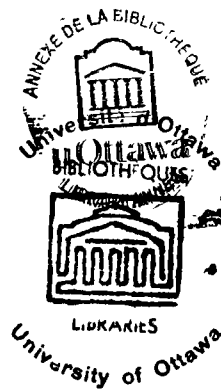


THE INTERACTIVE EFFECT OF STYLE OF SHORT-TERM MEMORY
AND EXPOSURE TO SEMANTIC AND ALPHABETIC MATERIALS ON
ACHIEVEMENT IN FIRST GRADE ORAL READING

by Robert M. Whittle

Thesis presented to the School of Graduate Studies
as partial fulfillment of the requirements for the
degree of Ph.D. in Education



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CURRICULUM STUDIORUM

Robert M. Whittle was born October 11, 1937, in Ottawa, Ontario. He received the Bachelor of Arts degree in English and History from McMaster University in Hamilton Ontario, in 1964. He received the Master of Education degree from the University of Ottawa in 1968. The title of his interim research report was The Relationship of Perceptual Development to Achievement in Learning Tasks Associated with Three Methods of Teaching Reading.

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INTRODUCTION

In the past, efforts to improve the teaching of reading in the elementary schools have been limited by the inconclusive findings of methods studies. Although methods of teaching beginning reading have been debated for years, insufficient attention has been paid to discovering the most appropriate ways of individualizing materials and instructional strategies. Only recently and in the current decade has attention been focused upon the nature and needs of the individual faced with the task of learning to read.

Some segments of the research literature in beginning reading have recognized the uniqueness of the individual reader to the extent where questions such as Emerald Dechant's were raised for consideration.

In evaluating reading methods it seems legitimate to ask: Which method best develops the child's skill in attacking new words? Which method makes him self-directive in identifying new words?¹

A second and more specific question posed by Singer² is included here as a point of departure for the purpose of the study to be developed in this section of the report.

¹ Emerald V. Dechant, Improving The Teaching of Reading, New Jersey, Prentice Hall, 1970, p. 217.

² Harry Singer, Theories, Models and Strategies For Learning To Read, paper presented at the National Reading Conference, St. Petersburg Florida, E.R.I.C. ED 079 006, December 1970, p. 4.

Under the heading of Meaningful Questions in Reading Teaching Methods, Singer asked "What is the extent to which variations in method or initial units and sequences of instruction have to be adapted to individual differences in learners?" In short, both Dechant and Singer implied that in the teaching of reading, aspects of content and instructional strategies must be accommodated to some degree to the individual's style of learning.

The writer was interested in the possibility of developing a screening and placement process which might prevent the occurrence of needless reading problems. By matching beginning reading materials and methods to the language learning styles of individual readers, it might be possible to facilitate the learning of reading. The most appropriate match would combine a learner with a method which would either capitalize on strengths or remediate weaknesses in his language learning capacity.

At that point the research problem was formulated in its initial stage: Would there be a significant combined or interactive effect of both instructional method in reading and style of learning upon achievement in reading after the first year of formal instruction?

The literature revealed that research studies which use an aptitude-treatment interaction paradigm are aptly suited for an empirical investigation of the interactive

effect of learning style and teaching method upon achievement in learning to read. In other words, such a method-aptitude research study could be useful in the development of theory to guide the preparation of diagnostic-prescriptive reading programs.

In the first chapter aspects of the research problem are treated in detail. After a brief analysis of the contemporary methods controversy, two methods of teaching beginning reading are identified as levels of the independent method variable. Auditory and visual components of short-term memory, a perceptual aptitude necessary in the acquisition of language and reading, are identified as levels of the independent aptitude variable. Achievement in oral reading becomes the dependent variable of concern.

A review of related studies is presented in Chapter II to develop a rationale justifying the choice of independent and dependent variables in the experimental study. The chapter is concluded with a statement of hypotheses to be tested in the experimental study.

In Chapter III, the description of the experimental design is presented along with the selection of the subject population, the choice of testing instruments and the sequence of experimental procedures.

Chapters IV and V contain a presentation and discussion of the testing results.

A summary of the study in its conclusions precedes an annotated bibliography. An appendix concludes the thesis and contains organizational materials (letters and surveys), samples of testing instruments, tables of raw data and the thesis abstract.

CHAPTER I

STATEMENT OF THE PROBLEM

Research findings on problems in reading over the last decade indicate that the incidence of reading retardation (where the actual grade level in reading is at least two years below the expected grade level) is unexpectedly high. Among elementary and secondary students in Canada, the United States and Britain, the proportion of retarded readers ranges from twenty-five to thirty-five percent of the total school populations^{1,2,3,4}. A proportion of the cases of reading retardation are dyslexic. According to Rabinovitch⁵ their difficulties in learning to read may

1 J. G. McMurray, "Some Correlates of Reading Difficulty In Satisfactory and Disabled Readers, A Preliminary Study in Grade 3", Ontario Journal of Educational Research, 1963, Vol. 5, p. 155.

2 L. Eisenberg, "The epidemiology of reading retardation and a program for preventative intervention", The disabled reader, J. Money, (ed.), Baltimore, The John Hopkins Press, 1966, pp. 49-58.

3 Sir James Pitman and John St. John, Alphabets and Reading, London, Sir Isac Pitman and Sons Ltd., 1969, p. 7.

4 Frank R. Vellutino and Christopher Connolly, "The training of paraprofessionals as remedial reading assistants in an inner-city school", The Reading Teacher, Vol. 24, No. 6, March 1971, p. 506.

5 Ralph D. Rabinovitch, "Dyslexia, Psychiatric Considerations", Reading Disability, J. Money, (ed.), Baltimore, John Hopkins Press, 1967, p. 74.

reflect two basic types of etiological problems. A number of cases are diagnosed as brain injury with reading retardation. With other cases, the cause is biological and is diagnosed as primary reading retardation. Regardless of the differences in etiology, both types of cases reflect a disturbed pattern of neurological organization. Such cases often exhibit impairments in the perceptual areas of auditory and visual memory and directionality.

Rabinovitch challenges educators and reading specialists to come to the assistance of young readers exhibiting primary reading retardation⁶. These children require an early diagnosis followed appropriately with an adjusted curriculum through the school years.

The method used to teach beginning reading and the personal style of learning are two factors contributing to success in reading achievement. The purpose of the present study is to examine both factors in an attempt to construct and test a rationale for the individualization of the teaching of beginning reading. In other words, the objective is the development of an instructional methodology in beginning reading which can both sequence the different kinds of reading materials and adjust their rates of

6 Ibid., p. 79.

presentation to suit the needs of different individuals learning to read.

Twenty years have passed since Rudolf Flesch condemned those methods of teaching beginning reading which did not produce phonics trained readers⁷. The gist of his argument was that a methodology which did not teach beginners to sound out parts of words, in the learning to read process, would lead to a psuedo type of reading practice. Such reading would consist of nothing more than rote memorization and guessing. It was claimed that such a pedagogy would delay the achievement of reading independence for the learner by restricting his ability to attack new words. That is, the reader would not be equipped with the word attack strategies necessary for the reading of different materials in other programs commensurate with his level of comprehension.

More recently, Mrs. Mary Johnson⁸, an elementary school critic in Winnipeg, wrote that reading problems were due to the lack of teaching of articulated phonics. Her criticisms were based on her informal examinations of the

7 Rudolf Flesch, Why Johnny Can't Read and What You Can Do About It, New York, Harper and Brothers, 1955, p. 42.

8 Mary Johnson, Programmed Illiteracy In Our Schools, Winnipeg, Clarity Books, 1970, p. 139.

oral reading performances of elementary school children outside the school situation. Specifically she noted an abundance of errors in accuracy. Many errors consisted of wrong terminal and medial sounds, indicating that children had learned to associate letters with words rather than with sounds. She added further that rote memory allowed the children to present fluent and accurate reading of familiar sentences from the school reader but the reading of new material was characterized by halting, stumbling, floundering and guessing.

According to Johnson the solution lay in the teaching of letter sounding and blending so that early independence in reading is gained.

Children who learn the separate letter sounds and have to sound out words from the beginning of grade one become independent readers in six months. They are able to read whatever interests them at their level of comprehension and therefore do not provide a captive market for the controlled vocabulary readers and workbooks of any one publishing company.⁹

In other words she extolled that kind of reading instruction which emphasizes the blending of separate letter sounds as the principal kind of word attack skill. She held that this type of instruction would produce readers who could read independently from any source of reading material at their level of comprehension.

9 Ibid., p. 124.

Although the investigations noted above do not constitute a controlled research study emanating from a theoretical base, the conclusions are worthy of examination for at least two reasons. First, a more effective use of phonics in reading instruction once more appears to be demanded in the Flesch tradition. However, this time, the problem is given a Canadian locus and a suggested solution rests in the teaching of blending letter sounds. A similar methodology is espoused in a Canadian reading program, Language Patterns¹⁰, written by Dr. John Linn and teachers of The Ottawa Public Schools. Second, the statement attributing errors in oral reading to the association of letters with words rather than sounds, runs counter to the thesis of Frank Smith of The Ontario Institute for Studies in Education. Smith^{11,12} held that the reader sees the word as an ideogram and not as a sequence of phonic units which can be blended.

10 John Linn, Language Patterns, Teacher's Guide, Part One, Toronto, Holt Rinehart and Winston, 1968, p. 7.

11 Frank Smith, Understanding Reading, - A Psycholinguistic Analysis of Reading and Learning to Read, Toronto, Holt Rinehart and Winston, 1971, p. 155.

12 Frank Smith, Psycholinguistics and Reading, Toronto, Holt Rinehart and Winston, 1973, p. 121.

Visual feature lists enable the reader to conceptualize the name of an object without pronouncing the individual phonemes. Visual feature lists are associated with a complex semantic structure that mediates the meanings of words and groups of words.¹³

Therefore, according to Smith, it is not the sounds of letters in words but rather the categorization of words by acoustic, syntactic and semantic features, which enables the reader to recognize or pronounce the written form of the language.

The differences of opinion held by Johnson and Smith on the importance of sound blending as a word attack skill in the process of reading are reflected in the methodologies of two current approaches to the teaching of reading. Blending sounds is the method of word recognition taught to beginning readers in the Language Patterns program and becomes one of the two levels of the method variable (independent method variable) in the present study. The conceptual approach in a whole word method of teaching reading becomes the second level of the independent method variable. The study, therefore, will test the positions of Smith and Johnson by examining in the light of individual learning styles, the effects of two methods of teaching on

¹³ Ibid., p. 121.

achievement in oral reading at the end of the first year of instruction.

The method of teaching beginning reading in the Language Patterns series allows the child to overlearn a few letter-sound letter-name associations. Equipped with the letter-name and letter-sound association for several consonants and one or two short vowels, the reader reads his first words by blending the sounds of the letters from left to right slowly and deliberately. Successive practice accelerates the blending process until such time as the reader has established the word more or less permanently as one which can be instantly recognized on sight (sight word).

To date, it appears that no other Canadian series of beginning readers has structured blending and sounding into the instructional sequence of word attack skills. The 1973 edition of Circular #14, the list of texts authorized for use in Ontario schools by the Ministry of Education, identifies eight beginning reading series. Seven are whole word basal reading series and only differ according to the publisher-author approach. Only one series, Language Patterns has been included and it stresses what Johnson has called articulated phonics in the teaching of word attack skills¹⁴.

14 Thomas L. Wells, Ministry of Education, Textbooks, Circular 14, 1973, Toronto, 1973, p. 1.

The Ontario objectives in the teaching of beginning reading were found in the 1971 edition of P₁ J₁ and generally support the assumptions and methodology of a whole word method of teaching beginning reading.

Children who are taught from the beginning to think about what they read, find the acquisition of word attack skills comparatively easy; but if these skills are overemphasized, many children become so concerned with words and parts of words that they fail to understand the ideas behind the words.¹⁵

In essence, the objectives hold that the young reader must be encouraged to consider larger units of language such as phrases and sentences when reading the text for meaning.

The 1971 document contains a basic skills section in the reading area and emphasizes such word recognition cues and word attack skills as 1) word form (shape), 2) context clues, 3) phonetic analysis, 4) structural analysis and 5) dictionary analysis. Nowhere is any reference made regarding the use of blending or synthesis of sounds, that is, synthetic phonics.

The individual's learning style will also directly affect development in language perception and achievement in reading. Wepman has identified a pattern of development

¹⁵ The Minister of Education, Curriculum Guidelines Primary and Junior Divisions, Toronto, Ontario Department of Education, 1971, p. 4.

in language acquisition¹⁶. For most children, the two major modalities, the auditory and the visual seemed to have reached a stage of equalization of function by the age of nine. In other words prior developmental lags in either modality are overcome by this time.

The audile child for Wepman is one whose auditory pathway matures earliest and whose early development of auditory perceptual and conceptual functions probably assured the child of "an early and accurate acquisition and use of speech"¹⁷. If the visual function of this child also develops rapidly, achievement in reading should be relatively simple. However, if the visual development were slow, achievement in reading could be delayed. In the latter case, no significant change in reading achievement would probably occur until the reader experienced some visual perceptual development. Then in the reading process both modalities integrate the auditory and visual data which represent the written language of the text.

16 Joseph M. Wepman, "The Modality Concept - Including a statement of the perceptual and Conceptual Levels of Learning", Perception and Reading, p. 1., (ed.), Helen K. Smith, Vol. 12, Proceedings of the Twelfth Annual Convention, International Reading Association, Delaware, 1968, p. 1.

17 Ibid., p. 3.

The visile child is one whose visual channels in the sensory, perceptual and conceptual areas developed first ontogenetically. If the visile child is at least average in auditory learning, there should be no problem in learning to read¹⁸. If slow in auditory learning, such an individual would benefit from 1) the automatic compensation which is concomitant with high intelligence, 2) an intensive auditory perceptual training program and 3) in the case of a deaf child, an alternate symbol system relating the actual object to its visual referrent in the text. Again it must be pointed out that for the hearing child, success in beginning reading is the result of an effective perceptual integration of auditory and visual data.

It follows, therefore, that the style of learning most conducive to the easiest development of skill in reading is one which rests upon a successful integration of the auditory and visual modal pathways of learning. Ruth Strang indicated that it is possible to distinguish between normal and retarded readers to the extent of their ability to integrate auditory and visual stimuli¹⁹.

18 Ibid.

19 Ruth Strang, Reading Diagnosis and Remediation, International Reading Association, Delaware, 1968, p. 34.

Carroll²⁰, de Hirsch²¹ and Strang²² contended that the diagnostic testing of beginning readers for auditory and visual style followed by an appropriate method of teaching which develops the auditory or visual strength, could reduce the incidence of reading failure. They stated further that such prescriptive teaching would be most valuable to the group showing a discrepant auditory-visual modality pattern, that is to say, the group whose profiles show either a perceptual deficit in visual capacity or a perceptual deficit in auditory capacity. Therefore, the effectiveness of the instructional intervention called for by Carroll, de Hirsch and Strang will depend upon the degree to which such instruction can bring about an integration of both the auditory and visual perceptual modalities.

Individuals whose auditory and visual perceptual capacities have developed equally in the integrative sense will experience the least difficulty in learning to read. At the readiness level in kindergarten, perceptual language

20 John Carroll, "The Analysis of Reading Instruction, Perspectives from Psychology and Linguistics", Theories of Learning and Instruction, 63rd Yearbook of The National Society For The Study of Education, Chicago, University of Chicago Press, 1964, p. 340.

21 Katrina de Hirsch, Jeannette Jansky and William S. Langford, Predicting Reading Failure, New York, Harper and Row, 1966, p. xv.

22 Ibid., p. xiv.

training first involves the practice and development of auditory and visual discrimination through exercises in matching and identifying differences in sounds and figures.

Once a basic discrimination capacity has been acquired, training in auditory and visual sequencing should follow. The ability to remember and sequence auditory and visual signals over a short period of time is an essential feature of achievement in the spoken language and the written languages²³. Thus auditory short-term memory contributes to the youngster's temporal organization necessary in speech and visual short-term memory contributes a spatial organization deemed necessary in reading by de Hirsch²⁴.

In reading, however, neither of the subprocesses can be considered to function alone. The modal integration referred to by Wepman occurs when both auditory and visual sequential short-term memory abilities permit the reader to "translate a sequence of sounds seen - a sequence in space - into a sequence of sounds heard - a sequence in time"²⁵. In other words, the reader's integrative perceptual capacity enables him to translate sequences from a visual language to sequences in an auditory language. Then the sequences may

23 Katrina de Hirsch, Op. Cit., p. xiv.

24 Ibid., p. xiv.

25 Ibid., p. xiv.

be encoded or expressed privately in a silent reading situation or publicly in the case of oral reading.

Oral reading was chosen as a dependent achievement variable because of its importance to both the learner and the teacher of beginning reading. By listening to the accuracy and the fluency of oral reading, the teacher is given an opportunity to check the pupil's word attack skills and phrasing. Such diagnostic checks provide direction to the teacher in helping the pupil to arrive at the goal of fast meaningful silent reading.

Much of the research in beginning reading has tended to ignore oral reading which is more complex than silent reading. Oral reading results in a greater strain being imposed upon a reader's short-term memory. The strain is caused by the greater time element involved in the process of oral reading and is due partly to the reader listening to himself as his eyes scan ahead to the next group of words in the text. That is, the oral reader pronounces words to the audience while simultaneously focusing ahead to the next cluster of words. The silent reader is spared the task of pronunciation and therefore has the opportunity to scan ahead as quickly as his comprehension of the material will allow. The scanning phenomenon is referred to as an eye-voice span and its capacity will depend to some extent upon

ability to hold information in an auditory and visual short-term memory store.

The present study was designed to investigate further the interrelationships among style of learning, the teaching method imposed by the nature of the beginning reading materials and achievement in oral reading. Several related issues were also considered in the planning stage. Styles of learning expressed as integrational patterns of auditory and visual short-term memory would be examined exclusively regardless of method of teaching, to study the effect on achievement in oral reading. In addition, it was held that any information relating styles of learning to types of beginning reading materials could assist teachers and administrators in the identification and initial programming of children suspected of having potential problems in learning to read. Therefore, the present study was also designed to test the unequivocal claims of those who call for one particular method of teaching beginning reading to all children. In other words, it was decided to examine the direction of the results in oral reading achievement according to the learning style of the reader.

In the following chapter three types of experimental variables are identified and justified in terms of the development of a theoretical rationale for the study. After

the presentation of relevant method-aptitude research literature, the chapter concludes with a restatement of the problem and hypotheses to be tested.

CHAPTER II

STATUS OF THE INVESTIGATION: A REVIEW OF RELATED STUDIES

Methods of teaching beginning reading have theoretical and practical differences which are misunderstood by many publishers and educators and consequently are not used to the advantage of the children who are being taught to read. Successful individualization of reading instruction occurs when the pupil's aptitude for language acquisition governs to some extent the nature and sequence of experiences in learning to interpret the printed word.

In the writer's perception of the situation, the individualization of reading instruction raises questions such as the following for consideration:

1. Should this pupil be exposed or not to a reading method which places a heavy emphasis on phonic instruction in the beginning stages?

2. Does this particular pupil's problem in oral reading speed and accuracy relate to the misuse of a phonics method of instruction?

3. What if any is the nature of the relationship between auditory and visual learners and so called auditory and visual methods of teaching reading?

The purpose of the present investigation is to examine the feasibility of individualizing instruction in

beginning reading by matching some language acquisition aptitudes of the reader with the demands of the particular method of teaching reading. The choice of specific aptitudes, instructional methods and achievement criteria necessary for the formulation of an appropriate method-aptitude research problem develops from the following review of the literature.

In their study of the reading process, Venezky and Calfee¹ considered three classes of variables. Their first, the stimulus variable deals with the orthography of the written language to be read, that is the grammatical relationships of semantics and syntax. The subject class of variables pertains to the pattern of aptitudes which the reader brings to the task of reading. Finally the classification of task variable reveals the underlying processes of reading referred to as perception, cognition and memory.

The organization of variables in the present study is derived from the Venezky and Calfee analysis to permit a method-aptitude research of achievement in oral reading. Two methods of teaching beginning reading become two levels of the independent method variable. In the Venezky and

¹ Richard L. Venezky and Robert C. Calfee, "The Reading Competency Model", in Theoretical Models and Processes of Reading, (ed.), Harry Singer and Robert S. Ruddell, Newark, International Reading Association, 1970, p. 281.

Calfee analysis, the independent method variable was identified as the stimulus variable. The reader's aptitude in short-term memory becomes the independent aptitude variable in the present study and would correspond to Venezky and Calfee's subject class of variables. Achievement in oral reading becomes the dependent variable in the present study. Such a task variable in the Venezky and Calfee analysis would be dependent upon the main or interactive effects of variables in the subject and stimulus classes.

In the present chapter the literature is reviewed which deals with the basic theory and the related experimental research. The research examined concerns achievement in beginning reading as a function of 1) method of teaching and 2) the learner's ability in short-term memory. In section one, theory on the nature of short-term memory and on the dynamics of short-term memory within the process of oral reading is examined. Section two deals with the teaching of beginning reading and presents the rationales which support the semantic whole word method and the synthetic phonics alphabetic method. Positions of theorists pressing for the individualization of the teaching of beginning reading are used to forge a connection between a learner's development in short-term memory and achievement in beginning reading after exposure to either a semantic or

alphabetic method of learning to read. Research findings in section three treat studies in beginning silent and oral reading which have involved 1) alphabetic and semantic levels of the method variable and 2) auditory and visual components of the aptitude variable, short-term memory. The chapter ends with a summary and a critical appraisal of the state of the existing knowledge in the field. Specific intentions of research and an expression of the problem are stated for the present study and then are coupled with consequent theoretical expectations.

1. The Role of Short-term Memory in the Reading Process.

The nature of short-term memory is defined and examined in order to establish its function in the processes of both beginning and mature reading. To that end models of language acquisition are studied with respect to their treatment of the perceptual nature of auditory and visual sequential short-term memory. To examine further the role of short-term memory, achievement in reading is related to modality integration, the dynamic interplay of long and short-term memory and disabilities in the short-term memory function.

Bruininks' definitions of the two terms, auditory short-term memory and visual short-term memory are utilized in the context of the present investigation. His definitions

encompass the aspect of sequencing from memory, a subtask mentioned previously in regard to the process of reading². Bruininks defined auditory short-term memory as the ability to retain sequences of orally presented symbols such as digits or words which may or may not be related to each other. Visual short-term memory is the ability to retain their perceptual figural images over time.

In the process of reading, the short-term memory faculty works in conjunction with intermediate and longer-term memory banks. The intermediate and long-term memory functions interrelate with short-term memory functions and enable the reader to retain records which edit selected aspects of the final comprehended messages.

It would appear, therefore, that all language systems make demands on short and longer-term memory faculties. However, an alphabetic language system such as English in comparison with an ideographic system such as Chinese, places many fewer demands on learning and memory.

Within the English language different methods of teaching beginning reading may make different demands on the reader's short-term memory. Critics of alphabetic

² Robert H. Bruininks, Relationship of Auditory and Visual Perceptual Strengths to Methods of Teaching Word Recognition Among Disadvantaged Negro Boys, Nashville, I.M.R.I.D., Behavioural Science Monograph, No. 12, 1968, p. 45.

methods of teaching beginning reading fault the use of regularized materials which impose a strain on the learner's auditory and visual short-term memory³. Such methods emphasize the early memorization of letter names and sounds so that these sounds and symbols can be sequenced and even blended to form words.

Short-term Memory in Language Models — Wepman⁴ postulated a tri-level language paradigm involving reflexive, perceptual and conceptual levels of function. A short-term memory is involved at the perceptual level and a longer-term memory is involved at the conceptual level. Each of the three levels can convey activities across the nervous system from input to output. As shown in Figure 1, the auditory and or visual stimulus may be shunted to any one of three levels of reception according to the needs of the organism. For example, in the task of reading, the visual stimulus from the text would first be transmitted across the perceptual level from input to integration to output. That is, within the central integrating process at the perceptual level the short-term memory is involved in the transition of the stimulus from an input symbol to an output pattern of

3 Robert C. Aukerman, Approaches to Beginning Reading, Toronto, John Wiley and Sons, 1971, p. 10.

4 Joseph M. Wepman et al., "Studies in Aphasia: Background and Theoretical Formulations", Journal Of Speech And Hearing Disorders, 25, 1960, p. 327.

