

Suffixes

-tion (ation, ition, sion, ion)

-ment

-ness

-ance (ence, ancy, ency)

motion vacation position mission champion	agreement shipment apartment assortment	goodness sickness lightness thickness	allowance vacancy evidence agency
---	--	--	--

1. The place where something is (locate)
2. Knowledge (inform)
3. Getting ready (prepare)
4. Taken away from something (separate)
5. A guard against something (protect)
6. An amount of money paid (pay)
7. A place to live (apart)
8. High state of interest. (excite)
9. Not careful (care)
10. Amount of speed (swift)
11. Without speed (slow)
12. Lack of weight (light)
13. Money given for spending (allow)
14. A service (agent)

1. A vine that grows grapes is a _____
2. When something is all around us, we say it is _____
3. The night of this day is called _____
4. My mother's mother is my _____
5. A baby rose is a _____
6. A ball made of snow is a _____
7. What father reads every night is a _____
8. A tree that does not lose its leaves is called an _____
9. Something to scare birds away from a corn field is a _____
10. A wide road outside the city is called a _____
11. The second part of the day is called the _____
12. A kind of porridge is _____
13. A room where pupils gather with their teacher _____
14. The skin of a bear is a _____
15. A man who delivers letters is a _____
16. Riding on a horse is called riding _____

horse _____
mail _____
grape _____
every _____
to _____
rose _____
grand _____
bear _____
class _____
oat _____
after _____
high _____
scare _____
even _____
news _____
snow _____

APPENDIX III

ABSTRACT OF

The Effect of Phonetic-Kinesthetic Training on the Measurable Reading Performance of Primary Pupils with Reversal and Inversion Difficulties¹

During the last decade and a half there has been considerable concern in educational, psychological and neurological circles over the child who despite no apparent physical, intellectual or emotional handicap, nevertheless could not learn to read adequately because of tendencies to reversals and inversions in letters, and to reversals and other confusions in words and order of words in phrases. At least six theories have been put forth and are still held in various centres as to why these children experience difficulty. These theories are those based on: mixed cerebral dominance, crossed dominance, left dominance, delayed development in spatial orientation, poor visual memory, and a final theory in which the difficulty is not recognized as a specific one. The report presents an extensive survey of the literature.

The investigator undertook to discover whether these children could be helped to learn to read by a method which

¹Doris Sutherland deMerlis, doctoral thesis presented to the School of Psychology and Education of the University of Ottawa, 1959, xi to 233 p.

stresses phonetic and kinesthetic contact with letters and words as well as by the necessary visual contact. A group of twenty-five primary children having the described difficulty were selected from Grades I, II and III, over a three-year period. These pupils were subjected to an intensive Phonetic-Kinesthetic training over eight months periods, using mainly materials especially developed to suit the method.

At the beginning of the training period the pupils in the experimental group with the exception of Grade I pupils, were retarded six months or more in reading skill. Each child, including the Grade I group seemed to show a high proportion of characteristic reversals and inversions and each seemed to fit at least one of the theories mentioned.

Three sub-hypotheses were developed about the possible effects of the training. The first two were:

a) The measurable reading performance of primary children with the described difficulty will not improve significantly with Phonetic-Kinesthetic training.

b) If there is significant improvement, the reading age indicating the measurable reading performance at the end of the training period will be significantly less than the expected reading age corresponding to mental age.

Drawing from possibly related factors described in the literature and from those variables usually associated with normal progress in reading, a third sub-hypothesis was formulated in an effort to gain as much information as possible about differences in performance under the experimental method.

c) Differences in measurable reading performance at the beginning and at the end of the training are not related to:

1. Grade level and amount of time spent in the regular classroom before entering the experimental group.
2. Intelligence Quotient.
3. Quotients in Perception or Space.
4. Sex.
5. Presence or absence of speech or auditory confusion.
6. Diagnostic group.

The Gates Primary and Gates Advanced Primary tests were used to measure performance at both the beginning and the end of the training period. Reading ages have been transformed into reading quotients using the formula reading age over mental age and the results multiplied by 100 for most of the statistical presentation.

The first sub-hypothesis was shown to be null because there was a difference of 14.9 in mean reading quotients between the beginning and the end for the total group, in Word Recognition, and of 10.8 in Paragraph Reading. The differences were significant at the .01 level. The mean amount of improvement during the eight months training period was 21.2

months in Word Recognition and 19.1 in Paragraph Reading for Grade I, 23.0 in Word Recognition and 25.2 in Paragraph Reading for Grade II, and 18.6 in Word Recognition and 23.6 in Paragraph Reading for Grade III.

Sub-hypothesis (b) was shown to be null also. At the end of the training period, in the total group there were no significant differences in means in favour of the expected reading quotient of 100. In Grade I the final reading quotient was 111.3 in Word Recognition and 109.2 in Paragraph Reading. The Grade II final quotients were both 105.4 and Grade III quotients were 96.0 and 97.6. The higher Grade I quotients were explained as due to a partial preparation for the test because of the method used, an experience not shared by the standardization sample of the tests used.

Examination of the variables listed in the third sub-hypothesis, in regard to the total group showed no relationship to the initial amount of retardation nor to the final quotient except in Grade level and amount of time spent in the regular classes before entrance to the special class. In this the Grade I group showed significantly higher performance at the end than the Grade III group probably due to lesser retardation at the beginning and to the possible test differences already mentioned.

There was a tendency toward an apparent lesser performance by the group called Mixed Dominance than by the groups labelled Crossed Dominance and "others". When the Grade I pupils were removed from the sample due to the reasons stated above and also due to the greater likelihood of incorrect diagnostic placement, the group called Mixed Dominance stood out as a relatively homogenous group with a mean performance inferior to the others. The difference in mean reading quotients with the group called "others" was 13. in Word Recognition at the beginning and 12.7 at the end, significant at the .01 level and the .05 level respectively, and in Paragraph Reading 13.6 at the beginning and 15.6 at the end, both significant at the .01 level. Compared with the Crossed Dominance group, the differences appeared large between the latter group and the group called Mixed Dominance but were significant in Word Recognition at the end of training at the .05 level only. Both groups Crossed Dominance and "others" were quite heterogenous and the suggestion of further inexactitude of diagnostic category was made.

It was suggested that the real differences in the experimental group were probably due to the cause of the specific difficulty. This is possibly why the emphasis has been on mixed and crossed dominance in clinical situations where only the most severe cases of retardation appear, and

on delayed development, poor visual memory and the arguments of no specific cause, in classroom situations where most of the children examined would belong in these categories. The continuing reversal and inversion tendencies of children diagnosed as mixed dominance was noted and compared with the gradual disappearance of these habits in the other groups.

There was not complete satisfaction with the progress of some subjects after they had left the experimental class and suggestions were made for further study of later progress and of a methodology usable with older children. Suggestions were made also, for continued study of the methods and materials of the Phonetic-Kinesthetic approach used in the study with a view to improvement and refinement of techniques.

An appeal was made for better instruments to detect reversals patterns and to improve differential diagnosis.