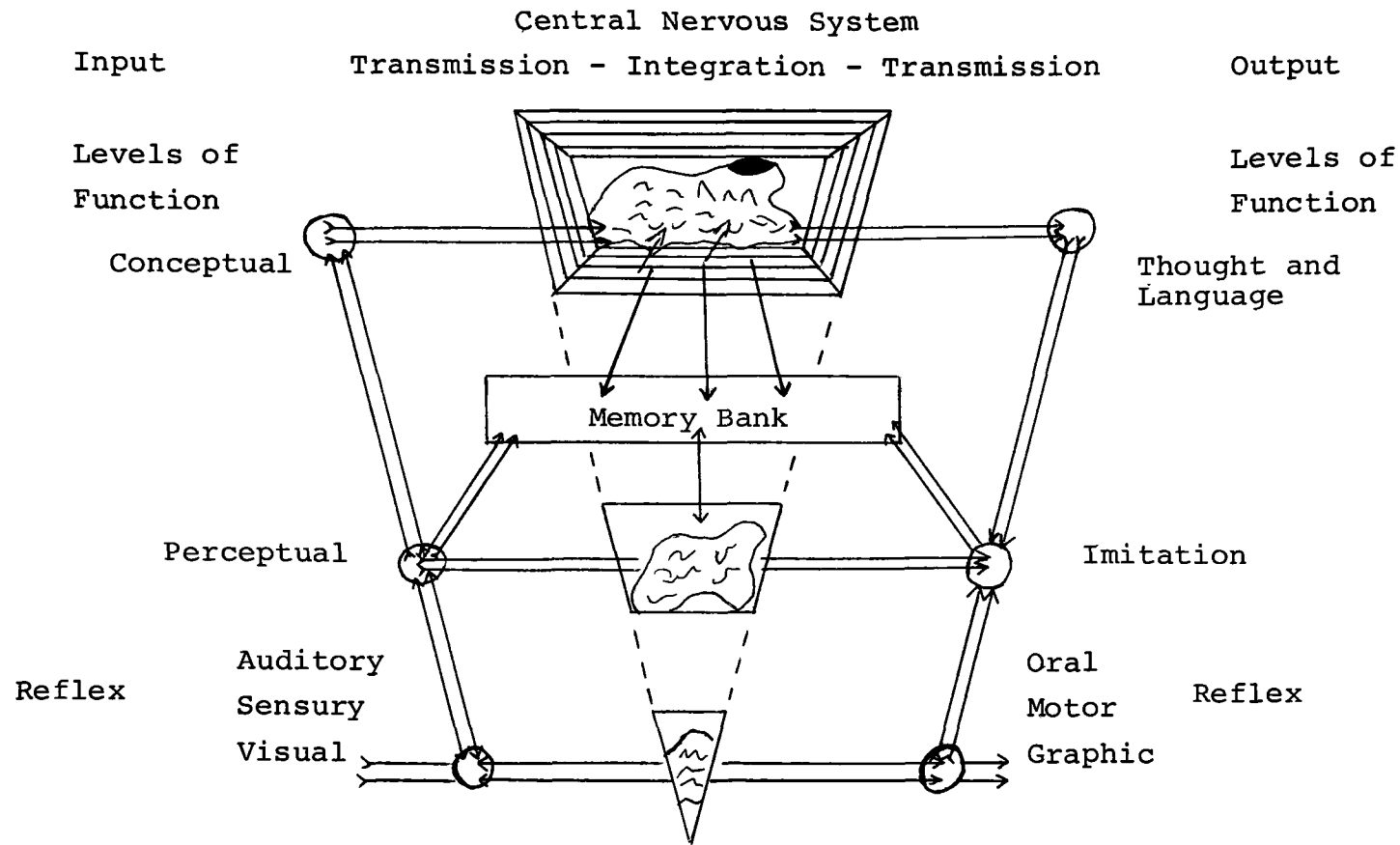


Figure 1. - Operational Paradigm for Language in the Central Nervous System

Adapted from Joseph M. Wepman, Op. Cit., p. 326.

expression. If comprehension is necessary, a longer-term memory operating at the conceptual level is also involved. In such instances, incoming messages are decoded and if appropriate, output responses are encoded or expressed in previously learned patterns.

Wepman also identified concrete examples of subordinate perceptual language tasks which are related to reading and involve the use of short-term memory. He noted that if the input stimulus remains at the perceptual level and does not rise to the conceptual level, the phenomenon is "seen as the capacity of the organism to transmit percepts which leave traces on the memory bank but have no meaning to the individual"⁵. In such a case Wepman identified four non meaningful, non conceptual language factors as 1) the ability to repeat auditory stimuli, 2) the ability to read visual symbols aloud (non meaningful oral reading) and 4) the ability to write words presented aurally (spelling dictation).

Wepman⁶ established the role of perceptual operations as being the source of linguistic representation.

5 Ibid.

6 Joseph M. Wepman, "The Modality Concept-Including a Statement of the Perceptual and Conceptual Levels of Learning", in Perception and Reading, Newark, International Reading Association, 1968, p. 5.

Such operations would correspond to Piaget's sensory-motor and preoperational stages of learning⁷. The development of the maturing perceptual level results in the progressive achievement of such preconceptual skills as 1) discrimination, retention, and recall of sounds and letters, 2) the sequential ordering of phonemes and graphemes and 3) the ability to interrelate one with the other. These perceptual skills are essential for the recoding of letter symbols to sounds as the first stage in the process of reading.

Bannatyne⁸ attempted to characterize input, integrational and output functions at the perceptual level of Wepman's model. He suggested that in the past, images of objects and actions have been repeatedly associated with 1) acoustic symbols, phonemes and words and 2) visual symbols, graphemes and words. Then the association has been committed to memory.

From a neobehaviourist's point of view, Osgood presented a generalized behavioural model which set the

7 John H. Flavell, The Developmental Psychology of Jean Piaget, Toronto, D. Van Nostrand, 1963, pp. 88-163.

8 Alex Bannatyne, "The Transfer from Modality Perceptual to Modality Conceptual", in Perception and Reading, (ed.), Helen K. Smith, Newark, I.R.A., 1968, p. 7.

stage for Wepman's operational model⁹. To account for the role of memory which Wepman depicted as interacting between conceptual and perceptual levels of function, Osgood postulated a representational mediation process. Such a phenomenon reflects the redundancies in the experience of the organism and occurs from the repeated pairings of stimulus and response integrations at the integrative (perceptual) and the representative levels of language function. By identifying a decoding stage where verbal input data is interpreted and an encoding stage where verbal data is expressed, he paved the way for a model of language acquisition constructed by Kirk and McCarthy and later utilized in the experimental design of the present study.

A model of language acquisition constructed by Kirk and McCarthy¹⁰ was created from two separate models developed previously by Osgood (1957) and Wepman (1960). In the Kirk and McCarthy model, auditory and visual sequential short-term memory capacities are identified as psycholinguistic aptitudes which occur at the automatic

9 Charles E. Osgood, "Motivational Dynamics of Language Behavior", Nebraska Symposium on Motivation, (ed.), Marshall R. Jones, Lincoln, University of Nebraska Press, 1957, p. 356.

10 S. A. Kirk and J. J. McCarthy, "The Illinois Test of Psycholinguistic Abilities - an approach to differential diagnosis", American Journal of Mental Deficiency, Vol. 66, 1961, p. 403.

level. That is, both modality types of short-term memory operate at Osgood's integrative level and Wepman's perceptual level.

Kirk and McCarthy depicted the sequential short-term memory aptitude as primarily a perceptual function involving little or no cognition and described its frame of reference as follows:

. . . (b) the automatic level, in which the individual's habits of functioning are less voluntary but highly organized and integrated . . . involved in such activities as visual and auditory closure, speed of perception, ability to produce a sequence seen or heard, rote learning, synthesizing isolated sounds into a word and utilizing the redundancies of experience.¹¹

Speed of perception, the production of language sequences and the synthesis of language sounds will be later expressed as criteria for the evaluation of achievement in oral reading, the dependent variable in the present study. That is, speed and accuracy are the bases upon which achievement in oral reading is judged within the scoring conventions of standardized oral reading test instruments. Again, the purpose of the study is to investigate the possibility of an interactive effect of aptitudinal patterns of development in short-term memory and exposure to alphabetic materials (emphasizing sequencing and synthesis) or semantic materials on achievement in oral reading.

¹¹ Samuel A. Kirk, James McCarthy and Winnifred D. Kirk, Examiner's Manual, I.T.P.A., (rev. ed.), Urbana, University Press, 1968, p. 7.

It would appear that the primary role of short-term memory in the three models of language examined, involves the recoding aspects of oral and silent reading which occasionally occur without conceptual intervention. Such a situation might provide the etiological basis for diagnosing the familiar classroom problem of the fluent oral reader who has little or no comprehension. In addition, it should be noted that silent and oral reading must be processed at the conceptual level. However, meaningful silent and oral reading are both dependent upon a recoding or symbol translation function which is part of the role of a short-term memory operating at the perceptual level.

Integration of Auditory and Visual Short-term Memory — Two symbol systems, a system of sound symbols and a system of visual symbols are responsible for the linguistic phenomenon of human communication. In both systems, short-term memory as defined by Bruininks plays an important role. The auditory system permits the individual to hear an acoustic symbol and to identify a particular image with that word. The visual system permits the individual to 1) recognize some whole visual word patterns as symbolizing a gestalt of sound (a word) and or 2) some sequences of visually coded phonemes which he must blend.

Howe¹² and Murdock¹³ suggested that the auditory short-term memory functions at a more complex level than the visual short-term memory. They described the visual short-term memory as being a brief, peripheral and passive holding mechanism which utilizes no elaborate coding but makes use of the simple visual characteristics of a stimulus.

The auditory and visual components of short-term memory also differ according to 1) type of product held, 2) duration and capacity of holding power and 3) the degree of complexity involving the cortical processes^{14,15,16}.

As stated previously, the auditory short-term memory retains information longer than the visual component because of the more complex cortical processes preceding acoustic storage. The auditory memory is involved in the

12 Michael J. A. Howe, Introduction to Human Memory, A Psychological Approach, New York, Harper and Row, 1970, p. 30.

13 Bennet B. Murdock, "Modality Effects In Short-Term Memory, Storage or Retrieval", Journal of Experimental Psychology, Vol. 77, 1968, pp. 79-86.

14 Ibid.

15 P. A. Katz and M. Deutsch, Visual and Auditory Efficiency and Its Relationship to Reading in Children, Final Report 1963, Project No. 1099, Co-operative Research Program, Office of Education, Department of Health Education and Welfare, p. 45.

16 Michael J. A. Howe, Op. Cit., p. 39-37.

retention of all verbal items whether spoken or written because they are retained on the basis of factors associated with their sound during articulation. However, according to Howe, the visual memory is not involved in the storage of all verbal items because verbal spoken items which are received by the auditory modality may completely bypass the visual component of short-term memory¹⁷.

Howe's position on the verbal acoustic efficiency of the auditory short-term memory would imply that beginning readers decoding print to meaning mainly through sound might retain more linguistic units in short-term memory than those decoding print to meaning mainly through sight. Such relationships, however, would not hold true for the mature, fast, visual reader. Such a reader depends less on the denotative value of words and more on the connotative values which are a function of the individual reader's experiences and are stored in long-term memory.

As the reader matures physically and gains experience, changes in perceptual demands and perceptual performance also occur. The role of the auditory modality in the short-term memory function was very significant in the early stages of beginning reading because emphasis was being placed upon learning the sound symbol correspondences

17 Ibid., p. 31.

of the written language¹⁸. In the case of mature reading the role of the auditory modality becomes subordinate to the role of the visual modality and the use of the visual modality is subject to change. No longer does the reader focus on parts of a word to note its visual denotative qualities in an attempt to associate it with a known sound value. The mature visual reader depends more on the ideational or connotative value of larger meaningful language units such as phrases, clauses and sentences to obtain meaning from the text.

It follows then, that the auditory and visual perceptual components of sequential short-term memory assume a different degree of importance as the reader matures and the reading task becomes more demanding. For example, in the case of beginning reading, an auditory sequential short-term memory retains familiar acoustic signals such as word sounds and letter sounds and a visual sequential short-term memory retains familiar visual cues such as word images and letter images. Together auditory and visual sequential short-term memory banks effect a sound symbol correspondence in the perceptual recoding aspect of the reading process. With maturity the demands made upon the visual short-term

¹⁸ Sir James Pitman and John St. John, Alphabets and Reading, London, Sir Isac Pitman, 1969, p. 16.

memory in the process of reading will exceed those made upon the auditory component¹⁹. Such demands encourage the individual to read with speed and comprehension by dealing with larger order visual cues such as complex words, phrases and sentences.

As developed in the first chapter, it should be understood that integration of the auditory and visual perceptual processes occurs within the process of reading. S. J. Samuels in his model of mental structures and processes involved in word recognition, postulated that the reader's word attack cues when necessary are selected from long-term memory, held in short-term memory and "are recognized through visual processes perhaps in association with the auditory system"²⁰. The effects of varying patterns of auditory and visual short-term memory are examined later in the present study to test hypotheses on the significance of integration to achievement in oral reading.

Dynamics of Short-term Memory in Reading — The theorists, Wepman, Osgood, Kirk and McCarthy, whose models

¹⁹ Frank Smith, Understanding Reading, A Psycholinguistic Analysis of Reading and Learning to Read, Toronto, Holt Rinehart and Winston, 1971, p. 175.

²⁰ Harry Singer, Theories, Models and Strategies For Learning to Read, paper presented at the National Reading Conference, St. Petersburg Florida, 1970, p. 24.

were previewed earlier in this chapter, agree that short-term memory operated at the perceptual level of functions. However, the incoming data which the reader uses to form a perceptual image come partly from the graphic cues on the page and partly from cues stored in a long-term memory. Before an image enters the short-term memory, it must be screened or exposed to older data stored in a long-term memory bank. Thus the perceptual image is developed both from what the individual expects to see and what he does see. In other words, the stored products in short-term memory occur in phonemic and graphemic forms whose structures reflect the interplay between the data which is lately received and data germane to the situation which are retrieved from long-term memory. If the edited data in the short-term memory bank can be reconciled with data collected from past experience, it will be transferred in its basic form for storage in long-term memory.

Within the short-term memory storage, the incoming language in phonemic and graphemic forms, is collected and organized into three main cue systems: 1) grapho phonological (according to appearance and sound), 2) semantic (according to meaning) and 3) syntactic (according to linguistic sequence within a phrase, clause or sentence).

Venezky and Calfee characterized the "products of information" held in short-term memory as²¹ 1) style of writing, 2) general subject matter, 3) colour of print and style of type setting, 4) inter-intra sentence-phrase word data, 5) grammatical units and 6) graphemic units.

The short-term memory functions intermittently among phases of intermediate and longer-term memory in the whole information-processing model. The incoming language elements are scanned in a search mode for the largest manageable or meaningful unit. The products of information mentioned above by Venezky and Calfee are developed both from incoming data and from data stored in longer-term memory banks. In effect the incoming data is analyzed for the largest meaningful unit. Such analysis of the surface structure of language, that is, the complex grammatical and syntactical organization of units in phrases, clauses and sentences, occurs simultaneously with its temporary storage in the short-term memory. If data from intermediate and longer-term memory can be reconciled with the new data through accommodation and or assimilation (Piaget)²², it is reduced to a basic form in its preparation for storage in long-term memory.

21 Harry Singer, Op. Cit., p. 273.

22 John H. Flavell, Op. Cit., p. 88-163.

The use of sequential short-term memory and the expression of non meaningful oral reading both qualify as prelinguistic operations. These emerge from the perceptual level of Wepman's and Osgood's language behaviour models. For comprehension to occur, there must be a transition of the linguistic operations from the perceptual level to the conceptual level. Osgood²³ stated that the degree of comprehension in oral reading exists to the extent that meanings of printed words learned previously as sensory integrations will elicit different representational mediators. Thus an efficient short-term memory could enable the reader to achieve accurate pronunciation in non meaningful oral reading which is considered primarily as a perceptual-motor skill, temporarily disconnected from a representational or mediational system.

For first and second year readers, rates of oral and silent reading expressed in words per minute (w.p.m.) are similar (sixty w.p.m. for first year readers and 70 w.p.m. for second year readers). However, rates of silent and oral reading begin to spread with maturing reading at the end of the third year (silent 120 w.p.m. — oral 90 w.p.m.)²⁴.

23 Charles E. Osgood, Op. Cit., p. 358.

24 Miles V. Zintz, The Reading Process, The Teacher and The Learner, Dubuque, William C. Brown, 1970, p. 236.

Such evidence when considered in relation to Osgood's theoretical distinction between meaningful and non meaningful oral reading, suggests that conceptual factors enlarging comprehension may contribute more to the speed of mature silent reading. At a maturer stage a well developed longer-term memory plays a larger role in the reconciliation of new data held temporarily in the short-term memory bank with data previously held in the long-term memory bank. Beginning reading, on the other hand would be more dependent upon operations at the perceptual level such as discrimination, short-term memory and closure. Such dependencies could be lessened proportionately if the reader 1) was dealing with material previously encountered and or 2) was reading a language experience chart story which had been composed by the reader himself in conjunction with the teacher and the peer group.

The demands made upon short-term memory differ according to the process of either oral or silent reading. Although abilities in both oral and silent reading are dependent upon 1) word recognition skills, 2) a meaningful vocabulary and 3) a capacity to understand, theory develops the position that oral reading is a more complex skill than silent reading. In the first place, a word must be read

silently before it can be pronounced²⁵. Second, smooth and meaningful oral reading demands wider and more flexible eye-voice span than does silent reading^{26,27}. That is, the number of words lying between the word being pronounced and the word being focused upon by the eye in a search and scan mode, is related to the reader's performance before a listening audience. Oral reading requires a greater number of fixations and regressions than silent reading in order to encode (express orally) to a personal or public audience. Third, it follows that in the accelerated process of comprehensive oral reading, that is, reading for comprehension, the reader has less time and opportunity to listen to himself and to think about the concepts presented than in silent reading²⁸. Fourth, the rate of processing units in short-term memory in silent reading surpasses that of oral reading by one or two units per second so that in effect,

25 John J. DeBoer and Martha Dallman, The Teaching Of Reading, Toronto, Holt Rinehart, 1970, p. 302.

26 Henry P. Smith and Emerald V. Dechant, Psychology In Teaching Reading, Englewood Cliffs, Prentice Hall, 1969, p. 19.

27 Kenneth S. Goodman, "The Psycholinguistic Nature of The Reading Process", in The Psycholinguistic Nature Of The Reading Process, Detroit, Wayne State University Press, 1968, p. 19.

28 George D. Spache, The Teaching of Reading, Bloomington, Phi Delta Kappa, 1972, p. 43.

short-term memory capacity is taxed more by oral than by silent reading²⁹.

Disabilities in Short-term Memory and Reading Performance — Johnson noted that disabilities in short-term memory are reflected in both learning and reading problems.

. . . deficiencies in memory span in themselves or as symptoms of difficulties such as deficiencies in attention have a deleterious effect on learning generally and acquisition of reading ability in particular.³⁰

In other words short-term memory capacity is necessary for competence in all communicative language functions.

In her treatise on achievement in first grade reading, Benger³¹ concluded that good readers emerge as significantly superior to poor readers only at the more complex levels of auditory and visual perception. That is, good readers have acquired the aptitude of retaining auditory and visual stimuli against distraction.

29 John J. Geyer, "Models of Perceptual Processes in Reading", in Theoretical Models And Processes Of Reading, Newark, International Reading Association, 1970, p. 84.

30 M. S. Johnson, "Factors Related To Disability In Reading", Journal of Experimental Education, Vol. 26, 1957, p. 20.

31 Kathlyn Benger, A Study Of The Relationships Between Perception, Personality, Intelligence And Grade One Reading Achievement, paper presented at I.R.A. Conference, Seattle, 1967, p. 16.

Hurley's rationale of the reading process related a breakdown in visual sequential short-term memory to faulty reading practices such as reversals, inability to see the word as an entity, uncertain memory for shapes of letters, poor comprehension and slow reading speed³².

Ruth Strang's reported interview with children having word attack difficulties in reading reveals a sequencing problem resulting from a deficiency in sequential short-term memory.

What do you do if you don't know a word? You have to sound it hundreds of times. (Regarding the word kitten) - When I get half, the other half goes half off - I get 'n' in the first half when it's supposed to be in the second.³³

In Strang's example, the pupil had not acquired the aptitude to remember the letters and words in the correct order.

In her study of backward readers at the third grade level, Nurss³⁴ agreed with Bengier and Strang. In other words, she advocated a perceptual training program as a preventive measure against the possibility of problems in verbal

32 Oliver L. Hurley, "Perceptual Integration and Reading Problems", in Exceptional Children, 1968, 35, No. 3, p. 208.

33 Ruth Strang, Learning to Read, Insights For Educators, Toronto, O.I.S.E., 1960, p. 16.

34 Joanne Nurss, "A Diagnostic Comparison of Two Third Grade Reading Classes", in Reading Difficulties: Diagnosis, Correction and Remediation, Newark, I.R.A., 1970, p. 150.

sequencing. Such a program would place emphasis on sequencing (ordering the position of letters within words and words within phrases) and immediate memory span, considered to be the same as short-term memory.

Summary — The purpose of the study is to examine oral reading achievement (the dependent task variable) at the end of grade one as a function of 1) type of instructional materials (independent stimulus variable) and 2) pattern of aptitude in auditory and visual short-term memory (independent aptitude variable). The subject's developmental pattern of aptitude in both auditory and visual short-term memory was selected as the independent aptitude variable in this study.

From the diagnostician's point of view, disabilities in short-term memory can be related to problems in learning to read. Bengner identified good readers according to their aptitude of retaining auditory and visual stimuli. Both Hurley and Strang described faulty reading practices resulting from deficiencies in short-term memory. Nurss advocated a perceptual training program as a preventative measure for all beginning readers to avoid problems in verbal sequential memory.

The role of short-term memory in language acquisition was examined in models developed by Wepman, Osgood and Kirk and McCarthy. In Wepman's model, the auditory and

visual short-term memory activities were depicted as 1) occurring at the perceptual level in a non meaningful language function and 2) also occurring in a position to relate to central processing at the conceptual level in a meaningful language function.

Osgood described a short-term memory function from a neobehaviourist's point of view. His representational mediation process accounted for the organism's ability to benefit from the redundancies of its experience. The association or memory function could occur at the integrative level (perceptual) in either a decoding or encoding process in non meaningful imitative language activities. As in Wepman's model, meaningful language activities would occur eventually at the representative level.

A role for auditory and visual short-term memory was identified in the Kirk and McCarthy model of language acquisition. Kirk and McCarthy accepted Bruininks' definitions and held that auditory and visual sequential short-term memory operates at the automatic level of language function. From their model was developed The Illinois Test Of Psycholinguistic Abilities, used later in the experimental design of the present study to classify the subject population.

Both the auditory and the visual components of sequential short-term memory work in an integrated fashion.

Within the visual symbol system where data are organized for the process of reading, the reader recognizes and retains visual patterns symbolizing patterns of sound. Additional data within the auditory symbol system are processed by the reader. The literature suggested that the cortical processing of short-term memory data was more complex from the auditory component than from the visual component. Howe added further that beginning readers depended more on decoding print to sound than to sight because of the superior verbal acoustic efficiency of auditory short-term memory. Regardless of the effect of maturation or the reader's modality preference in learning, a synthesis of both modalities must occur if auditory symbols are to be recognized and retained in a visual process called reading.

There is a constant interplay between short-term and longer-term memory functions in the process of reading. The perceptual image stored in the short-term memory is first exposed to older data in a long-term memory bank. If reconciliation of old and newer data occurs, new knowledge is accumulated and edited and short-term memory data are transferred to a long-term memory bank. In other words, for comprehension to occur, the linguistic operations of short-term memory originating at the perceptual level must transcend to the conceptual level in the reading process. Speed and comprehension in reading develop with the

perceptual maturity of the reader's aptitude in co-ordinating short and longer-term memory activities.

Skillful oral reading makes even greater demands upon the individual's short-term memory than does silent reading. The almost simultaneous silent decoding and oral encoding of the visual data depends upon the development of a wide and flexible eye-voice span. Consequently the rate of processing units into the short-term memory in oral reading is slowed down considerably and subsequently taxes the memory capacity. Therefore, it seemed likely that in an experimental study, the aptitudinal effects on short-term memory could best be examined in an oral reading situation.

In the present study, to test hypotheses on the role of sequential short-term memory in the process of oral reading, five levels of psycholinguistic aptitude were identified. The five levels were expressed as developmental patterns of auditory and visual sequential short-term memory which were arbitrarily defined utilizing score cut-off points within the framework of Kirk and McCarthy's Illinois Test Of Psycholinguistic Abilities (I.T.P.A.).

2. Methods of Teaching Beginning Reading.

In section two factors distinguishing between two different methods of teaching beginning reading are related to schools of learning theory. Relationships among teaching methods and aptitude in sequential short-term memory are examined in order to build a theory of method-aptitude interaction. Testing such a theory becomes the experimental task of the present study.

Identification of Semantic, Alphabetic and Linguistic Methods — The analytic phonics whole word method, the synthetic phonics part word method and the linguistic phonics method have all been incorporated within basal reading series by various publishing houses in Canada and the United States.

In an analytic, whole word method, reading is viewed as a process of decoding which proceeds from the meaning of a word to its sound. Dechant³⁵ suggested that the whole word method derives support from a field theory of verbal learning which considers the teaching of reading as a molar system. Then emphasis is placed on linguistic wholes which relate to smaller parts by providing meaning. The criteria for vocabulary control in whole word methods

35 Emerald V. Dechant, Op. Cit., p. 567.

are minimal and include 1) frequency of usage in everyday language, 2) repetition within the text, that is, the writer's purposeful and repetitive use of new words as a teaching-learning strategy, 3) suitability in carrying the meaning of the story and 4) in the case of language experience, occurrence within the beginner's personal vocabulary.

A sequence of word recognition or word attack skills emphasizes the use of the visual modality and proceeds from the establishment of a sight vocabulary. The sight vocabulary is eventually analyzed for commonality of initial, terminal, and medial sounds by using a substitution phonics method. Further visual emphasis is placed on recognizing words with the aid of configuration (shape) and context (meaning) clues. Finally structural analysis (patterns of roots, affixes and syllables) and the use of the dictionary complete the sequence. In short, the fore-mentioned emphases on sensory and whole modalities and analysis of wholes have contributed to a myriad of labels, some of which follow: 1) whole word, 2) visual method, 3) analytic phonics, 4) look say, 5) semantic method. Since all methods involve some sensory whole and part modality learning, phonics and analysis and synthesis, methods in the present study have been labelled according to the emphasis built into the materials. Therefore, the method being

presently discussed will be referred to henceforth as the semantic method.

In a synthetic part word method, reading is viewed as a process of decoding which proceeds from sound to meaning. Dechant³⁶ identified the supporting role of a stimulus-response learning theory which views the teaching process as a molecular system and which considers that the analysis of reading behaviour begins with parts which have meaning in isolation. Vocabulary is controlled for consistency or regularity of sound symbol correspondence by introducing words related in their common use of a structural pattern. The consonant short vowel consonant grouping is usually considered one of the first of such structures in a sequence of graded reading materials.

Such words can be blended easily for two reasons. In the first place, the vowel is always expressed with a short sound when in the consonant vowel consonant pattern. Second, the sequence of word attack skills proceeds from a study of names and sounds of letters to be blended in the co-ordinated reading exercises. The name and sound connections must be learned to the extent that they become automatic responses to letter stimuli and no longer require

36 Ibid.

conscious thought, that is, they become tools with which to attack words³⁷.

Synthesis and blending drills are followed directly with reading exercises to achieve maximum reinforcement of the blending of the particular letter sounds. The instructional sequence is designed to provide an early independence in word attack procedures.

Gradually throughout the first year of instruction a transition to less regular words (in terms of stability of pattern and ease of blending) is provided in order to expand the reader's reading vocabulary. In short, the early emphasis on the auditory and part modalities and on the synthesis of parts has been reflected in the use of the following labels: 1) part word, 2) auditory method and 3) synthetic phonics. Following the convention adopted earlier in the study, the method presently being discussed will be referred to as an alphabetic method in order to reflect the emphasis written into the organization and structure of the reading materials.

Some linguistic methods of teaching reading attempt to utilize the more regular aspects of the English orthography. Such methods use a highly controlled beginning

37 Annette Shawaker, "A Substitute for the Whole-Word Method", The Reading Teacher, Vol. 20, No. 5, 1967, p. 430.

reading vocabulary and consider reading primarily as a code breaking process. Frequently the new words are presented in families which have similar beginning sounds, medial sounds or terminal sounds. One linguistic reading series advocates a spelling to pronunciation approach. Here the reader proceeds from the names of each of the component letters to the pronunciation of the whole word.

Linguistic teaching methods differ in their focus on the most meaningful unit in language for the beginning reader. The linguistic units considered to bear meaning vary in size from the letter to the sentence.

Some linguistic teaching methods deny the artificiality created by controlling a beginner's reading vocabulary and therefore advocate the use of the child's own spoken vocabulary as a base for beginning reading. Such thinking presumes that meaning is a more powerful tool than recoding in arriving at word recognition and reading.

It would appear that much of the linguistic beginning reading material has not been particularly adapted to fit the individual's learning style. Rather the linguistic instructional approaches attempt in various ways to seize upon characteristics of English orthography to facilitate the process of learning to read. Since the examination of possible method-aptitude interaction in a beginning reading situation is among the objectives of the present study, it was decided

to exclude the linguistic reading materials from further consideration as a method variable.

It was necessary to exclude the linguistic reading materials from the experimental design for several additional reasons. In the first place, a great deal of subjectivity would be required to a) define a particular school of linguistic thought and b) to find publishers' materials which would reflect the former definition. Second, the rationale behind the utilization of linguistic reading materials lacks any reference to specific aptitude on the part of the learner. Third, some of the vocabulary control built into alphabetic reading material is not unlike that which is found in the linguistic materials of the Barnhart and Bloomfield and some of the early Fries materials^{38,39}. Therefore, the stimulus variables in experimental research comparing an alphabetic method to a linguistic method would not, in many cases be significantly different. That is to say, quite often similar word patterns could be found in the early reading material of both alphabetic and linguistic primers.

38 Barbara Bateman and Janis Wetherell, "A Critique of Bloomfield's Linguistic Approach to The Teaching of Reading", The Reading Teacher, Vol. 18, No. 2, November 1964, p. 98-104.

39 Charles C. Fries, Linguistics and Reading, Toronto, Holt Rinehart, 1962, p. 170.

Rationale For the Semantic Method — Supporters of semantic methods claim to follow a sequence in presenting reading materials in such a way that the reading tasks are commensurate with the developing language behaviour of individuals. Such an ontogenetic sequence can be observed in the child who first perceives words as wholes (the use of a sight vocabulary), then notices and responds to details (analysis for phonics) and finally reintegrates for whole patterns⁴⁰. Methods using semantic materials focus upon the word, considered the smallest linguistic unit which has meaning and therefore, related to the beginner's speaking experience⁴¹. Semantic methods are based on the premise that readers do not stop to identify letters or letter patterns within words but rather as tachistoscopic evidence suggests, focus on words⁴².

Mathews criticized the instructional aspect of the semantic rationale for its failure to recognize the integration of visual and auditory data in the reading process⁴³.

40 Barbara Bateman and Janis Wetherell, Op. Cit., p. 98-104.

41 Emerald V. Dechant, Op. Cit., p. 565.

42 Frank Smith, Understanding Reading - A Psycholinguistic Analysis of Reading and Learning to Read, Toronto, 1971, p. 124.

43 Mitford M. Mathews, Teaching to Read Historically Considered, Chicago, University of Chicago Press, 1966, p. 203.

He noted that insufficient attention is paid to the acoustic or phonic characteristics of words so that the beginning reader could not make adequate use of his past auditory experience. In other words the child would not be aided by his "having been born into a world of sound where he has developed a vocabulary of thousands of words which he knows by sound only"⁴⁴.

A Rationale For The Alphabetic Method — A synthetic aspect of behaviourism forms the basis of part word methods and holds that percepts are formed through associations of stimulus and response until the relationship is learned. Therefore, alphabetic methods reinforce letter-sound blending associations through immediate practice in the controlled vocabulary of the reader⁴⁵. That is, the beginning reader who is taught to blend a number of short vowels and consonants is then exposed to silent and oral reading stories containing similar linguistic patterns within their vocabularies, all controlled for the emphasis and expression of the same patterns.

Cutts⁴⁶ described alphabetic materials which the writers have organized into programs carefully controlling

44 Ibid.

45 Robert C. Aukerman, Op. Cit., p. 18.

46 Warren S. Cutts, Modern Reading Instruction, Washington, Centre for Applied Research in Education, 1964, p. 108.

the introduction of letters as well as words expressing specific patterns of consonants and vowels. Thus in the earliest reading experiences, the child would be able to avoid encountering more than one phonemic representation for each letter. That is, no vowel or consonant would ever represent more than one sound in the words utilized in the controlled vocabulary of the earliest reading experiences.

In Bruner's concept of structure as an aid to long-term memory storage, support can be found for the instructional strategies in alphabetic methods and materials. Bruner suggested that children learn best when a very few easily distinguishable units are presented at a time and drilled in varying contexts before any additional new units are added⁴⁷.

Ausubel agreed with Bruner by stating that "Knowledge of graphemic phonemic correspondences can be transmitted more effectively on a systematically programmed and guided basis"⁴⁸.

Selection of Independent Method Variable — For purposes of the present study, alphabetic materials and semantic materials are selected as the two levels of the stimulus (independent method) variable. The investigator

47 Jerome S. Bruner, The Process Of Education, Toronto, Random House, 1966, p. 24.

48 D. P. Ausubel, "Cognitive Structure: Learning To Read", Education, Vol. 87, p. 547.

wished to measure oral reading achievement (the dependent achievement variable) at the end of grade one in relation to the two independent variables, 1) levels in auditory and visual sequential short-term memory and 2) type of teaching material, semantic or alphabetic.

Individualizing Instruction in Beginning Reading —
Dechant's position on the individualization of the teaching of beginning reading is unequivocal.

The task facing teachers and psychologists today is that of identifying the pupil who learns best with either one or the other method. Who is the pupil that would best be introduced to reading through a synthetic approach? Who is the pupil that would best be introduced to reading through an analytic approach?⁴⁹

Answers to Dechant's questions will depend largely on the existence of a method-aptitude interaction occurring between aspects of teaching procedures and aspects of pupil-learning styles.

Auditory, visual and tactile learning systems develop at different rates and to varying degrees of efficiency among all children. Therefore, differential grouping occurs in the kindergarten to effect readiness programs which prepare the participants for acquisition of the skill of reading⁵⁰. The concept of attempting to match

49 Emerald V. Dechant, Op. Cit., p. 235.

50 Katrina de Hirsch et al., Predicting Reading Failure, p. 82.

a specific pattern of modality development in short-term memory to either an alphabetic or a semantic method of teaching reading finds support in Manning's statement.

. . . educators are just beginning to appreciate the relationship between neurological system development, reading, language readiness and formal programs.⁵¹

In the present research study, the five patterns of auditory and visual modality development in short-term memory would refer to Manning's "neurological system development" and the "formal programs" would be represented by the alphabetic and semantic methods of teaching beginning reading.

Strang suggested that method-learning style matches can individualize the teaching of beginning reading and would take the following directions⁵².

⁵¹ John C. Manning, Eclectic Reading Instruction For Primary Grade Classes, paper presented at International Reading Association Conference, Boston, 1968, p. 3.

⁵² Ruth Strang, Reading Diagnosis and Remediation, Newark, International Reading Association, 1968, p. 25.

1. In the readiness phase, the majority of children would start with a whole word approach utilizing semantic materials at the kindergarten level.⁵³

2. During the beginning stage of formal reading instruction, two alternatives would allow (a) more mature children who are ready to respond to details in words and or children whose auditory perception and memory were well developed, to follow an alphabetic method in phonic training and word building through synthesis and (b) less mature children not ready to respond to details in words and or children whose visual perception and memory were preferred areas of development, to follow a semantic analysis and word building through phonic substitution.⁵⁴

Pitman and Mathews disagree on the relationship of the reader's auditory background to instruction in a semantic method. Pitman underscores the superior role of the beginning reader's auditory modality in the learning to read process (regardless of instructional method). Mathews, on the other hand claims that the semantic method ignores the reader's background of auditory experience and makes demands which require substantial development of the visual modality. In other words, Mathew's implication is that visual learners will be most successful with the semantic method of teaching beginning reading. However, for

53 Joyce M. Morris, "The Relative Effectiveness of Different Methods of Teaching Reading, Teaching Children to Read", Educational Research, Vol. 1, No. 2, 1959, p. 74.

54 M. E. Hocker, "Primary Prevention of Reading Failure", Elementary English, 46, 1969, p. 189.

both visual and auditory learners who are being exposed to the semantic method of learning to read, the visual memory of sight words in the initial stages becomes fundamental to the later analysis and regeneration of new words for the reading vocabulary.

In summary, Ausubel⁵⁵ stated that the difference between the two schools of thought (utilizing semantic and alphabetic materials) which is largely one of timing and relative emphasis, is "important theoretically and practically".

Summary — This section has dealt with the psychological rationales behind the instructional sequences of the alphabetic and semantic methods of teaching beginning reading. Then relationships among methods and levels of aptitude in short-term memory necessary for the individualization of teaching reading were examined briefly.

According to Dechant, the semantic method of teaching beginning reading reflects a Gestaltic influence with its emphasis on whole words rather than parts of words in the initial stages of instruction. The instructional sequence commences with the study of whole sight words which eventually are analyzed for commonalities in beginning, medial and terminal sounds. New words are added to the

55 D. P. Ausubel, Op. Cit., p. 547.

reading vocabulary by means of the substitution phonic method.

The semantic method employs an instructional sequence of word study which recognized the ontogenetic perceptual transition in verbal learning. That is, the child is exposed first to sight words, then to an analysis of word wholes into parts and finally to a reintegration of the parts into whole patterns.

The alphabetic method of teaching reading derives support from a stimulus response theory of verbal learning. The instructional sequence commences with the learning of letter names and sounds which are then blended to form any number of words. Reading materials which accompany the alphabetic method utilize words which contain patterns of consonants and short vowels which can be easily blended. Such phonemic regularity is gradually phased out by means of a reading vocabulary which contains a greater number of orthographically less regular words. The proportion of such words increases with the readability grade range of the material to the point where little or no vocabulary control is found at the highest level of a basal series.

The reinforcement of verbal stimulus response associations in reading experiences forms the basis of the alphabetic method. Thus verbal stimuli, that is words to be read, are composed of only those letters which have

been learned in association with specific sounds. Such control of vocabulary is supported by both Bruner and Ausubel who advocated a structured and programmed sequence of steps in the teaching of beginning reading.

Alphabetic materials utilize a vocabulary control similar to the Barnhardt and Fries variety of linguistic materials although the means of presenting word attack skills to the pupils differ. Therefore, it was decided to limit the study to an examination of semantic and alphabetic materials.

Individualization of beginning reading instruction will depend upon the identification of method-aptitude interaction among the subject, stimulus and achievement variables.

Theoretically by using the I.T.P.A., it is possible to identify children with different degrees of integrational development in the visual and auditory components of the short-term memory capacity. Practically it is just as possible to assign children to the beginning reading program utilizing either the semantic or the alphabetic method according to their degree of aptitudinal development.

The review of the literature indicates that the timing of the methodology is important in the teaching of beginning reading. If a significant method-aptitude interaction can be revealed, co-ordination of the individual

reader's language learning style with semantic and alphabetic teaching methods could become a viable objective for the teaching of beginning reading in the elementary schools.

3. Report of Related Research Findings.

In section three research reports dealing with achievement in beginning reading are analyzed according to 1) differences in the organization of the aptitude and method variables and 2) differences related to the processes of oral and silent reading. The section ends with a restatement of objectives for the present study.

The literature is replete with reports of laboratory and field research on instructional methods in beginning reading which investigate the relative effectiveness of alphabetic and semantic methods. However, a lesser amount of evidence has been gathered on the issue of differential instruction in the teaching of beginning reading. The effects of developmental patterns of short-term memory and instructional method on achievement in oral reading are investigated in the present study. Therefore, the three areas deemed most significant were reports which 1) claim an overall superiority in silent reading achievement for the alphabetic method, 2) identify auditory short-term memory as a major aptitudinal factor contributing to success in beginning reading and 3) link success at silent

reading achievement in an alphabetic method with sequencing ability in auditory and visual short-term memory in a method-aptitude interaction study.

The first research area to be investigated linking achievement in silent reading with exposure to an alphabetic method of teaching was chosen because it represents the consensus of research findings in method studies in the last decade. Little research has been devoted to method studies where oral reading was used as the dependent variable. It seemed appropriate to examine research literature questioning the value of auditory short-term memory ability in learning to read for two reasons: 1) auditory and visual components of sequential short-term memory were being used as independent variables in the present study and 2) the distinction between beginning and mature reading depends largely on a shift from the auditory to the visual modality. The third research area to be examined is the most germane to the present investigation because it deals with a few research studies in beginning reading which have been of the method-aptitude interaction type. However, the present study tests the generalizability of the existing findings by investigating their application to achievement in oral reading at the end of the first year of formal instruction.

Superiority of Alphabetic Methods in Silent Reading Achievement — Related laboratory research in verbal learning, searching for the most effective linguistic units of representation has occurred across all levels of aptitude among subjects. In summary such research holds that letters and word components (syllables) as found in alphabetic methods of teaching reading are superior to whole configurations in the learning and transfer of whole words^{56,57,58}.

A large number of method studies in the field of beginning reading instruction emphasize the superiority of alphabetic methods.

Bliesmer and Yarborough⁵⁹ reported that pupils in five alphabetic (synthetic) programs were superior in grade

56 W. E. Jeffrey and S. J. Samuels, "Effect of Method of Reading Training On Initial Learning and Transfer", Journal of Verbal Learning and Verbal Behaviour, VI, 1967, p. 354.

57 Marjorie Sherman and George Marsh, Transfer From Word Components To Words And Vice-Verse In Beginning Reading, Southwest Regional Educational Laboratories, Englewood, 1970, 14 p.

58 Douglas G. Muller, The Effect of Letter Training On The Acquisition Of Word Reading Skills, paper presented at New Mexico State University, Los Cruces, July 1970, 29 p.

59 Emery P. Bliesmer and Betty H. Yarborough, "Comparison of Ten Different Beginning Reading Programs In First Grade", Phi Delat Kappan, 46, p. 504.

one silent reading achievement to those in five programs following a semantic (analytic) method.

According to independent research studies by Ruddell⁶⁰, Bear⁶¹, Dykstra⁶², Potts and Savino⁶³, and Sabaroff⁶⁴, rate, comprehension and word recognition scores as measured by group achievement tests in silent reading were greater for grade one pupils whose reading programs had utilized alphabetic methods rather than semantic methods.

Of particular importance to the present investigation is the introductory study carried out by Linn and Ryan⁶⁵ on the effectiveness of their grade one reading

60 Robert B. Ruddell, "Reading Instruction in First Grade With Varying Emphasis on the Regularity of Grapheme-Phoneme Correspondences and the Relation of Language Structure to Meaning", The Reading Teacher, Vol. 19, p. 660.

61 David E. Bear, "Phonics For First Grade, A Comparison of Two Methods", Elementary School Journal, April 1959, p. 402.

62 R. Dykstra, "Four Types of Primary Reading Programs, A Comparative Study", National Elementary Principal, 47, April 1968, p. 56.

63 M. Potts and C. Savino, "Relative Achievement of First Graders Under Three Different Reading Programs", Journal of Educational Research, July 1968, p. 450.

64 Rose E. Sabaroff, "A Comparative Investigation of Six Reading Programs: Two Basal, Four Linguistic", Education, Vol. 91, No. 4, May 1961, p. 314.

65 J. R. Linn and T. J. Ryan, "Multi-Sensory Motor Method of Teaching Reading", Journal of Experimental Education, 1968, p. 59.

program, a synthetic phonics type. A control group of eighty-five pupils following a semantic whole word program were matched with eighty-five in the experimental program. At the end of the first year Linn found the experimental group significantly superior to the control group in silent reading achievement (a function of speed and comprehension of graded paragraphs in The Dominion Primary Achievement Test) and spelling.

Chall's general interpretation of the research from 1912 to 1965 favours the use of code-emphasis (alphabetic) methods for beginning reading. She added the qualification that once the pupil has learned to recognize in print the words which he knows as part of his listening and speaking vocabulary, additional work in decoding is unnecessary⁶⁶. At the same time she acknowledged that her recommendation would not apply to some pupils whose unique styles of learning (aptitudes) would have to be considered.

Achievement in Oral Reading — The conflict in the research literature on method studies appears to be based on the achievement criterion being used. That is to say, where silent reading achievement measured according to speed and comprehension is concerned, alphabetic methods are

⁶⁶ Jeanne S. Chall, Learning to Read: The Great Debate, Toronto, McGraw-Hill, 1964, p. 307.

reported upon as being superior to semantic methods. On the other hand, after analyzing research reports, Spache considered oral reading achievement, measured according to accuracy and speed, as the yardstick which shows that semantic methods produce beginning readers who are more accurate and faster than their counterparts in alphabetic methods⁶⁷.

Robinson⁶⁸ examined the effects on both oral and silent reading when subjects were grouped by auditory and visual modality pattern and instructional program in beginning reading. Although no statistically significant main or interactive effects were found among levels of method and modality pattern, analysis of the groups' main scores revealed some interesting trends. With the exception of the low auditory-low visual group, the remaining three modality groups exposed to alphabetic instruction earned higher mean scores in silent reading achievement than did their counterparts exposed to semantic methods. However, when achievement in oral reading was the dependent variable, two of the former three groups and the low auditory-low

67 George D. Spache, Op. Cit., p. 61.

68 Helen M. Robinson, "Visual and Auditory Modalities Related to Methods for Beginning Reading", Reading Research Quarterly, Vol. 8, No. 1, Fall 1972, p. 7.

visual group exposed to semantic instruction earned higher achievement scores than did their counterparts exposed to alphabetic instruction.

Three observations can be made from the Robinson study. It would appear that the trends in the mean scores of the groups might relate differences in the processes of oral and silent reading to the instructional sequences and emphases particular to either the semantic or the alphabetic method. In the first place the data indicate a contrary profile for two of the modality groups when achievement in both oral and silent reading is examined. Second, the majority of the alphabetic instructional subjects achieved results superior to their semantic counterparts in silent reading. Such a result is similar to the findings of most method studies claiming the superiority of alphabetic instructional programs in silent reading achievement. Third, the majority of the semantic instructional groups achieved results superior to their alphabetic counterparts in oral reading. Such a result is similar to Spache's findings concerned with achievement in oral reading⁶⁹. It could follow that achievement in both oral and silent reading at the end of the first year in instruction may be both hindered and assisted when either of the

69 George D. Spache, Op. Cit., p. 61.

two instructional methods and materials is used exclusively. That is, semantic instructional materials may have a positive effect upon achievement in oral reading and a negative effect upon achievement in silent reading. Conversely, alphabetic instructional materials may have a positive effect on silent reading achievement and a negative effect on achievement in oral reading. The present study attempts to examine such possibilities in relation to achievement in oral reading. That is, the interactive effects of both instructional methods and readers' styles of short-term memory upon achievement in oral reading are examined.

In section one, theoretical positions on the different processes of silent and oral reading revealed the latter to be a more difficult process to master. The longer time factor involved in oral reading because of the addition of subprocesses (many of which are not part of silent reading) probably taxes the short-term memory of the reader. That is, the oral reader must retain the visual and auditory images long enough to permit decoding to meaning (semantic method) or to sound and then to meaning (alphabetic method).

The relationship of instructional method and achievement in oral reading can be partly examined by considering the chief features which distinguish oral from

silent reading and the semantic from the alphabetic method.

Meaningful oral reading requires the reader to have developed an eye-voice span allowing him to pronounce word phrases while simultaneously attacking the next group of words. Such a task is more visual than auditory in nature. That is, the reader must acquire a meaning for the words and or groups of words through a visual identification process. In the words of Frank Smith, "there is no time to work out what words are by synthesizing possible sound combinations"⁷⁰. Consequently ten months of instruction with blending or synthesis as the chief form of word attack skill may well slow a reader down to the point where his oral reading achievement is affected.

Achievement in oral reading as measured in contemporary reading tests is a function of accuracy and speed. Therefore, it is conceivable that readers taught by an alphabetic method may score less well at the end of grade one than their peers taught with a semantic method. Such a phenomenon could be due to the delaying effect of blending letter sounds in the word attack process of an alphabetic method. Again, such a question is treated in the present study by later examining

70 Frank Smith, Op. Cit., p. 127.

achievement scores in oral reading which have been organized according to one or the other method of instruction.

Ability in Auditory Short-Term Memory and Reading Achievement — The findings of research relating ability in auditory short-term memory to achievement in beginning reading appear to support Murdock's thesis presented earlier in the study. That is, the beginning reader depends more on the products of the auditory than the visual short-term storage, the former being a temporal distribution of acoustic signals and the latter a spatial distribution of visual signals. Thus readers having ability in auditory short-term memory may retain more language elements in short-term memory than readers whose short-term memory ability is more visual. The size of the eye-voice span so necessary in oral reading may depend heavily upon the reader's ability to store and sequence acoustic signals which are recoded from visual signals on the printed page.

Additional independent studies reported by Katz and Deutsch⁷¹ and Morsink⁷² characterize poor readers

71 P. A. Katz and M. Deutsch, Visual and Auditory Efficiency and Its Relationship to Reading in Children, Final Report 1963, Washington, Office of Education, p. 45.

72 Catherine Voelker Morsink, "Teaching Early Elementary Children with Reading Disability", The Reading Teacher, Vol. 24, No. 6, March 1971, p. 550.

according to 1) their difficulties in learning auditory material and 2) their strategies employed in learning to read. Poor readers experience more difficulty in learning auditory than visual material. Also they found that poor readers attempted to read only by using visual memory aided by context (meaning) and configuration (shape) without the assistance of phonic analysis and synthesis.

Bateman⁷³ examined achievement (comprehension and speed) in silent reading by grade one pupils who had been organized by both method of instruction and by virtue of scores in the auditory and visual sequential short-term memory subtests of the I.T.P.A. She found that auditorially preferred subjects were superior to visually preferred subjects in all classes regardless of the method of instruction.

Such findings suggest two possibilities for the direction of results in the present study. First, subjects having discrepant patterns of sequential short-term memory, low in the auditory component and subjects having patterns low in both components would also be poor at oral reading. Such pupils in Bateman's study were poor in silent reading. Second, since success in reading is the result of an integration of auditory and visual perceptual operations, reliance

73 Barbara D. Bateman, "The Efficacy of an Auditory and a Visual Method of First Grade Reading Instruction with Auditory and Visual Learners", in Perception and Reading, (ed.), Helen K. Smith, p. 105.

on only visual signals, the storage products of visual sequential short-term memory, could result in the errors of substitution and insertion. These errors are often the result of guessing at word identification in the task of oral reading by a purely visual reader. In short, weakness in auditory sequential short-term memory may be a factor capable of destroying accuracy in oral reading. Such a possibility will be examined in the context of the present study.

Method-Aptitude Interaction in Silent Reading Achievement — Drawing her evidence from clinical and research data, involving the use of the I.T.P.A., Bateman⁷⁴ hypothesized two forms of method-memory interaction for subjects with discrepant patterns or styles in auditory and visual sequential short-term memory.

First, the child with poor auditory memory but good visual memory (A^-V^0), a discrepant pattern presenting a weakness in the auditory component, would enjoy some initial success with a semantic method. Later the child would encounter difficulty when phonic instruction was introduced. No success immediate or delayed would be encountered with an alphabetic method.

74 Barbara D. Bateman, Interpretation of the 1961 Illinois Test of Psycholinguistic Abilities, Seattle, Special Child Publications, 1963, p. 53.

Second, Bateman was concerned with the child having a poor visual memory and a good auditory memory ($A^O V^-$), a discrepant pattern presenting a weakness in the visual component. Such a learner would enjoy initial success with an alphabetic program and a delayed success which would occur with a semantic program when phonics instruction would be added after the initial period of memorizing sight words.

Frank Smith's argument against an alphabetic method of teaching reading is based on two premises. First, the use of phonic rules is the slowest method of identifying words and second, the limited information processing and memory capacity of the visual system cannot tolerate a slow rate of reading⁷⁵. In other words, visual short-term memory is unduly taxed by an alphabetic method. Such a finding is in agreement with Bateman's hypothesis in 1961 and could imply that pupils showing weakness in visual short-term memory might achieve superior results in silent reading achievement with a semantic method as opposed to an alphabetic method. In the alphabetic method, the beginning reader would lose valuable time in blending the letters to synthesize a word and consequently strain the capacity of both the visual short-term memory and the

75 Frank Smith, Op. Cit., p. 180.

auditory short-term memory. Such a position would appear to counter the more traditional stand which holds that a poorly developed visual perceptual modality is better suited for an alphabetic (auditory) method than for a semantic (visual) method^{76,77}. However, what the traditional position overlooks is the fact that the success of the reading process depends upon the reader's aptitude at integrating auditory and visual signals. Thus the beginning reader must eventually expand his reading vocabulary by analyzing known sight words for auditory and visual elements which must be reintegrated in different patterns in a process of phonic substitution to form new words.

Spache also argues that the "phonics" in an alphabetic method makes heavy demands upon auditory discrimination and auditory imagery creating great difficulty for children deficient in those areas⁷⁸. In effect Spache and Smith appear to be disposed against an alphabetic method of teaching reading.

76 Katrina de Hirsch et al., Op. Cit., p. 82.

77 Ruth Strang, Reading Diagnosis and Remediation, E.R.I.C. Reading Review Series, International Reading Association, Newark, 1968, p. 81.

78 George D. Spache, Op. Cit., p. 60.

Rosner⁷⁹ on the other hand takes a completely opposite point of view in the method-aptitude interaction question. He argued that the so-called "sight" (semantic) method will discriminate against the child who is deficient in auditory perceptual skills such as auditory sequential short-term memory because the auditory analysis in a semantic method is more difficult than the auditory synthesis in an alphabetic method. He argued further that the student who is deficient in the auditory perceptual area requires the structure of the phonics instruction in an alphabetic method.

Hartlage⁸⁰ measured achievement in word recognition (the reading test section of the Wide Range Achievement Test) by grade one pupils who for a year were exposed to alphabetic and semantic methods of reading instruction. His findings tend to support Rosner's argument on the corrective effect of the alphabetic method for the learning styles weak in auditory sequencing. Although he controlled the sex variable, the results for both girls and boys showed that weakness in auditory sequencing was least

79 Jerome Rosner, "Language Arts and Arithmetic Achievement and Specifically Related Perceptual Skills", American Educational Research Journal, Vol. 10, 1973, p. 65.

80 Lawrence C. Hartlage, "Prereading Screening To Determine Optimum Reading Instructional Approaches", Reading Improvement, Vol. 11, Spring 1974, p. 7.

troublesome for beginning readers exposed to a "linguistic-phonetic" (alphabetic) method of instruction.

Rosner, Spache and Bateman would all agree that development of the reader's auditory perceptual area is necessary for success in beginning reading. Where they disagree concerns the corrective effect of the alphabetic method. Bateman's 1968 research study 1) failed to support one of her previous hypotheses which suggested that the auditory deficit (A⁻V⁰) learning style would be better suited to a semantic method of instruction and 2) showed the alphabetic method to be superior for all learning styles in terms of achievement in silent reading⁸¹. Thus in the area of silent reading Bateman and Rosner agreed that the alphabetic method would be best for all readers. However, Rosner later cautioned against slowing down the efficient reader with an overabundance of structured synthetic phonics⁸².

Dealing in the area of oral reading, Spache stated that research reports achievement in accuracy and rate of oral reading to be greater for pupils exposed to a semantic

81 Barbara D. Bateman, "The Efficacy of an Auditory and a Visual Method of First Grade Reading Instruction with Auditory and Visual Learners, in Perception and Reading, (ed.), Helen K. Smith, p. 105.

82 Jerome Rosner, Op. Cit., p. 67.

method than pupils exposed to an alphabetic method, regardless of their learning style⁸³.

Stalling and Keepes⁸⁴ investigated the possibility of method-aptitude interaction in silent reading achievement. They proceeded from the assumption that the exercise of holding graphemes and phonemes in memory and blending them as needed, required in an alphabetic method would require a greater sequencing ability in the auditory and visual mode than would a semantic method. Utilizing both auditory and visual short-term memory subtests from the I.T.P.A. as well as their own experimental instruments, they found that after seventy days 1) grade one children with a lower combined (auditory and visual) sequencing score pattern (A^-V^-) were superior in silent reading achievement after exposure to a semantic method, 2) grade one children with a higher combined score pattern (A^+V^+) achieved superior results in an alphabetic method and 3) the performance of children taken as a group in the alphabetic method was significantly better than those in the semantic method considered also as a group.

83 George D. Spache, Op. Cit., p. 61.

84 Jane A. Stalling and Brian D. Keepes, Student Aptitudes and Methods of Teaching Beginning Reading, A Predictive Instrument For Determining Interaction Patterns, California, Palo Alto Unified School District, 1970, p. 4.

Bateman, Stalling and Keepes are the only researchers who have searched for a method-aptitude interaction involving 1) ability in auditory and visual short-term memory, 2) exposure to alphabetic or semantic methods and 3) consequent achievement in speed and comprehension in silent reading. Both researchers report that subjects high in both modes of sequencing ability, that is, auditory and visual sequential short-term memory were the best readers and obtained the best results from alphabetic materials. Bateman organized her independent aptitude variable into an auditorially or visually preferred category while Stalling and Keepes organized their independent aptitude variable into high or low sequencing ability. Bateman failed to obtain a method-aptitude interaction. However, Stalling and Keepes were able to report interaction results which indicated that 1) low sequencers achieved results in semantic methods superior to those in alphabetic methods and 2) high sequencers achieved their best results in alphabetic materials.

Rosner concluded, in agreement with Bateman and Stalling and Keepes, by suggesting that a child's success in reading will depend upon his ability to analyze acoustical information effectively⁸⁵. Where methods of teaching reading

85 Jerome Rosner, Op. Cit., p. 65.

differ, stated Rosner, is not in the visual demands made upon the reader but in the auditory demands. Contrary to critics of the alphabetic method such as Smith and Spache, Rosner has felt that less acoustical analysis is required to synthesize a word in the alphabetic method than to analyze a word in a semantic method.

In essence the research reports of Bateman, Stalling and Keepes are not in contradiction. In silent reading, therefore, method-aptitude interaction can occur when total sequencing strength is the aptitude variable of concern but does not occur when visual or auditory preference in sequencing ability are the aptitude variables of concern.

It now remains the objective of the present study to test the theses of Bateman, Stalling and Keepes, Smith, Spache and Rosner when the dependent achievement variable is oral rather than silent reading.

The added complexity and difficulty of oral reading in comparison to silent reading were discussed earlier in section one of the present study. It was shown that the time factor was the main difference between the two processes. In oral reading the reader has less time to monitor himself and must deal with a short-term memory capacity considerably reduced in efficiency from its potential in the process of silent reading.

4. Summary and Statement of Hypotheses.

Section four concludes the review of the literature in Chapter II. A purpose for the study is restated and is followed with a summary of the literature reviewed in sections one to three. Two hypotheses to be tested experimentally are presented with reference qualifications regarding the results of related research. The section closes with a restatement of the research problem.

The purpose of the study is to discover whether beginning readers who possess different patterns of aptitude in short-term memory will differ in their abilities to read orally after a year's instruction in either an alphabetic method or a semantic method of teaching reading.

Rationale developed in the first section of the review examined the role of auditory and visual sequential short-term memory in the process of learning to read. The literature revealed that disabilities in short-term memory accounted for such faulty reading practices as uncertain memory for letters, reversals, sequencing problems, poor comprehension and slow reading speed. Models of language acquisition developed by Wepman, Osgood and Kirk and McCarthy were presented to exemplify the locus and range of short-term memory activities. It was shown that auditory and visual short-term memory operate at the perceptual

level of language generation in a three-stage process involving input, integration (recoding and decoding) and output (encoding).

Integration of the auditory and visual components of short-term memory was recognized as being vital to its effectiveness in any language function. Although the theorists identified 1) the superior complexity of the functioning of the auditory component and 2) the shift from the auditory emphasis to the visual emphasis with maturity, all agreed that the integration of both components is important in the process of reading for the sighted person.

Ruddell, Goodman, Geyer, Venezky and Calfee agreed on the dynamic interplay between short-term memory and long-term memory in the reading process. When a language function such as reading involves comprehension the short-term memory assists processing at the conceptual level. Thus the short-term memory capacity acts as a temporary holding store for data which are rejected if it does not relate to a structure of knowledge gained previously and stored in a longer-term memory. It was noted that in the process of oral reading, there was an increased demand made upon the short-term memory capacity. More time is required to process units in short-term memory to allow the reader to decode silently to himself while encoding orally to a public audience.

The role of short-term memory was related to the purpose of the study. Five patterns of aptitude in auditory and visual sequential short-term memory can be defined for a subsequent investigation of possible interaction with two methods of teaching beginning reading upon achievement in oral reading.

In section two, rationales for two methods of teaching reading were examined for demands made upon the reader which might be related to aptitudinal patterns in short-term memory. The possibility of individualizing a beginning reading program on such a method-aptitude basis was treated at the end of the section.

The literature revealed that the alphabetic method derives support from a stimulus response school of learning theory and attempts to reinforce sound-symbol associations of letters and sounds before proceeding to the formation of words through blending and synthesis. The semantic method derives support from a field theory of learning and introduces the student to a study of whole words and or sentences before proceeding to an analysis of whole words for generalizations on sound-symbol associations.

Linguistic methods were omitted from the present study for two reasons. First, linguistic methodology generally fails to reflect individual differences in language learning. Second, one of the linguistic approaches emphasizing individual sounds and letters controlled the reading

vocabulary in a way similar to that exercised by the alphabetic method. Therefore, the study was limited to the investigation of the main and interactive effects of 1) semantic and alphabetic methods and 2) five patterns of aptitude in auditory and visual sequential short-term memory upon achievement in oral reading at the end of grade one.

The viability of individualizing instruction in beginning reading by matching patterns in modality development to the demands of alphabetic and semantic methods was examined. Both Dechant and Ausubel supported the need for differential reading instruction while de Hirsch, Hocker and Strang were more specific in their recommendations which are summarized as follows:

1. In the readiness phase of prereading instruction, most children would benefit from a semantic whole word approach to the teaching of reading.

2. Later during the grade one formal instruction period, an additional route involving the alphabetic approach should be considered for more mature children whose auditory perception and memory were sufficiently developed to permit them to respond to details within words.

Research reports on method-aptitude studies in beginning reading were examined in section three. The studies selected for review related 1) achievement in

silent reading to aptitude in short-term memory and 2) alphabetic and semantic methods to achievement in oral and silent reading.

No method-aptitude research has been carried out with oral reading as the achievement variable and aptitude in short-term memory as an independent variable. Bateman found no interaction effect on silent reading achievement when preferred modality in sequencing ability was one of the independent variables. Stalling and Keepes found interaction favouring high sequencers in an alphabetic method and low sequencers within a semantic method with their study of silent reading achievement.

Reconciliation of apparent conflicts in the method-aptitude question of beginning reading instruction was based on the difference of process between silent and oral reading. Such a difference appears to change the results of achievement tests in oral and silent reading. That is, research results in silent reading at the grade one level claim the superiority of the alphabetic method while Spache insists that research on oral reading achievement claims the superiority of the semantic method. Data from the Robinson study suggested that superior achievement in oral reading was dependent upon a semantic instructional method. Spache and Smith would attribute the poor achievement results in oral reading under an alphabetic method of instruction to

a strain imposed on both the auditory and visual components of short-term memory caused by the slow procedure of sounding out and blending, characteristic of the beginning stages of such a method.

Status of Method-Aptitude Interaction Research — Only two studies have investigated the interaction effect of abilities in short-term memory and the semantic or alphabetic method of instruction on achievement in silent reading and consequently the research has yet to treat the following gray areas of theoretical and practical importance:

1. Clearly identify the phonic tasks of word recognition in an alphabetic method and a semantic method of instruction in beginning reading.
2. Support the contentions of Spache and Smith that the initial phonic blending approach in word attack procedures utilized in an alphabetic method in beginning reading materials would slow the reader down, tax the visual and auditory short-term memory and destroy the speed and accuracy of oral reading (individually tested and considered to be a greater strain on short-term memory than silent reading).
3. Examine a method-aptitude interaction effect on oral reading achievement as a result of subjects with preferred modality patterns in sequential short-term memory being exposed to a first year of instruction in either an

alphabetic method (a Canadian synthetic phonics type) or a semantic method (a Canadian analytic phonics type).

4. Examine an interactive effect among the above methods of instruction and strength of total sequencing in auditory and visual short-term memory on achievement in oral reading at the end of grade one.

Statement of Hypotheses — The complexity of the oral reading process and the strain it places upon the short-term memory capacity of the reader are factors which tend to suggest the following hypotheses in a method-aptitude interaction research study.

1. The oral reading achievement of subjects possessing the following sequencing styles of short-term memory (concerned with the respective patterns of components of sequential memory) will be ranked regardless of instructional method, as follows from first to fifth:

- S₁ A⁺V⁺ (superior in both auditory and visual components)
- S₂ A⁰V⁰ (normal in both auditory and visual components)
- S₃ A⁰V⁻ (visual deficit sequencing style)
- S₄ A⁻V⁰ (auditory deficit sequencing style)
- S₅ A⁻V⁻ (low in both auditory and visual components)

Bateman, Stalling and Keepes, Rosner and Robinson recognize the individual's need of auditory perceptual development to

benefit from formal instruction in reading regardless of the method of instruction.

2. Oral reading achievement under M_1 will be greater than achievement under M_2 , for each style of sequencing except S_4 , the auditory deficit sequencing style.

Smith would suggest that the strain on the visual short-term memory (less well developed than the auditory short-term memory, Howe 1970 and Murdock 1968) imposed by the comparatively slow (synthetic) approach to oral reading generated by the alphabetic method, would have a restrictive effect on the reader's accuracy and speed in oral reading.

Stalling and Keepes with their research in silent reading achievement supported the assumption that the holding of graphemes and phonemes in either auditory or visual short-term memory as required in the blending process of an alphabetic method of teaching reading would discriminate against subjects low in both auditory and visual components of sequential short-term memory.

Spache (1972) interpreted the results of research in beginning reading as indicating that in contrast with other methods in the teaching of oral reading, phonic approaches (as emphasized in an alphabetic method) appear to produce inferior performances in accuracy and rate of

oral reading, in spelling, and in silent reading comprehension.

Robinson's study (1972) utilized auditory and visual discrimination as the aptitude variable. Her data indicated that beginning readers with an auditory weakness who were exposed to an alphabetic program obtained slightly higher scores on an oral reading achievement test than did their counterparts exposed to a semantic program. However, results for the other three aptitude groups were in the opposite direction so that achievement scores in oral reading were highest for those exposed to a semantic program.

Rosner (1973) assumed that if the reader's ability to analyze visual data is intact, then the type of reading program chosen should structure the phonic word attack instruction according to the subject's ability to analyze acoustic data. In other words, a subject with an auditory weakness requires a structured alphabetic program.

Restatement of the Problem — The research problem concerning the study examined, the relationships among teaching methods, individual learning styles and achievement in oral reading may be expressed as follows: Are there differences in oral reading achievement scores among 1) high auditory and visual sequencers (A^+V^+), 2) medial

auditory and visual sequencers ($A^{\circ}V^{\circ}$), 3) auditorially preferred sequencers ($A^{\circ}V^{-}$), 4) visually preferred sequencers ($A^{-}V^{\circ}$) and 5) low auditory and visual sequencers ($A^{-}V^{-}$)? Do all but the visually preferred sequencers ($A^{\circ}V^{-}$) achieve better oral reading results under a semantic method of instruction while an alphabetic method is more conducive to success for these same visually preferred sequencers ($A^{\circ}V^{-}$)?

In the following chapter on experimental design, a testing population, testing instruments and statistical analysis are identified for the research experiment. The experimental study tests the hypotheses derived from the review of the literature completed in the present chapter.

CHAPTER III

EXPERIMENTAL DESIGN

Chapter III explains the procedure for testing the experimental hypotheses concerning the main effects of style and the interactive effects of style and method-based materials upon achievement in oral reading, the dependent variable. Section one describes the selection of the subject population. Section two treats 1) the procedures for identifying the classes to participate in the study and 2) the use of testing assistants. The use of the Illinois Test of Psycholinguistic Abilities and the use of Gray's Oral Reading Tests are justified in section three. Section four treats the organization of the data and section five, the experimental design. Utilizing a three-factor nested ANOVA design, five styles of auditory and visual short-term memory are crossed with two types of methods (alphabetic and semantic materials) within which are nested a total of fourteen classes. The chapter concludes with a summary.

1. Subject Population.

Pupils in their ninth and tenth months of grade one, most of whom would reach their sixth birthday by December 31, 1972 and who attended English speaking classes in 1) fifteen schools within the jurisdiction of The Ottawa (City)

Board of Education, b) forty-two schools within The Ottawa Roman Catholic Separate School Board and 3) forty-six within The Carleton (County) Board of Education were potential subjects for the experiment. The three boards mentioned above serve children in areas of varying degrees of socioeconomic level found within 1) the inner city, 2) suburban and 3) rural and township areas of Carleton County.

2. Procedure for Selection of Sample.

After obtaining permission from the research committees of the three boards, classroom identification sheets were sent to principals. To ascertain the eligibility of grade one classes for inclusion in the research study, the identification sheets allowed the investigator to restrict the sampling to those classes which 1) began formal reading instruction in September 1972 and 2) were involved in either a semantic or an alphabetic reading program.

The experimental design called for the selection of fourteen classes from the three boards which made available a total of 102 classes, eighty-one of which were eligible. Seven of the classes chosen were those which had been exposed to an alphabetic materials-based method for nine months and seven who had been exposed to a semantic materials-based method for the same period of time. The random sampling of

the fourteen classes was accomplished using a computer program in A.P.L. Finally each of the fourteen classes was later divided into five experimental units according to style of auditory and visual short-term memory to permit an analysis of achievement in oral reading according to aptitude in short-term memory.

3. Instruments.

The instruments described and justified in this section were deemed suitable for testing the hypotheses relating aptitudinal pattern in short-term memory to achievement in oral reading. The Illinois Test of Psycholinguistic Abilities.

The I.T.P.A. first published by McCarthy and Kirk¹ in 1961 and later revised in 1968² is a diagnostic individual test of psycholinguistic abilities. It was labelled by one reviewer as a test of language perception and short-term memory abilities³. The I.T.P.A. utilizes the rationale of Osgood's generalized behaviour model in communication and

1 J. J. McCarthy and S. A. Kirk, Illinois Test of Psycholinguistic Abilities, Examiner's Manual, Urbana, University of Illinois Press, 1961.

2 Samuel A. Kirk et al., Examiner's Manual, Illinois Test of Psycholinguistic Abilities, (rev. ed.), Urbana, University of Illinois Press, 1968.

3 Clinton I. Chase, "Review of the I.T.P.A.", in The Seventh Mental Measurements Yearbook 7, Vol. 1, 1972.

Wepman's model of neural language organization within the central nervous system.

Of interest to the present study are two subtests, auditory sequential memory (also called auditory short-term memory) and visual sequential memory (also called visual short-term memory). Specifically, auditory sequential memory is the ability to memorize a span of digits presented at the rate of two per second while visual sequential memory is the ability to reproduce sequences of non meaningful figures after a five-second exposure.

The I.T.P.A. is designed to measure psycholinguistic abilities of children aged two to ten years across 1) two channels of communication, auditory-vocal and visual-motor, 2) two processes, receptive and expressive and 3) two levels of organization, the representational and the automatic.

The channels of communication are auditory and visual sensory modality routes through which sense impressions are received and forms of expression are produced. The auditory and visual modalities are forms of input and the vocal and motor expressions are forms of output. Auditory sequential memory would be located in the auditory vocal channel and visual sequential memory in the visual motor channel of communication.

The clinical model of the I.T.P.A. postulates that habits of communication are organized within the individual

at the representative level and at the automatic level. At the representative level occur more complex mediating processes while less voluntary but more highly organized and integrated activities occur at the automatic level. The auditory and visual sequential memory tests both call for activities considered to occur at the automatic level.

The I.T.P.A. analysis of language behaviour considers a receptive, an expressive and an organizing process. The receptive process is the ability to recognize and understand what is seen or heard and precedes the organizing process involving the mental manipulation of percepts, concepts and linguistic symbols. The expressive process follows and is the ability to express ideas or to respond in a vocal or physical manner. The auditory and visual sequential memory subtests measure aptitudes within the organizing process.

Although the complete battery of the 1968 I.T.P.A. consists of twelve subtests, only two of the subtests at the automatic level, auditory sequential memory and visual sequential memory were designed to test the aptitude variable of short-term or sequential memory.

In the norming procedure, explained more fully later in the section, reliability and validity measurements were done on all subtests individually and are therefore, subject to evaluation on a separate basis. The choice of the language quotient (obtained by dividing a subtest language

age by the subject's chronological age) as an index of aptitude in short-term memory was taken partly because of its independence from the data of other subtest scores. Since the comparisons of scores in the aptitude variable of concern were among groups of individuals, and not among scores in aptitudes within a single individual (an intra-individual diagnosis), additional subtest score data were considered unnecessary and time consuming for the present study. That is, the study was concerned with five groups of individuals organized only according to style of short-term memory. At that point their achievement in oral reading was examined in the light of two methods of teaching. As noted earlier both Stalling and Keepes and Bateman used the auditory and visual short-term subtests (excluding other subtests) in their reading studies because both modes of short-term memory aptitudes as shown in the theoretical discussion of chapter one are related to achievement in reading.

The I.T.P.A. has been extensively used by Cass⁴, Macione⁵, and others in the research of beginning reading to

4 Corrine Cass, "Psycholinguistic Disabilities of Children With Reading Problems", Exceptional Children, 1966, Vol. 32, p. 533-539.

5 J. R. Macione, Psychological Correlates of Reading Disability as Defined by The Illinois Test of Psycholinguistic Abilities, doctoral dissertation, University of South Dakota, 1969, 97 p.

identify psycholinguistic correlates of reading disability. Smith⁶, Bateman⁷ and Stalling and Keepes⁸ used the I.T.P.A. to investigate the possibility of a method-aptitude interaction effect on achievement in silent reading. The latter two used auditory and visual sequential subtest scores as determiners of aptitude level for the subjects.

The 1968 edition of the I.T.P.A. used in the present study was normed on a population of 962 children aged two to ten years, selected from an initial group of 2,413 on the basis of average scores in intellectual attainment, school achievement, sensory-motor integration and personal-social adjustment. The sample was taken from grades one to four, enrolled in middle range socio-economic schools in five Illinois communities⁹.

Factor analysis studies on subtests in the I.T.P.A. assessed the accuracy with which a test measured single aptitudes, considered mutually exclusive, that is aptitudes

6 C. M. Smith, The Relationship of Reading Method and Reading Achievement to I.T.P.A. Sensory Modalities, doctoral dissertation, University of Georgia, 1969, 48 p.

7 Barbara Bateman, Perception and Reading, p. 105-112.

8 Jane A. Stalling and Brian D. Keepes, Op. Cit., p. 1.

9 John Paraskevopoulos and Samuel A. Kirk, The Development and Psychometric Characteristics of the Revised Illinois Test of Psycholinguistic Abilities, Urbana, University of Illinois Press, 1969, p. 52.

which were not measured by any other subtests. Ryckman and Wiegerink¹⁰ refactored the correlation matrices of eighteen factor analysis studies of the I.T.P.A. (1961 ed.) and isolated five global factors. Two of these factors with their appropriate subtest loadings as reported are shown in Table I with auditory memory included within factor I and visual memory within factor II.

C. E. Meyers found more exclusive differentiation for the memory subtests in the I.T.P.A. which were included as factors IV and V in a series of seven.

. . . it (factor IV) saturates test 5, a visual motor sequential (visual memory), a visual-motor test, and its nature is confirmed by the important reference tests. One might note that test 5 loads separately from the auditory memory test 6. Such clear segregation of auditory and visual memory has been found in several non I.T.P.A. subtests. The structure of intellect name is Memory For Figural Systems (visual) M.F.S. . . . Factor V saturates only with auditory memory (test 7) and does so in all five studies which employ other auditory memory tests. There is no doubt that it is Guilford's memory for symbolic systems (auditory).¹¹

Table II presents the findings of the Meyers study in relation to tests five and seven.

10 David B. Ryckman and Ronald Wiegerink, "The Factors of the Illinois Test of Psycholinguistic Abilities: A Comparison of 18 Factor Analyses", Exceptional Children, 36, No. 2, October 1969, p. 109.

11 C. E. Meyers, What The I.T.P.A. Measures, A Synthesis of Factor Studies of the 1961 Edition, Educational and Psychological Measurement, 1969, 29, p. 872.

Table I.-
Loading of Five Subtests on Two Global Factors.

Factors	Subtests	Loading
I	auditory vocal automatic	.614
I	auditory memory*	.906
I	auditory vocal association	.516
II	visual memory*	.733
II	auditory decoding	.749

Adapted from David E. Ryckman and Ronald Wiegerink,
Op. Cit., p. 109.

* Subtests used to measure aptitude variable

Table II.-

Factor Designations of Two Subtests of the I.T.P.A.

I.T.P.A. Subtest	Factor No.	Common Name	Guilford Name	Nature of Tests and Reference Tests
5	IV	Immediate Visual Memory	M.F.S. Memory for figural systems	Visual span-type tests
7	V	Immediate Auditory Memory	M.S.S. Memory for symbolic systems	Auditory span-type tests: letters - words - digits

Adapted from C. E. Meyers, Op. Cit., p. 872.

Paraskevopoulos and Kirk found the intercorrelations of the twelve subtests of the I.T.P.A. and concluded that "auditory and visual sequential memory appear to be relatively independent of the other subtests"¹².

Concurrent validity studies on the 1961 subtests in auditory and visual sequential memory were carried out by McCarthy and Olson¹³. Their studies may be considered in relation to the 1968 edition, with the realization that revision added items to the subtests and increased the response time¹⁴.

McCarthy and Olson created The Random Word Test as the criterion on the I.T.P.A. auditory sequential memory subtest validity study to demonstrate that whether words or numbers had been used for immediate recall, the aptitude measured would be largely the same. Such appeared to be the case when the subtest validity coefficient was .65.

The Knox Cube Test, The Random Word Test and the Paragraph Reading and Spelling sections of The Stanford Achievement Test were used as criterion tests for the concurrent validity study of the visual sequential memory

¹² John N. Paraskevopoulos and Samuel A. Kirk, Op. Cit., p. 187.

¹³ James J. McCarthy and James L. Olson, Validity Studies on The Illinois Test of Psycholinguistic Abilities, Milwaukee, 1964, p. 20.

¹⁴ Samuel A. Kirk, Examiner's Manual, p. 6.

subtest. The coefficient of correlation with The Knox Cube Test was .15 and with the other three tests was .32.

McCarthy and Olson interpret the results by stating that any obtained correlation of The Random Word Test and the visual sequential memory test could be due to the subject's transfer of some part of the visual stimuli to the auditory memory. That is, the subject would pronounce the sequence of visual stimuli to himself in order to assist the recall power of his visual memory in a test involving visual stimuli.

The California Elementary School Test Evaluations Centre examined the research reports mentioned in the examiner's manual and rated the content validity for the auditory and visual sequential subtests on an informal scale as eight out of ten¹⁵.

Detailed reliability statistics on the 1968 edition have been prepared by Paraskevopoulos and Kirk¹⁶. Coefficients of internal consistency for items in both auditory and visual sequential memory subtests (the ability of items within a subtest to measure the same characteristic) were derived from the Kuder-Richardson formula. Coefficients of internal consistency for the age group six years seven months

¹⁵ Ralph Hoepfner, (ed.), C.S.E. Elementary School Test Evaluations, Los Angeles, U.C.L.A., 1970, p. 24.

¹⁶ John N. Paraskevopoulos and Samuel A. Kirk, Op. Cit., p. 95.

to seven years one month (corrected for restricted intelligence) were reported as 1) Auditory Memory .85 and 2) Visual Memory .60.

Stability (that is, the dependability of the scores from one testing to the next testing on the same population) was calculated on a six month test-retest interval and showed coefficients of .89 for auditory memory and .38 for visual memory. Paraskevopoulos and Kirk stated a rationale to support the findings of the subtest stability testing.

It is the hypothesis of remediation that the rate of development of psycholinguistic abilities can be changed by remedial intervention. Determination of stability over time and the effects of educational intervention will await research on stability over different time intervals with a comparison of different educational intervention procedures. It should be emphasized that the ultimate outcome of successful individualized instruction is the reduction of the test-retest reliability.¹⁷

The authors noted that determination of size of stability must be affected by the educational interaction between test and retest.

Summarizing the results of critical evaluations of the I.T.P.A., Clinton Chase¹⁸ states in M.M.Y.7., that the "tests are reasonably reliable at each age level and score profiles moderately stable".

17 Ibid., p. 107.

18 Clinton Chase, Op. Cit., p. 82.

In short, it appears that the bulk of the review literature supports the cautious use of the I.T.P.A. and indeed demands researchers to build up more information on what can be called the only psycholinguistic learning aptitude test presently available. Studies of theory and practice reviewed in chapters one and two identified auditory and visual memory as subtests at the automatic perceptual level which correlate with reading achievement. Therefore, reasons for the suitability of the use of the selected subtests in the present study are listed as follows:

1. The instrument has sound theoretical foundations derived from the models of Osgood and Wepman.
2. The I.T.P.A. at the automatic level measures attributes concerned with learning to read.
3. Profiles in auditory memory and visual memory show common deficiencies for mentally retarded (having reading problems) and dyslexics¹⁹.
4. Bateman's review of literature on the I.T.P.A. performance of children with reading problems revealed common deficiencies at the automatic-sequential level of psycholinguistic functioning (auditory sequential memory, visual sequential memory).

¹⁹ John N. Paraskevopoulos and Samuel A. Kirk, Op. Cit., p. 192.

5. There is a similarity of the norming population with the present subject population.

6. Reliability statistics are adequate for clarification purposes.

7. Content validity and factor analysis studies suggest the true significance of test objectives at the automatic level.

8. Use of the I.T.P.A. in several reading research projects has resulted in the availability of data on derivation and interpretation of scores and cut-off points.

Gray Oral Reading Tests — The Gray is an individual oral reading test and was designed to meet the following objectives:

1. Provision of an objective measure of growth in oral reading from first grade to college.
2. Diagnosis of oral reading difficulties.
3. Placement in grades or reading groups.
4. Provision of a good measure of the reader's grasp of the meaning of the passage as a whole.

The test consists of a series of thirteen passages ranging in difficulty from first grade to the college and adult levels. Four simple literal comprehension questions are associated with each passage and are given orally to the examinee after his reading of the particular passage.

The manual describes the norming procedure in adequate detail²⁰. The test was normed on elementary, junior and senior high school students attending school districts in Chicago and Florida. Four forms of the instrument were administered to each of 502 subjects.

The Gray purports to measure fluency and accuracy in oral reading as a function of time and number of errors. Writing in the Sixth Mental Measurements Yearbook, both Lohnes²¹ and Bliesmer²² commend the reading tests as being useful in the instrumentation of educational research into reading and its correlates. Concurrent validity is indicated by the test's discrimination ability in identifying grade levels of pupils randomly selected from representative groups of co-operating schools in the standardization project²³.

20 William S. Gray and Helen M. Robinson, (ed.), Gray Oral Reading Tests, Manual of Directions for Administering Scoring and Interpretation, revised, New York, Bobbs-Merrill, 1967, p. 25.

21 Paul R. Lohnes, "Gray Oral Reading Test", The Sixth Mental Measurements Yearbook, (ed.), Oscar Krisen Buros, Highland Park, New Jersey, The Gryphon Press, 1965, p. 1131.

22 Emery P. Bliesmer, "Gray Oral Reading Test", The Sixth Mental Measurements Yearbook, (ed.), Oscar Krisen Buros, Highland Park, New Jersey, The Gryphon Press, 1965, p. 1129.

23 William S. Gray, Op. Cit., p. 30.

The variance of total scores was evaluated in a three-way analysis of variance with sex, age and the four forms of the test as the independent variables. The resulting 'F' ratio of 41, 285 due to grade level was the most significant. This ratio confirmed the discriminative ability of the tests for different school grades.²⁴

The Gray's discriminative capacity is reflected in the raw score conversion tables which express achievement by sex across twelve grades.

Content and construct validity were rated as 8/10 by the C.S.E. team²⁵.

The reliability of the Gray Oral Reading Tests according to Albert J. Harris²⁶, writing in The Sixth Mental Measurements Yearbook, compares favourably with that of other oral reading tests. The C.S.E. evaluation rates the Gray high on replicability, range and gradation and in opposition to high figures expressed in the manual, rates low the stability and internal consistence of the items²⁷. As expressed in the manual coefficients of equivalence for

24 Ibid., p. 27.

25 Ralph Hoepfner, (ed.), Op. Cit., p. 27.

26 Albert J. Harris, "Gray Oral Reading Test", The Sixth Mental Measurements Yearbook, (ed.), Oscar Krisen Buros, Highland Park, New Jersey, Gryphon Press, 1965, p. 1130.

27 Ibid., p. 28.

all subjects ranged from .973 to .982 with a standard error of measurement of four points²⁸.

4. Organization of Data.

The data from the I.T.P.A. and the Gray were collected in preparation for a three-factor nested analysis of variance. Five levels of style of short-term memory were crossed with two levels of method within each of which were nested seven classes.

The Independent Variables — The first independent variable was pattern of strength in auditory and visual short-term memory. Five patterns of auditory and visual age quotients were defined to identify aptitudinal integration among subjects. The language age quotient was derived from the language age tables by dividing each language age score by the subject's chronological age. According to Bateman this procedure

. . . has much the same effect as standard scores but is not subject to the levelling of standard scores, used fewer data columns, and is more familiar to some. It is also a useful teaching technique for illustrating the concept of discrepancies among abilities.²⁹

28 William S. Gray, Op. Cit., p. 30.

29 Barbara D. Bateman, Interpretation of the 1961 Illinois Test of Psycholinguistic Abilities, p. 90.

Thus five patterns or levels of learning style were arbitrarily defined as follows in terms of their auditory and visual quotients:

1. S_1 A^+V^+ both quotients 110 or higher
2. S_2 A^0V^0 both quotients between 100 and 110 or just one above 110
3. S_3 A^0V^- visual quotient below 100
4. S_4 A^-V^0 auditory quotient below 100
5. S_5 A^-V^- both quotients below 100

Such an organization of styles within the independent aptitude variable was designed specifically by the investigator to effect a more comprehensive analysis of aptitudinal pattern in short-term memory than was achieved previously by either Bateman or Stalling and Keepes. The former had organized styles only according to auditory or visual preference and subsequently failed to find interaction. The latter organized for total sequencing ability as either high or low and obtained interaction. Thus in the present analysis, the investigator attempted to incorporate the Stalling and Keepes organization (high sequencers and low sequencers) with an intermediate three-level organization of integration in auditory and visual short-term memory. That is to say, three styles were defined to indicate the following patterns similar to those used by Bateman: 1) S_2 - average degree of integration of both

modalities - $A^{\circ}V^{\circ}$, 2) S_3 - a visual deficit - $A^{\circ}V^-$ and 3) S_4 - an auditory deficit - A^-V° . Then the remaining two styles, used by Stalling and Keepes, S_1 , a high degree of integration and S_5 , a low degree of integration, were added to complete a five level organization of the independent aptitude variable.

The second independent variable, method of teaching beginning reading was represented in two levels of M. M_1 referred to the use of semantic materials in the teaching of beginning reading and was represented with materials from the following basal series:

1. Nelson Language Development Reading Program³⁰
2. Ginn Integrated Language Program³¹
3. Copp Clark Canadian Reading Development Series - Primary³². M_2 in the present study referred to one alphabetic method, namely Language Patterns³³ and was written and edited by Dr. J. Linn, formerly with The Ottawa Public School Board.

30 John A. McInnes, (ed.), Funny Surprises, Kittens and Bears, Pets and Puppets, Teacher's Guidebook, Toronto, Thomas Nelson (Canada), 1970.

31 Martha Kambeitz, Ginn Integrated Language Program, Guidebook for the Level One Program, Toronto, Ginn, 1969.

32 Barbara R. Mercer, Teacher's Manual to Accompany Off to School, (ed.), J. R. McIntosh, Toronto, Copp Clark, 1962.

33 John R. Linn et al., Language Patterns, Teacher's Guide, Part One, Toronto, Holt, Rinehart, 1968.

The dependent variable, achievement in oral reading, was expressed for each subject as a raw score on the Gray tests and was derived from summing the individual passage scores. In the Gray Oral Reading Tests, subjects must read each passage with fewer than seven errors and within fifty-three seconds if they are to score. Although passage scores had been normed for boys and girls and then converted to grade equivalents, the raw scores alone were used in the statistical analysis of the present study because no sex significances were posited in the statement of the experimental hypotheses. The comprehension questions were given to all subjects so that individuals who were calling words in lieu of reading with meaning could be eliminated from the testing population.

5. Statistical Analysis.

The raw score data from Gray's Oral Reading Tests were subjected to an analysis of variance utilizing a three-factor nested design so that styles of short-term memory (S) were crossed with types of instructional materials (M) within which were nested classes (C).

Within each class there were five style elements. The variance due to style and class interaction served as an error term for the style and the method-style significance

tests. The class factor served as an experimental control over variance due to factors other than style or method.

To test the two main hypotheses of 1) main effect in style and 2) method-style interaction, the data from fourteen classes were obtained, with seven classes under M_1 , the semantic materials group and seven under M_2 , the alphabetic materials group. The resulting ANOVA design had seventy cells and tested the sources of variance as follows:

1. M - instructional materials
2. C:M - classes nested within methods
3. S - style of short-term memory
4. M.S. - method crossed with style
5. S.C.:M - style crossed with classes nested

within materials

The desired level of statistical significance of .05 was chosen for testing hypotheses one and two.

Utilizing the Scheffe test, post hoc comparisons were used later to locate differences in achievement among five levels of style.

The ANOVA design showing measures of the experimental units, expressed as mean scores within each class, is presented in Tables III and IV.

Finally, the N.Y.B.M.U.L. program designed by Jeremy Finn³⁴ was used to perform the analysis.

6. Summary.

This chapter outlined the experimental design to be used in the testing of the research hypotheses concerned with the possibility of 1) a main effect for pattern of short-term memory and 2) an interactive effect of method and style (use of instructional materials) upon achievement in oral reading at the end of grade one.

The age of the subject population, its social and political orientation within Ottawa area boards of education and methods of selection were treated in sections one and two.

In section three, the two testing instruments, the I.T.P.A. and the Gray Oral Reading Test were examined with respect to suitability in testing the experimental hypotheses. The two subtests used from the I.T.P.A., auditory short-term memory and visual short-term memory were shown

34 Jeremy D. Finn, Multivariate - Univariate and Multivariate Analysis of Variance, Covariance and Regression, A Fortran IV Program, Version 4, Buffalo, Faculty of Educational Studies, State University of New York at Buffalo.

Table III.-

Mean Scores in Oral Reading Achievement Obtained by Semantic Instructional Materials Group (M_1) According to Pattern in Short-term Memory and Classroom Placement.

Patterns in Short-term Memory	Classroom Placement Semantic Group						
	C_1	C_2	C_3	C_4	C_5	C_6	C_7
S_1 A^+V^+	24.67	17.00	24.00	19.63	9.00	19.22	15.63
S_2 A^0V^0	18.50	11.25	29.00	7.67	3.00	18.57	13.67
S_3 A^0V^-	16.50	4.80	19.00	16.17	7.50	11.00	10.33
S_4 A^-V^0	11.20	8.60	4.89	5.50	13.60	9.00	15.20
S_5 A^-V^-	10.00	9.10	10.14	8.50	5.00	3.25	4.75

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Table IV.-

Mean Scores in Oral Reading Achievement Obtained by Alphabetic Instructional Materials Group (M_2) According to Pattern in Short-term Memory and Classroom Placement.

Patterns in Short-term Memory		Classroom Placement Alphabetic Group						
		C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}	C_{14}
S_1	A^+V^+	3.75	11.17	.67	6.67		17.75	20.00
S_2	A^0V^0	15.00	7.67	4.67	24.00	5.20	11.20	16.80
S_3	A^0V^-		11.00	1.80	5.25	1.83	30.00	16.33
S_4	A^-V^0	1.78	4.00	11.50	14.67	10.40	14.25	18.00
S_5	A^-V^-	.60	.67	.86	6.00	1.71	22.50	7.00

EXPERIMENTAL DESIGN

through factor analysis studies to have the ability to differentiate both types of memory. General support for the use of the I.T.P.A. was shown in the literature. Norming procedures, reliability and validity studies and the objectives of the Gray Oral Reading Test were presented. Oral reading achievement in the Gray is measured according to accuracy and fluency which, in the scoring convention, becomes a function of time and number of errors. The justification of the use of the Gray in the instrumentation of educational research was noted by two test evaluators, Lohnes and Bliesmer.

Section four described the organization of subjects into classifications of integrational patterns of auditory and visual short-term memory and explained subsequent conversions from I.T.P.A. subtest raw scores to auditory and visual age quotients. It was decided to use the raw passage scores from the Gray in the measurement of the dependent variable, achievement in oral reading.

In section five, the statistical procedure for analysis of the data was described as an analysis of variance utilizing a three-factor nested design. Scheffe post hoc comparisons were planned for further analysis in the event that significance is determined for main effect of style. The ANOVA would be performed with the use of the N.Y.B.M.U.L. program.

The succeeding chapter will report the testing results as they relate to the experimental hypotheses.

CHAPTER IV

PRESENTATION OF RESULTS

Chapter IV contains a presentation and analysis of the data obtained from the testing procedure. In section one the experimental problem and related hypotheses are reviewed. The analyses of the data and hypotheses test results are presented in section two. The presentation includes 1) a univariate analysis of variance to test for main effects of style and its interactive effects with method (materials) and 2) a Scheffe post hoc analysis to test the differences among levels of style. Appropriate tables and figures are supplied to illustrate the direction of the interactive effects of method (materials) and style. The chapter concludes with a summary.

1. Review of the Problem and Hypotheses.

The present study was designed to test hypotheses concerning the possible main effect of pattern of short-term memory and the effect of its interaction with type of teaching material on achievement in oral reading at the end of grade one. Thus, the question is raised, how will achievement in oral reading at the end of the first grade differ among pupils with varying integrational patterns of

short-term memory after some have been exposed to a semantic materials-based method of teaching beginning reading and others have been exposed to an alphabetic materials-based method of teaching beginning reading?

Two main hypotheses developed from the review of the literature were presented to treat the experimental problem.

1. Beginning readers possessing patterns of short-term memory which show higher degrees of integration of the auditory and visual components will obtain results in oral reading at the end of grade one superior to those whose patterns of short-term memory are less well integrated, regardless of method of instruction. The effects for five levels of style would be ranked accordingly:

- $S_1 - A^+V^+$ (superior in both auditory and visual components) — first.
- $S_2 - A^0V^0$ (normal in both auditory and visual components) — second.
- $S_3 - A^0V^-$ (visual deficit) — third.
- $S_4 - A^-V^0$ (auditory deficit) — fourth.
- $S_5 - A^-V^-$ (low in both auditory and visual components) — fifth.

2. Oral reading achievement for each style of sequencing under the semantic method (M_1) will be greater than achievement under the alphabetic (M_2), with the exception of S_4 (the auditory deficit style) which will be greater under the alphabetic method.

2. Presentation and Analysis of Data.

The hypothesis of a significant effect of style of short-term memory on achievement in oral reading was tested at the ninety-five percent level of confidence and significance was found. In Table V, a summary of the univariate ANOVA presents the data for the sources of 1) method (materials) M, 2) style of short-term memory (S), 3) classes nested in method C:M and 4) method-style interaction (MS). Method-style interaction was not significant.

When presented in order from S_1 to S_5 , the absolute values of the estimated means of the five styles range from highest to lowest as hypothesized. The means are ordered as follows:

1. S_1 - 13.82
2. S_2 - 13.30
3. S_3 - 11.26
4. S_4 - 10.19
5. S_5 - 6.43

To establish the location of significant differences in the main effect of style, a Scheffe Post Hoc Analysis of contrasts was carried out among levels of S. The following contrasts were examined for significance:

Table V.-

Univariate Analysis of Variance of Achievement in Oral Reading.

Source of Variance	Mean Square	Degrees of Freedom	F. Ratio	Probability
Main Effects				
Method (M)	113.1345	1	3.9386	.0532
Style (S)	125,1802	4	4.3579*	.0046
Interaction				
Method x Styles (MS)	47.4028	4	1.6503	.1799
Error Variance				
Style and Classes Nested in Method (SC:M)	28.724564	46		

*p < .05

1. Mean of S_4 - mean of S_5
2. Mean of S_3 - mean of S_5
3. Mean of S_2 - mean of S_5
4. Mean of S_1 - mean of S_5

Simultaneous confidence intervals were expressed for each of the contrasts above and revealed significant differences for 1) Mean of S_2 - Mean of S_5 and 2) Mean of S_1 - Mean of S_5 . The results are presented in Table VI.

In testing hypothesis two, as stated earlier, no significant interaction effect was found. Since it was hypothesized that M_1 (the semantic materials method) would produce greater achievement than M_2 (the alphabetic materials method), for four of the five style levels, it is not surprising that the interaction test result did not attain the level of significance. However, evidence that S_4 subjects achieve better results with alphabetic materials, while S_1 , S_2 , S_3 and S_5 students have greater achievement with semantic materials is shown in Figure 2.

The presence of an interactive effect between style and method can be observed whenever style 4, the auditorially deficit style is graphed in relation to the other four styles under both levels of M. The interactive effects are shown in Figures 2 to 6. As anticipated, the differences favour styles one, two, three and five under M_1 .

Table VI.-
Sheffé Simultaneous Confidence Intervals
for Style Mean Differences.

Contrast	Mean Difference	Confidence Interval
$u_4 - u_5$	3.76	- 2.76 to 10.28
$u_3 - u_5$	4.83	- 1.69 to 11.35
$u_2 - u_5$	6.87*	.35 to 13.39
$u_1 - u_5$	7.39*	.87 to 13.91

* differences significant

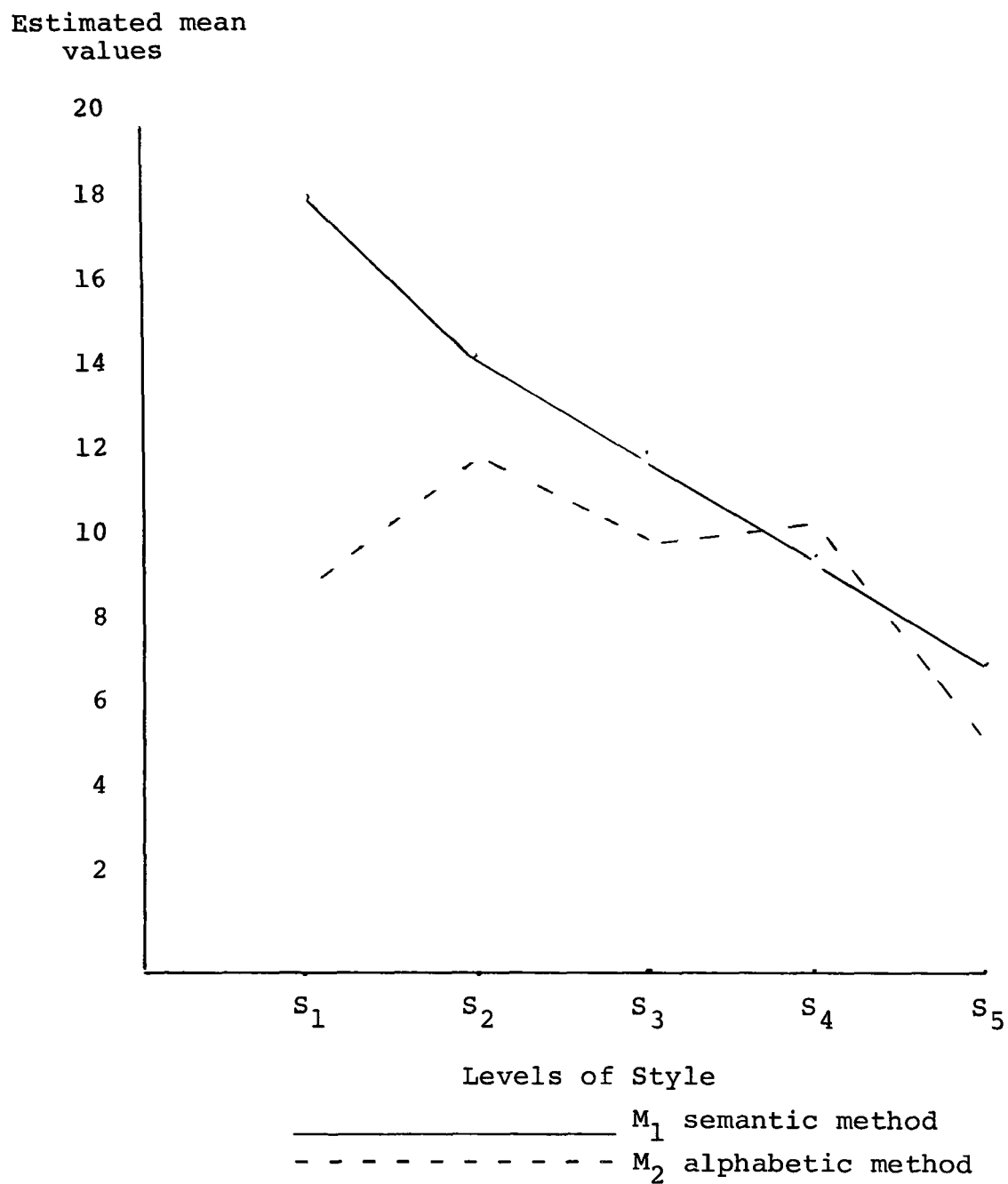


Figure 2. - The Interaction of levels of Method and Style using style as an independent variable

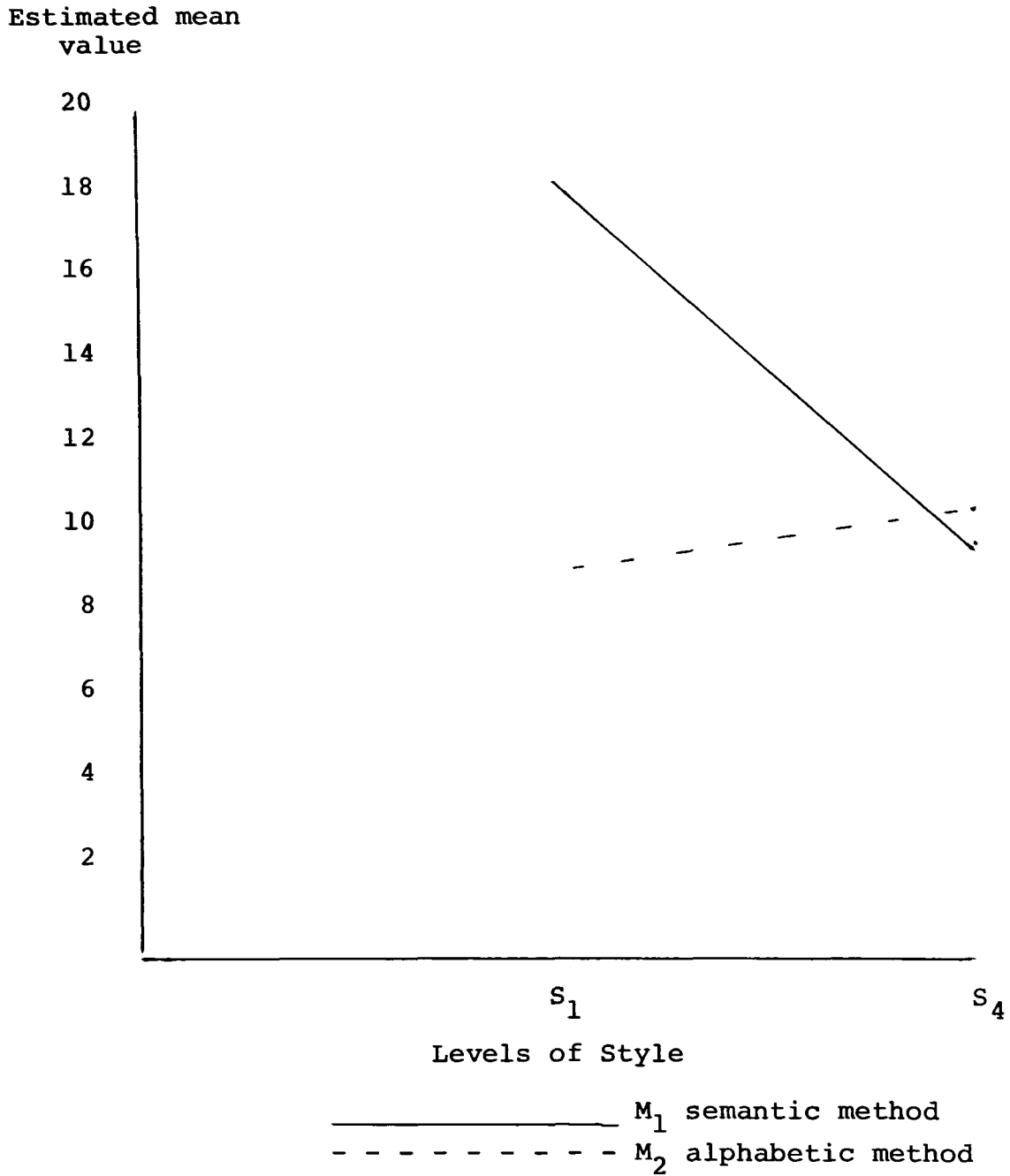


Figure 3. - The interaction of S₁ and S₄ with levels of M using style as an independent variable

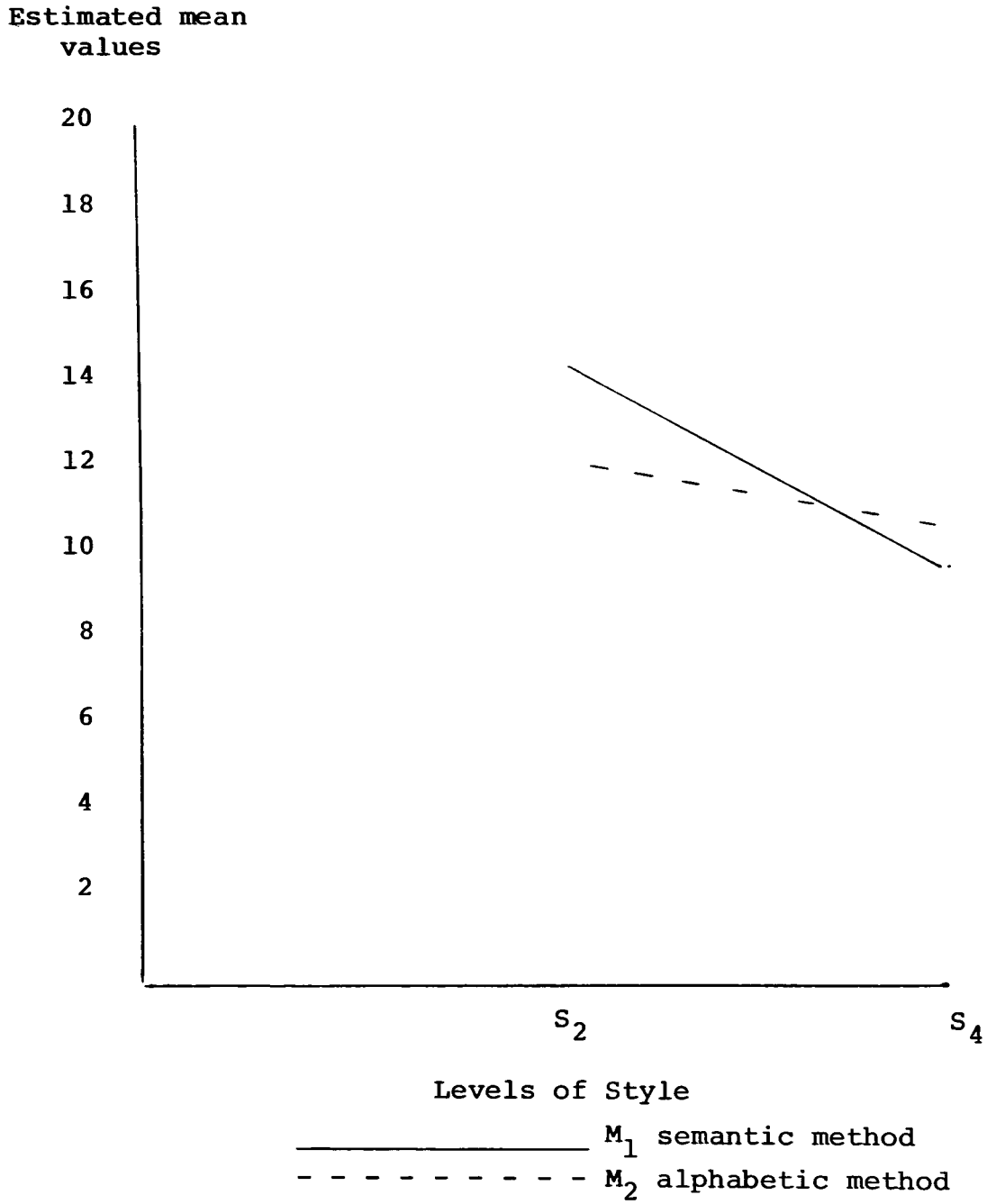


Figure 4. - The interaction of S₂ and S₄ with levels of M using style as an independent variable

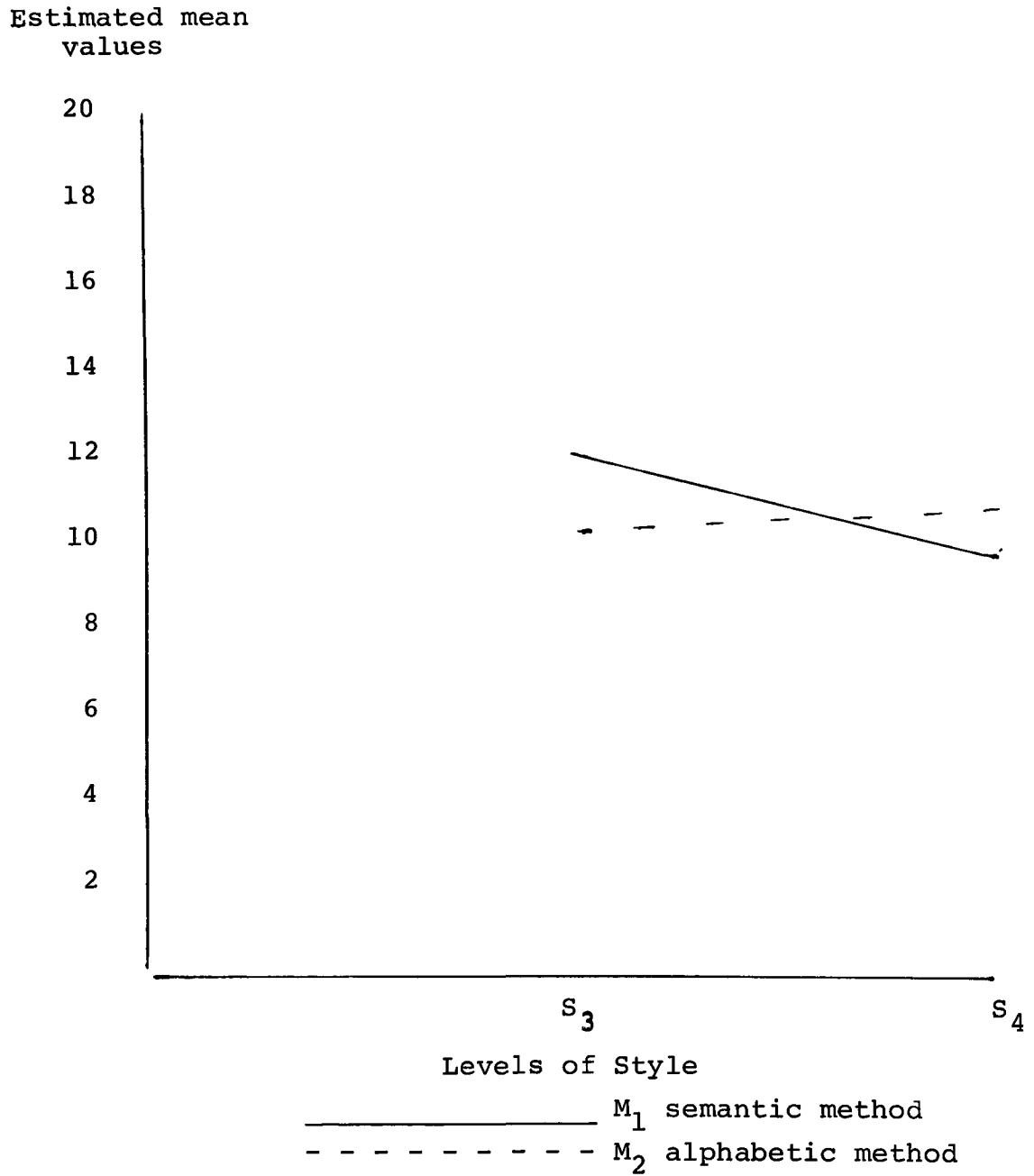


Figure 5. - The interaction of S₃ and S₄ with levels of M using style as an independent variable

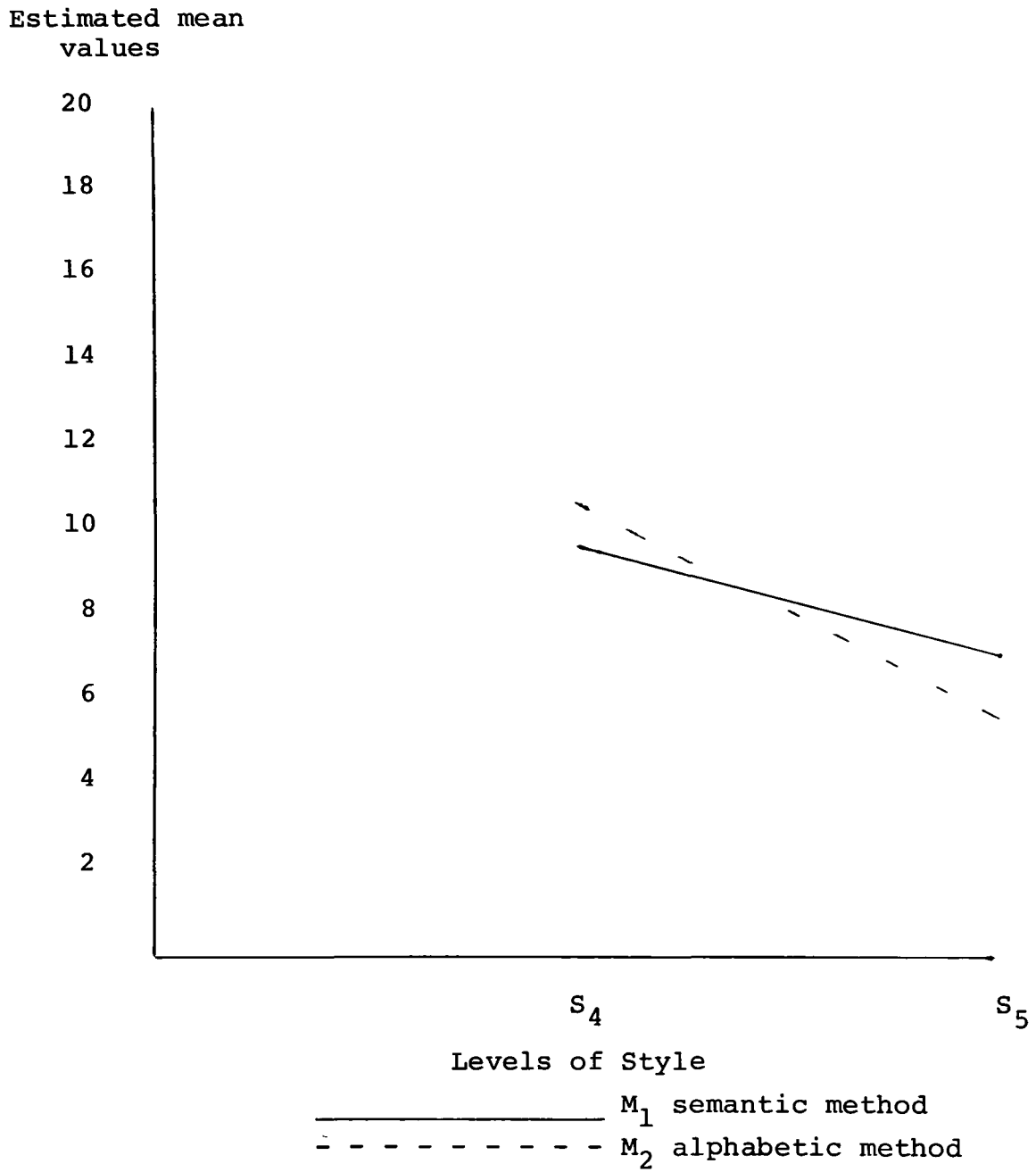


Figure 6. - The interaction of S₄ and S₅ with levels of M using style as an independent variable

In Table VII a comparison of the estimated means indicates the superiority of four levels of style under the semantic materials group M_1 with only the S_4 (A^{-V^O}) showing superior achievement under the alphabetic materials group M_2 .

3. Summary.

The purpose of the study was to test hypotheses concerning the main effect of style of short-term memory and its interactive effect with method upon achievement in oral reading at the end of grade one.

A univariate analysis of variance and a Scheffé Post Hoc analysis revealed and located a significant effect of style upon achievement in reading. Two of the four contrasts of mean values of style were significant. That is, significance was found for the differences between the pairs of means for 1) $S_2 - S_5$ and 2) $S_1 - S_5$. Consequently support was given to hypothesis one which held that levels of style in short-term memory would be ranked in order from one to five, in terms of degree of success in oral reading, the dependent achievement variable.

The interactive effect of method and style upon achievement in oral reading, as predicted in hypothesis two, did not reach significance at the ninety-five percent level of confidence. However, the disordinal direction of the

Table VII.-
Estimated Means of Achievement According to
Materials and Style of Memory.

Levels of Style (S)	Materials Groups	
	Semantic M_1	Alphabetic M_2
S_1	18.45	9.188
S_2	14.52	12.08
S_3	12.17	10.35
S_4	9.713	10.66
S_5	7.249	5.62

interaction of combinations of style compared with S_4 (the auditory deficit style) and method was noted and graphed in Figures 2 to 6.

The following chapter will include 1) a discussion of the results, 2) implications for classroom practice and 3) considerations for further research.

CHAPTER V

DISCUSSION OF THE RESULTS

In the present chapter the experimental results are discussed with reference to 1) the findings of current research, 2) the significance for classroom instructional practice and 3) replications and suggestions for further research. A discussion of the results of the testing of the two hypotheses concerning the main effect of style of short-term memory and its interactive effect with type of beginning reading materials occurs in sections one and two. Implications which can be drawn from the current study on the development of a reading program in the late kindergarten and early grade one year are presented in section three. In section four, features of the experimental design are examined and suggestions for modifications in replication studies are indicated. The latter part of section four is concerned with the identification of avenues for further research and deals with 1) the structure of longitudinal studies which maintain the same independent variables as the present study and 2) the structure for further research involving auditory and visual closure as the aptitude variables of concern. The chapter ends with a summary.

1. The Hypothesis of Main Effect of Style.

In this section, experimental findings supporting hypothesis one are related to the theoretical expectations of the literature.

The five styles or levels of psycholinguistic aptitude were defined as integrational patterns of auditory and visual short-term memory. Then the styles were presented to test hypotheses on the role of sequential short-term memory in the process of oral reading. The main effect of style of short-term memory was statistically significant with respect to achievement in oral reading. When achievement scores on Gray's Oral Reading Test were organized according to patterns of short-term memory, the highest auditory and visual sequencers were first (A^+V^+), and were followed by 1) the medial sequencers (A^OV^O), 2) the visual deficit (A^OV^-), 3) the auditory deficit (A^-V^O) and 4) the lowest auditory and visual sequencers (A^-V^-). Such findings are consistent with the literature which generates the following theoretical relationship between short-term memory and the reading process.

1. Short-term memory operates at the perceptual level together with such preconceptual functions as sequencing letters within words, generating echoic language and oral reading.

2. The auditory component of the short-term memory pattern is very significant in the early stages of beginning reading because of the emphasis on learning the sound symbol correspondences of the written language.

3. Method-aptitude research links achievement in silent reading to development of power in both the auditory component and the total sequencing strength of the reader's pattern of sequential short-term memory.

4. The complexity of oral reading and the subsequent lengthy time for processing chunks of information strain the short-term memory capacity to a greater degree than would silent reading.

In short, the experimental findings and the theoretical expectations in the literature related to perception and reading are consistent. Within the aptitudinal pattern of sequential short-term memory, the degree of auditory and visual modality integration, the strength of sequencing and the strength of the auditory component all contribute to achievement in oral reading at the end of grade one.

2. The Hypothesis of the Interactive Effect of Method and Style on Achievement in Oral Reading.

The discussion in section two focuses on the failure of the results to support, to a statistically significant degree, the hypothesis of interactive effect of method and

aptitude upon achievement in oral reading at the end of grade one. Related research findings and popular statements are put in perspective with reference to the findings of the present study.

No statistically significant interactive effect of method (materials) and style of short-term memory was obtained in the present study. However, an interactive effect existed to the extent that S_4 (A^-V^0), the auditorially deficit style earned higher oral reading scores (measures of the dependent variable) under M_2 (the alphabetic material) than under M_1 (the semantic material). All remaining styles were more successful under M_1 , and therefore, the mathematical weighting probably reduced the chances of obtaining an overall statistically significant interactive effect.

The Stalling and Keepes study on achievement in silent reading revealed the presence of a significant interaction when styles of short-term memory were divided only into high and low sequencers. That is, when achievement in silent reading was the dependent variable, 1) high sequencers (A^+V^+) obtained higher scores under the alphabetic method (M_2) than under the semantic method (M_1) and 2) low sequencers (A^-V^-) obtained higher scores under the semantic method (M_1) than under the alphabetic method (M_2).

The comparative factors can be considered as accounting for the difference in findings from the present study.

In the first place, achievement in oral reading more than in silent reading is affected significantly by the speed of word attack in the reading process. That is, in the present study with the exception of the S_4 auditorially deficit groups, faster word attack processes developed from the year's experience in a semantic materials whole word method of teaching beginning reading. In the second place, Stalling and Keepe's utilized only two groups comparable to the A^+V^+ and A^-V^- groups in the present study. Mathematically their organization of the independent style variable into only two groups increased their chances for obtaining a statistically significant method (materials) — aptitude interactive effect.

One of the findings of the present study showed the tendency of the S_4 auditorially deficit group to achieve greater results with a synthetic phonic blending program. Such a finding is supportive of both the Rosner and the Robinson studies which were discussed earlier in the review of the literature. Rosner concluded that a subject with an auditory weakness requires a structured alphabetic reading program. Likewise Robinson's data indicated that auditorially deficient readers in an alphabetic reading program earned higher oral reading scores than did their counterparts in a semantic reading program.

To conclude, it should be restated that a disordinal direction of interaction between the independent variables was present and was graphed in Figures 1 to 6 in chapter three. Although not statistically significant, the interaction was anticipated from the review of the literature.

3. Implications for Classroom Practice.

In this section the findings related to both of the experimental hypotheses are used to guide direction in teaching beginning reading. That is, the writer assumes that educators may apply the findings of the present study to the development of a reading program in the late kindergarten and early grade one years.

In keeping with the results supporting hypothesis one on the importance of the integrational aspect of the auditory and visual components of short-term sequential memory on achievement in oral reading, several recommendations for program can be made:

1. Readiness drills in the perceptual-linguistic area of short-term memory should occur in both the auditory and visual modality.

2. A brief screening of children in late kindergarten and early grade one for their I.T.P.A. profile in auditory and visual short-term memory would provide sufficient quick and reliable data necessary for decisions on

continuation and nature of readiness teaching and type of approach (materials and methods) in the formal teaching of beginning reading.

3. The finding of an interactive effect of method and aptitude on achievement in oral reading while not statistically significant would however, suggest that beginning readers having deficits in the auditory component of the psycholinguistic aptitude of short-term memory require the supportive work in the auditory modality provided in the word attack exercises of an alphabetic (synthetic phonics) beginning reading program.

4. Strong readers possessing a functional integration of the auditory and visual components of the psycholinguistic aptitudes do not require the attention paid to phonic sounding in an alphabetic program of beginning reading (M_2). In fact their rate of progress in oral reading in the first year would be greater with a semantic (analytic phonics) reading program (M_1).

5. Students weak in both auditory and visual components of short-term memory would require more readiness work where words were still considered as wholes and not broken into parts for synthesis or analysis.

4. Recommendations for Further Research.

This section deals with a suggested change in the organization of the data in the event of a replication study. Then two positions are taken regarding the direction of further research of the method-aptitude type in the study of achievement in beginning reading.

If the present study were to be replicated, the investigator would anticipate the composition of classes to be included in the experiment. That is, potential subjects would be tested in auditory and visual short-term memory in I.T.P.A. so that classes could be more equitably formed for study purposes. Then experimental units (the mean score of each style group) would have been derived from a similar number of n's across all classes (C) and both materials-based methods (M). Such a modification would allow all experimental units to be equally representative of all classes and would ensure that no cell would be empty.

In short, it is suggested that population selection and organization of data occur in the following sequence:

1. Selection of 400 pupils, from three educational jurisdictions.
2. Pretesting of all pupils for classification into five styles or patterns of integration of auditory and visual short-term memory.

3. Formation of classes containing five experimental units having similar n's across classes.

Further research should examine 1) the longitudinal effects over three years (the primary years of developmental reading) of beginning materials on individual achievement in both oral and silent reading and 2) the effects, both immediate and long range, of changing the aptitude variable to other modality-bound preconceptual psycholinguistic aptitudes such as closure and discrimination.

A longitudinal follow-up study could discover whether the skill of synthesis or blending utilized in an alphabetic method would improve over an extended period of time. That is to say, whether synthesis would occur more quickly, would require less time and therefore, present less of a strain on both the auditory and visual components of short-term memory. On the other hand, the analysis skills of successful readers at the end of grade one exposed to a semantic method (materials-based) may not compare as favourably at the end of the second and third years as the synthesis skills of readers exposed to the alphabetic method (materials-based). Such problems would occur if the children were not able to devise a personal word identification system, utilizing an auditory and visual processing of

the text, with what Smith calls his "Feature-Analytic Alternative"¹. It is suggested further that these non-achieving semantically trained children might never have learned to unlock a word encountered for the first time by examining the internal features of letter and sound sequencing. In short it is possible that the variables considered in the present study could act and interact differently two, three and even four years after the initial year of instruction in grade one. Such a possibility could generate the following questions:

1. As the act of reading matures and becomes more visually bound, will the auditorially-deficient style of learner ($S_4 A^{-}V^0$) lose, maintain or increase an advantage in reading achievement?

2. Could the supportive effect of an alphabetic program found to exist with the auditorially deficient style ($A^{-}V^0$) during the first grade become useful during the second and third years for pupils low in both components of sequential short-term memory ($S_5 A^{-}V^{-}$)?

3. At the end of the primary grades, how closely should remedial and corrective strategies be aligned with 1) style of short-term memory and 2) alphabetic or

1 Frank Smith, Understanding Reading, p. 127.

semantic control of reading vocabulary and 3) process of oral or silent reading?

Changing the Aptitude Variables — Auditory and visual closure are two perceptually bound aptitudes also assessed at the automatic level of the I.T.P.A. Both aptitudes respectively allow the subject to complete the gestalt of a sound and a visual pattern. A rationale for the role of auditory and visual closure should be developed and subsequently tested. Resulting hypotheses could logically reflect those of the present study but would use auditory and visual closure as the aptitude variable. Questions of main effect upon oral and silent reading could be examined for 1) auditory and visual closure alone and 2) the combined auditory and visual modality-bound aptitudes of closure and memory, the perceptual modality-bound subtests at the automatic level of the I.T.P.A. The research could also consider further, questions of an interactive effect of closure and memory with semantic and alphabetic reading materials upon achievement in oral and silent reading.

Thus the search continues for the identification of combinations of student aptitudes and instructional materials which will increase the chances of success for achievement in beginning reading. In short, the longitudinal effect of time, the maturational changes in the learner's aptitude and the inclusion of other automatic psycholinguistic

aptitudes can be considered as independent variables in further reading research of the method-aptitude type.

5. Summary.

Sections one and two incorporated the results of the present study into the existing theory. The theoretical expectations generated from the literature dealing with the main effect of style of short-term memory on achievement in oral reading were supported with the findings from the present study. It was found that strength in sequencing and integration of the auditory and visual modalities in the short-term memory function were significantly related to achievement scores in oral reading at the end of the first grade.

Theoretical expectations leading to the development of the second hypothesis postulating an interactive effect between method (materials-based) and aptitude upon achievement in oral reading were not supported at the desired level of statistical significance. However, the direction of the interaction which gave an advantage to the auditory-deficient style ($S_4 A^{-}V^0$) within the M_2 (alphabetic) materials group was observed and easily graphed. Lack of statistical significance at the ninety-five percent level of probability was examined in relation to the following factors:

1. One style ($S_4, A^{-}V^0$) out of five would have a limited effect mathematically on the acquisition of a statistically significant interaction.

2. The organization of the aptitude variable into five styles of modality integration in short-term memory differed from the organization into sequencing strength carried out by one research study in silent reading where interaction was statistically significant.

3. The direction of the interactive effect showing 1) four out of five levels of style enjoying greater achievement in oral reading after instruction with a semantic materials-based program and 2) one style, the auditory deficient ($A^{-}V^0$), enjoying an advantage after instruction with an alphabetic materials-based program, supported to a degree (not at the required level of significance) the theoretical expectations of the literature.

In section three several implications for classroom instructional practice were drawn from the findings of the present study. The study showed that good readers from either instructional method (materials-based) were able to effectively integrate the data from the auditory and visual components of the short-term memory capacity. Subsequently discussed were procedures for 1) screening, 2) remediation

and corrective work and 3) differential instruction according to pattern of auditory and visual sequential short-term memory.

Section four presented suggestions for data reorganization in the event of a replication study. In addition, two directions for further method-aptitude research in beginning reading were provided.

It was recommended that replication of the present study should include a reorganization of the population sample so that each classroom would contain a similar distribution of subjects representing the five styles of aptitudes in sequential short-term memory (the experimental units). Such a modification would 1) ensure equal n's within experimental units and 2) prevent the occurrence of empty cells.

Two directions for further method-aptitude research in beginning reading were presented. The first direction identified longitudinal studies which would examine 1) relative effectiveness of synthesis and analysis skills in word attack procedures over the primary years, 2) the development of the auditorially deficient reader ($S_4 A^{-}V^0$) faced with the mature reading task which becomes more visual and 3) the stability of corrective teaching strategies with older subjects. The second direction would focus attention on the auditory and visual components of closure also

measured by the I.T.P.A. at the automatic perceptual level. Thus auditory and visual closure could be examined for main and interactive effects on achievement in silent and oral reading at the end of grade one and at the end of succeeding years in the primary division.

Subsequent research could examine styles of learning derived from combined modality scores in short-term memory and closure. Such an aptitude variable would be completely preconceptual and modality bound. The study would again test for the presence of main and interactive effects of the combined memory-closure aptitude variable and the method material variable upon achievement in oral and silent reading on both an immediate and longer range basis.

SUMMARY AND CONCLUSIONS

The purpose of the present study was to generate and subsequently test two hypotheses on the teaching of beginning reading in grade one.

The literature on the psychology and psycholinguistics of reading provided ample evidence of the importance of the successful reader's aptitude in the auditory and visual components of short-term memory. The act of reading requires the integration of the memory aptitudes so that there is no lag between the auditory and the visual. Therefore, five styles of short-term memory which differed in degree of auditory and visual integration were defined and became the independent aptitude variable of concern.

Basal reading materials used in two types of beginning reading programs constituted the independent task variable of concern. Method or type of material which emphasized the identification of whole words within a meaningful context was labelled as semantic. Reading material which contained words regularly and linguistically structured for easy blending of consonants and vowels determined the alphabetic method. An examination of Ontario's 1973 list of texts approved for use in schools revealed seven basal series utilizing the semantic method and only one using the alphabetic method.

Achievement in oral reading at the end of grade one became the dependent variable. It was anticipated that achievement results in oral reading judged in relation to aptitude in short-term memory and type of reading materials would differ from the results of silent reading achievement (as reported in the research literature) judged in similar circumstances.

The literature was analyzed for theoretical guidelines capable of predicting achievement in silent reading when aptitude in short-term memory and method (materials) in teaching beginning reading were controlled. The theorists agreed that development of the reader's auditory perceptual area is necessary for success in beginning reading. They disagreed on the effect of the alphabetic method in the first year of instruction. The apparent conflict in research for oral and silent reading achievement was held to be due partly to the differences in process between silent and oral reading performance.

Subsequently two hypotheses were developed to test a theory derived from the literature which treated 1) the significance of the auditory and visual perceptual integration of the short-term memory capacity necessary in the process of reading and 2) the interactive effect of two types of beginning reading materials and perceptual styles of

short-term memory upon achievement in oral reading at the end of grade one.

Hypothesis one stated that subjects possessing styles of short-term memory showing auditory and visual integration with strength in the auditory component would achieve better results in a test of oral reading at the end of grade one than would subjects showing a lesser degree of integration with weakness in the auditory component. Specifically it was predicted that the styles would achieve according to the following rank order:

1. S_1, A^+V^+ (superior in both auditory and visual components) — first
2. S_2, A^0V^0 (normal in both auditory and visual components) — second
3. S_3, A^0V^- (visual deficit sequencing style) — third
4. S_4, A^-V^0 (auditory deficit sequencing style) — fourth
5. S_5, A^-V^- (low in both auditory and visual components) — fifth

Hypothesis two testing for the presence of an interactive effect stated that oral reading achievement for subjects with each sequencing style except S_4 would be greater under the semantic method M_1 than under the alphabetic method M_2 .

To test these hypotheses, fourteen classes of grade one pupils were selected. Seven had been exposed for a full year to a method of beginning reading instruction utilizing semantic materials while the other seven had been exposed

to beginning reading instruction utilizing alphabetic materials for the same period of time.

In May, auditory and visual short-term memory subtests of the I.T.P.A. were administered to both groups to establish within each, five styles of short-term memory integration. Immediately following the I.T.P.A. subtests, the Gray Oral Reading Test was administered to both groups to measure achievement in oral reading, the dependent variable. Then each of the fourteen classes yielded five mean reading scores.

To test for main effects of style and its interactive effects with method (materials), the data were analyzed by using a three-factor nested design and conducting an analysis of variance with significance tests. Scheffé post hoc analysis was used to test for achievement differences among levels of style.

Hypothesis one concerning a main effect of style of short-term memory on achievement in oral reading was supported at the ninety-five percent level of confidence. The values of the estimated means of the five style groups descended in order as predicted from S_1 to S_5 . Significant contrasts were located for the differences between the pairs of means for 1) $S_2 - S_5$ and 2) $S_1 - S_5$.

The prediction in hypothesis two of an interactive effect of method and style upon achievement in oral reading was not supported at the ninety-five percent level of confidence. However, the graphing of combinations of styles one, two, three, and five with style four revealed the opposite effect of style four under the two methods. That is, style four, the auditory deficient style of reader, obtained greater achievement in oral reading with M_2 (alphabetic) materials than with M_1 (semantic) materials.

Conclusions — The present study revealed that the beginning reader's degree of perceptual integration of the aptitudes of auditory and visual short-term memory are directly related to achievement in oral reading at the end of the first year of instruction. Strength in the auditory component of the perceptual short-term memory pattern determines the ranking of learning styles according to achievement in beginning oral reading.

The first stage of an instructional rationale in beginning reading governing the choice of structured (alphabetic) versus non structured (semantic) reading materials was developed. Although materials and short-term memory style did not interact significantly, the effect was in the hypothesized direction. All styles except S_4 produced greater achievement when semantic materials were used. On the other hand, S_4 subjects achieved better results when

alphabetic materials were used. Such a finding was in agreement with those studies which held that alphabetic materials would be preferable for those with auditory weakness.

The study supported other aspects of the literature which stated unequivocally that the slow synthetic blending approach in the alphabetic materials would hamper the beginning reader's progress by slowing him down and creating too severe a strain on the auditory and visual short-term memory capacity. Certainly the present study revealed that with the exception of the auditorially deficient style, the readers exhibiting the other four styles achieved better in oral reading with semantic whole word materials than with alphabetic materials.

The claims of both Rudolph Flesch, the American protagonist of "phonics-trained readers" in the 1950's and his Canadian counterpart of the 1970's, Mrs. Mary Johnson, have been challenged with Canadian children using readily available Canadian materials. That is, the results of the present study underscore the fact that no one method of teaching beginning reading or particular type of structure of beginning reading material will suffice for all styles of learning which are reflected in the profiles of beginning readers.

The instructional program in beginning reading must be accommodated to the learning style of the reader. Thus the wisest direction of future method-aptitude research in beginning reading will lead to the identification of additional subject, stimulus and task variables capable of significantly affecting reading achievement. The results of such research should lead to the development of programs and materials more sensitive to the needs of individuals learning to read.

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Bateman, Barbara D., Interpretation of the 1961 Illinois Test of Psycholinguistic Abilities, Seattle, Special Child Publications, 1968, p. 5-108.

A monograph treating the testing profiles from I.T.P.A. in relation to classifications of learning disability cases. A set of tentative generalizations expressed on ability in short-term memory integration and achievement in reading led directly to the formation of hypotheses in the present study to test the implications for oral reading.

-----, "The Efficacy of an Auditory and a Visual Method of First Grade Reading Instruction with Auditory and Visual Learners", Perception and Reading, (ed.), Helen K. Smith, Newark, International Reading Association, 1968, p. 105-112.

One of the few method-aptitude studies using method and short-term memory as independent variables and achievement in silent reading as a dependent variable. Bateman's findings were tested in the present study which was concerned with achievement in oral reading.

Bateman, Barbara and Janis Wetherell, "A Critique of Bloomfield's Linguistic Approach to the Teaching of Reading", The Reading Teacher, Vol. 18, No. 2, 1964, p. 98-104.

A lucid analysis of the psychological roots behind a semantic method of teaching reading. Used in the identification of a rationale for the semantic method.

Bear, David E., "Phonics for First Grade, A Comparison of Two Methods", Elementary School Journal, April 1959, p. 394-402.

Reported that with grade one pupils a synthetic phonics supplementary program with a basal reader contributed to superior reading achievement compared to an exclusive use of a similar basal reader. A sound piece of research bearing on the problem of the present study.

Benger, Kathlyn, A Study of the Relationships Between Perception, Personality, Intelligence and Grade One Reading Achievement, paper presented at I.R.A. Conference, Seattle, May 4, 1967, 24 p.

Outlines correlates of grade one reading achievement. Supports the contention of the present study that visual memory is a higher order perceptual ability required in learning to read.

Bliesmer, Emery P., "Gray Oral Reading Test", The Sixth Mental Measurements Yearbook, (ed.), Oscar Krisen Buros, Highland Park New Jersey, The Gryphon Press, 1965, p. 1129-1130.

Reviews the objectives, nature and norming detail for The Gray. Welcomed the addition of more than one form because of the practice of using the Gray test as a pre test and post test in remedial programs and in reported research studies.

Bliesmer, Emery P. and Betty L. Yarborough, "A Comparison of Ten Different Beginning Reading Programs in First Grade", Phi Delta Kappan, Vol. 64, June 1965, p. 500-504.

A key work in the research on methods controversy. Concludes with the superiority of the synthetic method in silent reading achievement at the end of grade one.

Bruininks, Robert H., "Relationship of Auditory and Visual Perception Strengths to Methods of Teaching Word Recognition Among Disadvantaged Negro Boys", I.M.R.I.D. Behavioural Science Monograph, No. 12, 1968, vi-154 p.

Examined modality preference, method of teaching beginning reading and reading achievement in grade three boys. Definitions of auditory and visual short-term memory stress the sequencing of orally and visually presented symbols - the task associated with the alphabetic method of teaching beginning reading.

Bruner, Jerome S., The Process of Education, Toronto, Random House, 1966, xvi-97 p.

Bruner's concept of structure as an aid to long-term memory storage supports the materials design and presentation in an alphabetic or phonics method of teaching reading.

Carroll, John, "The Analysis of Reading Instruction: Perspectives from Psychology and Linguistics, Theories of Learning and Instruction", 63rd Yearbook of The National Society for the Study of Education, Chicago, University of Chicago, 1964, p. 336-353.

Examined the roles of psychology and linguistics and identified them in models of reading theory. Useful for analysis of reading behaviour.

Cass, Corrine, "Psycholinguistic Disabilities of Children with Reading Problems", Exceptional Children, Vol. 32, 1966, p. 533-539.

Used the I.T.P.A. as a psycholinguistic identification of integrational difficulties in pupils who were non readers. Integrational difficulties are reflected in the weaker patterns of auditory and visual short-term memory styles in the present study.

Chall, Jeanne S., Learning to Read: The Great Debate, Toronto, McGraw-Hill, 1964, xviii-372 p.

A comprehensive treatment of the vast amount of controversial research relevant to methods of teaching reading. Strongly recommended.

Chase, Clinton I., "Review of the I.T.P.A.", The Seventh Mental Measurements Yearbook 7, Vol. 1, 1972, p. 820-824.

A thorough test review covering the objectives, origin, norming procedure and statistical reliability of the I.T.P.A. Concludes that the instrument goes far towards extending a psychometrist's ability to diagnose learning difficulties.

Coleman, J. C., "Perceptual Retardation in Reading Disability Cases", Journal of Educational Psychology, Vol. 44, 1953, p. 32-40.

Applied the Gestaltic stage theory to maturational development in the reading act. Used to illustrate a line of thinking often found in discussions on the history of methods of teaching reading.

Cutts, Warren G., Modern Reading Instruction, Washington, Centre for Applied Research in Education, 1964, x-118 p.

Discusses the linguist's arguments for using the controlled vocabulary approach in teaching reading. Used in the study of methods and related materials.

DeBoer, John J. and Martha Dallman, The Teaching of Reading, Toronto, Holt Rinehart, 1970, viii-597 p.

Useful for its differentiation of tasks involved in oral and silent reading.

Dechant, Emerald, Diagnosis and Remediation of Reading Disability, West Nyac, Parker, 1970, xxi-296 p.

Provides a detailed classification of reading teaching methods according to linguistic approaches, programmed reading, mediational approaches and remedial methods. A comprehensive resource used in the review of the literature on teaching methods in beginning reading.

-----, Improving the Teaching of Reading, Englewood Cliffs, Prentice Hall, 1970, vii-673 p.

Related schemes of classifying methods of teaching reading to schools of learning theory and approaches the question of individual preference. Useful in method identification and classification.

de Hirsch, Katrina et al., Predicting Reading Failure, New York, Harper and Row, 1966, xv-144 p.

The study tested a battery of predictive instruments of reading achievement. Supports the use of prescriptive-diagnostic procedure of testing and teaching - an objective of the present study.

Dykstra, R., "Four Types of Primary Reading Programs, A Comparative Study", National Elementary Principal, 47, April 1968, p. 35-39.

Probably the largest co-ordinated comparative study of reading programs on pupils selected at random. There were so many variables in such a massive study that results and findings must be interpreted cautiously.

Eisenberg, L., "The Epidemiology of Reading Retardation and a Program for Preventative Intervention", The Disabled Reader, Baltimore, John Hopkins Press, 1966, p. 3-20.

Presented a survey of causes of reading disability useful in expressing a rationale for individualizing teaching methods.

Flavell, John H., The Developmental Psychology of Jean Piaget, Toronto, D. Van Nostrand, 1963, xvi-472 p.

A detailed description and critique of Piaget's theory, and experiments. Used as a reference for the identification of strategies of learning in relation to concurrent language development.

Flesch, Rudolph, Why Johnny Can't Read and What You Can Do About It, New York, Harper and Brothers, 1955, ix-222 p.

Outlines rationales for the synthetic phonic method of teaching beginning reading and disputes the "word method". A popular work spearheading the methods controversy in the 1950's and 1960's.

Fries, Charles C., Linguistics and Reading, Toronto, Holt Rinehart, 1962, xviii-265 p.

Synthesized linguistic theory with a concomitant analysis of the reading process and built a case for reading materials requiring instant pupil response. A penetrating analysis of the reading process through the eyes of a linguist.

Geyer, John J., "Models of Perceptual Processes in Reading", Theoretical Models and Processes of Reading, (ed.), Harry Singer and Robert Ruddell, Newark, International Reading Association, 1970, p. 47-87.

Theoretically and empirically illustrates the strain on short-term memory caused by the oral reading process. Relates oral reading and short-term memory, respectively to the dependent and independent variables in the present study.

Goodman, Kenneth S., "The Psycholinguistic Nature of the Reading Process", The Psycholinguistic Nature of the Reading Process, Detroit, Wayne State University Press, 1968, p. 11-347.

Developed a model of reading progressing through stages of proficiency. Used cautiously to develop the difference between meaningful and non meaningful silent reading.

Gray, William S. and Helen M. Robinson, (ed.), Gray Oral Reading Tests, Manual of Directions for Administering, Scoring and Interpretation, revised, New York, Bobbs-Merrill, 1967, p. 3-30.

The Gray was used to measure achievement in oral reading, the dependent variable in the present study.

Harris, Albert J., "Gray Oral Reading Test", The Sixth Mental Measurements Yearbook, (ed.), Oscar Krisen Buros, Highland Park New Jersey, The Gryphon Press, 1965, p. 1130-1131.

Reports on the Gray Oral Reading Test by stating comparisons with the original test and by describing the reliability and validity detail. The reviewer considers The Gray a long-needed and welcome addition to a very limited number of reasonably satisfactory oral reading tests.

Hartlage, Lawrence C., "Prereading Screening to Determine Optimum Reading Instructional Approaches", Reading Improvement, Vol. 11, 1974, p. 7-10.

Produced a screening instrument to measure auditory and visual skills of sequencing and utilization of space. Using word recognition rather than reading, his findings supported those of Rosner (cited later) and confirmed the suitability of an alphabetic method for a student showing auditory perceptual weakness. The finding is confirmed with present study using auditory short-term memory as the auditory perceptual component.

Hoepfner, Ralph, (ed.), C.S.E. Elementary School Test Evaluations, Los Angeles, U.C.L.A., 1970, xviii-146 p.

A collection of contemporary test evaluations set up in standard criteria making it useful for test comparisons. Provided information on validity statistics for the I.T.P.A.

Hocker, M. E., "Primary Prevention of Reading Failure", Elementary English, 46, 1969, p. 188-190.

Reported that linguistic and synthetic code-emphasis programs were too difficult for children below average in readiness achievement. Useful in a predictive study involving maturation and reading achievement.

Howe, Michael J. A., Introduction to Human Memory, A Psychological Approach, New York, Harper and Row, 1970, ix-118 p.

Treats the storage products and processes within auditory and visual verbal memory. Useful in characterizing the auditory and visual components of short-term memory.

Hurley, Oliver L., "Perceptual Integration and Reading Problems", Exceptional Children, Vol. 35, No. 3, 1968, p. 207-215.

Builds a case for the role of visual sequential short-term memory in the reading process. Provided theoretical background.

Jeffrey, W. E. and S. J. Samuels, "Effect of Method of Reading Training on Initial Learning and Transfer", Journal of Verbal Learning and Verbal Behaviour, Vol. 6, June 1967, p. 354-358.

Reported on the superior value of letter training in comparison to whole word learning as methods for teaching beginning reading. Shows the trend of verbal learning experiments in transfer of learning.

Johnson, Mary, Programmed Illiteracy in Our Schools, Winnipeg, Clarity Books, 1970, 170 p.

Represents a Canadian opinion strongly expressed in favour of an articulated phonics (blending) method of teaching beginning reading. Follows in the tradition of Rudolph Flesch.

Johnson, M. S., "Factors Related to Disability in Reading", Journal of Experimental Education, Vol. 26, 1947, p. 1-26.

Identified weakness in visual and auditory functioning, laterality and associative learning as factors of poor reading. A significant study in the area of perceptual development and reading behaviour.

Kambeitz, Martha, Ginn Integrated Language Program, Guidebook for the Level One Program, Toronto, Ginn and Company, 1969, iv-204 p.

Similar to the Nelson program, the Ginn materials follow the semantic method of teaching beginning reading, one of the independent variables in the present study. Ginn materials were used by some subjects along with Nelson and Copp Clark.

Katz, P. A. and M. Deutsch, Visual and Auditory Efficiency and Its Relationship to Reading in Children, Final report 1963, Project No. 1099, Co-operative Research Program, Office of Education, Department of Health Education and Welfare, x-90 p.

Deals with the perceptual weaknesses of poor readers. Useful in the identification of the perceptual correlates of reading.

Kolers, Paul A., "Three Stages of Reading", Basic Studies on Reading, (ed.), Harry Lewin and Joanna P. Williams, New York, Basic Books Inc., 1970, p. 90-118.

Identifies English as an alphabetic language which imposes less strain on the reader's short-term memory than would an ideographic language such as Chinese. Used to relate short-term memory to alphabetic and semantic methods of teaching reading.

Kirk, Samuel A., "Illinois Test of Psycholinguistic Abilities: Its Origin and Implications", Learning Disorders, (ed.), Jerome Hallmuth, Vol. 3, Seattle, Special Child Publications, 1968, p. 397-427.

The chapter treats the concept of learning disability in behavioural terms in an attempt to show how the I.T.P.A. can analyze children's psycholinguistic functioning. Shows the relationship of the I.T.P.A. to Osgood's generalized behavioural model.

Kirk, Samuel A. et al., Examiner's Manual, I.T.P.A., (rev. ed.), Urbana, University Press, 1968, 101 p.

Treats the development and use of The Illinois Test of Psycholinguistic Abilities, used in the present study to identify patterns of short-term memory.

Kirk, S. A. and J. J. McCarthy, "The Illinois Test of Psycholinguistic Abilities - an approach to differential diagnosis", American Journal of Mental Deficiency, Vol. 66, 1961, p. 399-412.

A key reference for those examining the theoretical background and development of the I.T.P.A. Used to support the definitions of short-term memory later described as patterns of short-term memory - one of the independent variables.

Lefevre, Carl A., "A Multidisciplinary Approach to Language and to Reading: Some Projections", The Psycholinguistic Nature of the Reading Process, Detroit, Wayne State University, 1968, p. 291-312.

Presents a theoretical argument in the teaching of reading based on language structure and the child's own dialect. Lefevre's analysis of linguistic teaching methods was utilized in the review of the literature.

Linn, J. R. and T. J. Ryan, "Multi-Sensory Motor-Method of Teaching Reading", Journal of Experimental Education, Vol. 36, 1968, p. 57-59.

Reported the superiority of a synthetic phonics program over regular whole word basal programs in reading and spelling achievement after a three-year period. The only Canadian synthetic phonics program in the market - used as an independent (materials) variable in the research design.

Linn, John R. et al., Language Patterns, Teacher's Guide, Part One, Toronto, Holt Rinehart and Winston, 1968, p. 4-192.

The Language Patterns approach is the only published Canadian alphabetic method of teaching beginning reading and consequently is the source of materials for all subjects in the alphabetic materials group in the present study.

Lohnes, Paul R., "Gray Oral Reading Test", The Sixth Mental Measurements Yearbook, (ed.), Oscar Krisen Buros, Highland Park New Jersey, The Gryphon Press, 1956, p. 1131-1132.

Confirms the ability of the Gray Oral Reading Test to discriminate among grade levels and after reviewing the technical nature of the instrument (used to measure the dependent variable in the present study) states that the excellently prepared tests will be particularly useful in the instrumentation of educational research into reading and its correlates.

Macione, J. R., Psychological Correlates of Reading Disability as Defined by the Illinois Test of Psycholinguistic Abilities, doctoral dissertation, University of South Dakota, 1969.

Used subtests at the automatic level of the I.T.P.A. to differentiate able from disabled readers in grades two and three. Use of the I.T.P.A. at the automatic level replicated in the present study.

Mathews, Mitford M., Teaching to Read Historically Considered, Chicago, University of Chicago Press, 1966, viii-208 p.

A developmental history of the analytic and synthetic methods and their eventual relationship with approaches in language experience and I.T.A. Any significant evaluation of contemporary reading methods should be preceded with the reading of this work.

Mercer, Barbara R., Teacher's Manual to Accompany Off to School, J. R. McIntosh, (ed.), Toronto, Copp Clark, 1962, iv-182 p.

Similar to the Nelson and Ginn materials as an example of a semantic method of teaching beginning reading. Used by some of the subjects in the semantic materials group in the present study.

Myers, C. E., "What the I.T.P.A. Measures, A Synthesis of Factor Studies of the 1961 Edition", Educational and Psychological Measurement, 1969, 29, p. 867-876.

A factor analysis study of the I.T.P.A. which identified auditory and visual short-term memory in separate factors and identified both as testing for Guilford's memory for symbolic and figural systems. A favourable independent assessment of the I.T.P.A.

McInnes, John A., (ed.), Funny Surprises, Kittens and Bears, Pets and Puppets, Teacher's Guidebook, Toronto, Thomas Nelson and Sons (Canada), 1970, xv-304 p.

The Nelson program is an application of a semantic method of teaching beginning reading and was one of three sources of materials used in the semantic materials group in the present study.

McMurray, J. G., "Some Correlates of Reading Difficulty in Satisfactory and Disabled Readers, A Preliminary Study in Grade 3", Ontario Journal of Educational Research, Vol. 5, 1963, p. 149-157.

The author concludes that the greater proportion of remedial readers can be reduced through effective beginning reading programs based on a careful study of the nature of the reading difficulties. Used in the introduction to support arguments for individualization in the teaching of beginning reading.

Morris, Joyce M., "The Relative Effectiveness of Different Methods of Teaching Reading, Teaching Children to Read II", Educational Research, Vol. 1, February 1959, p. 61-75.

Classified teaching of reading methods into synthetic and analytic according to the inherent psychological process involved. A most useful and necessary control of semantics in the literature of the field of reading pedagogy.

Morsink, Catherine Voelker, "Teaching Early Elementary Children with Reading Disability", The Reading Teacher, Vol. 24, No. 6, March 1971, p. 550-555.

Related weakness in auditory and visual short-term memory to difficulty in decoding and subsequent disability in reading. A research study leading to the present area of concern.

Muller, Douglas C., The Effect of Letter Training on the Acquisition of Word Reading Skills, paper presented at New Mexico State University, Los Cruces, July 1970, 29 p.

Compares the task of reading instruction to a paired associates transfer task and experimentally demonstrates the superiority of a verbal learning paradigm where there is a great deal of correspondence between the stimulus and response terms. Reviewed in the verbal learning literature describing alphabetic approaches of reading instruction.

Murdock, Bennet B., "Modality Effects in Short-Term Memory, Storage or Retrieval", Journal of Experimental Psychology, Vol. 7, p. 79-86.

Presents two experiments dealing with sequencing in auditory and visual short-term memory. Used in the present study to characterize auditory and visual short-term memory.

Nurss, Joanne, "A Diagnostic Comparison of Two Third Grade Reading Classes", Reading Difficulties: Diagnosis, Correction and Remediation, Newark, I.R.A., 1970, vii-276 p.

Concluded that a perceptual training program for grade three backward readers should include an emphasis on sequencing and developing an immediate memory span. Helps to forge the connection between achievement in reading and short-term memory.

Olsen, Hanc C., "Linguistics and Materials for Beginning Reading Instruction", The Psycholinguistic Nature of the Reading Process, Detroit, Wayne State University, 1968, p. 273-297.

Critically analyzed three contemporary linguistic reading programs and showed how they departed from the linguistic school. Another useful reference work for classifying linguistic reading programs.

Osgood, Charles E., "Motivational Dynamics of Language Behaviour", Nebraska Symposium on Motivation, (ed.), Marshall R. Jones, Lincoln, University of Nebraska Press, 1957, p. 348-426.

Osgood's static behavioural model is used to explain the difference between meaningful and non meaningful reading in terms of a transition from sensory to conceptual language functioning. A key theoretical reference on the dynamics of the reading process.

Paraskevopoulos, John and Samuel A. Kirk, The Development and Psychometric Characteristics of the Revised Illinois Test of Psycholinguistic Abilities, Urbana, University of Illinois Press, 1969, x-244 p.

The study reports the results of three years of developing the revised edition (1968) of the I.T.P.A. used to measure patterns of short-term memory, one of the independent variables in the present study. Used to describe reliability-validity statistics and norming procedures.

Pitman, Sir James and John St. John, Alphabets and Reading, London, Sir Isac Pitman and Sons Ltd., 1969, xviii-349 p.

Presents a significant analysis of the causes of "backward reading", calling attention to wrong teaching methods, home background and psychological history.

Potts, M. and C. Savino, "Relative Achievement of First Graders Under Three Different Reading Programs", Journal of Educational Research, July 1968, p. 447-450.

A replication of the Yarborough Bliesmer study which reported the superiority of the synthetic method of teaching beginning reading. Considered in relation to the methods controversy.

Rabinovitch, Ralph D., "Dyslexia: Psychiatric Considerations", Reading Disability, Baltimore, John Hopkins Press, 1967, p. 73-79.

Differentiated between primary and secondary reading disability problems. An important distinction for the reading diagnostician.

Robinson, Helen M., "Visual and Auditory Modalities Related to Methods for Beginning Reading", Reading Research Quarterly, Vol. 8, No. 1, Fall 1962, p. 7-39.

Failed to find interactive and main effects in a method-aptitude study in beginning reading which compared reading achievement of subjects possessing differential patterns of auditory and visual discrimination. Supported predictions for achievement outcomes in silent reading.

Rosner, Jerome, "Language Arts and Arithmetic Achievement and Specifically Related Perceptual Skills", American Educational Research Journal, Vol. 10, 1973, p. 59-68.

Reported in a correlation study that his auditory analysis test distinguished levels of achievement in reading and concluded that pupils weak in auditory perceptual development should be given an alphabetic or phonically structured reading program. Rosner's hypothesis was confirmed in the present study in terms of auditory weakness in short-term memory.

Ruddell, Robert B., "Reading Instruction in First Grade with Varying Emphases on the Regularity of Grapheme-Phoneme Correspondences and the Relation of Language Structure to Meaning", The Reading Teacher, Vol. 19, 1968, p. 653-660.

Reports the superiority of alphabetic reading programs on grade one achievement in word recognition and paragraph and sentence meaning. Representative of reading method research studies in the 1960's.

Ryckman, David B. and Ronald Wiegerink, "The Factors of the Illinois Test of Psycholinguistic Abilities: A Comparison of 18 Factor Analyses", Exceptional Children, 36, No. 2, October 1969, p. 107-114.

A series of factor analysis studies of the I.T.P.A. are examined by age groups, modality channel, subtest type and major factor grouping. Identified auditory and visual short-term memory with two separate factors. Justification of the use of the two subtests to measure the aptitude variable in the present study.

Sabaroff, Rose E., "A Comparative Investigation of Six Reading Programs: Two Basal, Four Linguistic", Education, Vol. 91, No. 4, May 1961, p. 303-314.

Reported superior achievement at the end of grade one for pupils following reading programs containing linguistic regularly spelled material.

Shawaker, Annette, "A Substitute for the Whole-Word Method", The Reading Teacher, Vol. 20, No. 5, 1967, p. 426-432.

Described an alphabetic method of teaching reading as an alternative to a semantic whole word method. A sound commentary on the use of different methods of teaching reading.

Sherman, Marjorie and George Marsh, Transfer from Word Components to Words and Vice-Versa in Beginning Reading, Inglewood, South-West Regional Educational Laboratories, 1970, 14 p.

Using nonsense syllables discovered that learning sounded out words is a pivot task to both the learning of whole words and letters. However, no transfer of learning occurs between the latter two. Valuable as another example of verbal learning research which supports the alphabetic method of teaching reading.

Singer, Harry, Theories, Models and Strategies for Learning to Read, paper presented at the National Reading Conference, St. Petersburg Florida, December 1970, 24 p.

Singer reports on Samuel's model of the reading process and the role of short-term memory. The dynamics of short-term memory are well presented and utilized in the theoretical rationale of the present study.

Smith, C. M., The Relationship of Reading Method and Reading Achievement to I.T.P.A. Sensory Modalities, doctoral dissertation, University of Georgia, 1969, 48 p.

Utilizing main modality divisions as either auditory or visual and three methods of teaching reading, Carolyn Smith was unable to obtain main effects for either treatment or group. The present study therefore, organized the subject variable into five classes of degree of integration of both auditory and visual modality.

Smith, Frank, Understanding Reading - A Psycholinguistic Analysis of Reading and Learning to Read, Toronto, Holt Rinehart and Winston, 1971, x-239 p.

Provides a psycholinguistic rationale for the mature reading process. The present study tested and generally supported his thesis on the delaying effect of mediated identification processes inherent in synthetic phonic methods of teaching to read.

-----, Psycholinguistics and Reading, Toronto, Holt Rinehart and Winston, 1973, x-211 p.

Edits chapters on psycholinguistics and reading to support his thesis on direct reading without decoding to sound. A companion to the work cited above.

Smith, Henry P. and Emerald V. Dechant, Psychology in Teaching Reading, Inglewood Cliffs, Prentice Hall, 1961, x-470 p.

Develops the role, nature and process of oral reading in relation to silent reading. An excellent reference for psychological bases in reading.

Spache, George D., The Teaching of Reading, Bloomington, Phi Delta Kappa, 1972, xii-157 p.

Discussed the processes of oral and silent reading in relation to phonemic characteristics of beginning reading programs. Used in the theoretical development of the dynamics of short-term memory in the reading process in the first chapter of the present study.

Stalling, Jane A. and Brian D. Keepes, Student Aptitudes and Methods of Teaching Beginning Reading, A Predictive Instrument for Determining Interaction Patterns, California, Pala Alto Unified School District, 1970, 141 p.

Reported a method-aptitude interaction effect on achievement on silent reading and sequencing strength in auditory and visual short-term memory. The present study tests some of the findings by examining individual achievement in oral reading.

Strang, Ruth, Learning to Read, Insights for Educators, Toronto, O.I.S.E., 1970, v-50 p.

Most useful in its examination of the reading processes as seen successively by linguists, psychologists, and the neurologists.

-----, Reading Diagnosis and Remediation, Newark, International Reading Association, 1968, xii-190 p.

Surveyed the nature and frequency of reading disability cases and related lack of integration of auditory and visual signals to problems in reading. Hypothesis is tested in the present study.

The Minister of Education, "Interim Revision English", Curriculum Guidelines Primary and Junior Divisions, Toronto, Ontario Department of Education, 1971, p. 3-18.

A ministerial curriculum document containing a skill development sequence in listening, speaking, reading, and writing. The syllabus section dealing with reading calls for a whole word method and plays down the importance of word attack skills which tend to segment words into smaller parts.

Vellutino, Frank R. and Christopher Connolly, "The Training of Paraprofessionals as Remedial Reading Assistants in an Inner-city School", The Reading Teacher, Vol. 24, No. 6, March 1971, p. 506-512.

The authors identify the incidence of reading disability as the most pressing problem in elementary education today. They advocate the utilization of paraprofessionals to share the task on less technical problems thus permitting a more efficient use of professionally trained personnel. Provided purpose for study.

Venezky, Richard L. and Robert C. Calfee, "The Reading Competency Model", Theoretical Models and Processes of Reading, (ed.), Harry Singer, Newark, International Reading Association, 1970, p. 273-285.

Venezky and Calfee's organization of stimulus, task and subject variables in the analysis of reading is followed in the present study.

Wells, Thomas L., Textbooks Circular 14, 1973, Toronto, Ministry of Education, 1973, xii-100 p.

Textbooks in this circular are approved by the Minister of Education for use in Ontario schools. The two types of reading materials (independent variables) in the present study were taken from Circular 14.

Wepman, Joseph M. et al., "Studies in Aphasia: Background and Theoretical Formulations", Journal of Speech and Hearing Disorders, 25, 1960, p. 323-331.

Postulates the perceptual locus of short-term memory and preconceptual language. Used to develop a rationale for the role of short-term memory in the oral reading process.

-----, "The Modality Concept - Including a Statement of the Perceptual and Conceptual Levels of Learning", Perception and Reading, (ed.), Helen K. Smith, Delaware, International Reading Association, 1968, p. 1-6.

The modality concept is the basis for the psychological consideration of the communication process inherent in the central nervous system. Provided the necessary link in describing the perceptual aspect of the reading process and paved the way for the identification of behaviour within that process.

Zintz, Miles V., The Reading Process, The Teacher and The Learner, Dubuque, William C. Brown, 1970, ix-549 p.

A general discussion and analysis of the task and the diagnosis of problems in oral reading. Used for statistical data on the subject of developing maturity in silent and oral reading skills.

APPENDIX I

AN INTRODUCTORY LETTER TO SCHOOL PRINCIPALS

The following letter was sent to all principals of schools within the jurisdictions of the participating boards.

20 Gervin Street,
Ottawa, Ontario, K2GOJ8.

_____, Principal,

Dear _____

Recently the Research Committee of your Board (_____) extended to me the privilege of carrying out my research study in beginning reading in four grade one classes of the Board's jurisdiction. In order that I might randomly select the four participating classes, I must categorize all grade one classes according to the type of reading materials used in the core program. For example, some classes might utilize semantically oriented materials in such programs as the following:

- (1) Language Experience (formal with basal texts)
- (2) Language Experience (informal) no basal texts
- (3) Whole-word approach - Nelson Series, (Toy Box, Surprises etc.)
- (4) Individualized Reading Program (utilizing reading books on an integrated theme basis etc. . .)

Other classes might utilize materials controlled to some extent for Alphabetic regularity in such programs as the following:

- (1) Language Patterns - Holt Rinehart Series of Listening Letters, Laughing Letters, etc. . .)
- (2) The S.R.A. Linguistic Approach, The Pig Can Jig.
- (3) Any experimental material stressing a totally phonic approach utilizing language controlled for ease of blending and sounding.

To expedite this collection and collation of data, I will need your assistance in (a) filling out the attached data sheet accounting for the nature of programs in reading in grade one classes (defined as those classes which began their grade one program in September 1972 and are not included in a split grade situation with a grade 2 class)

and (b) returning the data sheet in the enclosed, stamped, self-addressed envelope.

Please understand that data which I collect is strictly confidential. In that regard when I ask for the teacher's name, it is of benefit to me only in the randomization phase insofar as it remains the simplest and most unambiguous way of identifying different grade one classes within a school. If perchance, a grade one class from your school were to be randomly selected for the experimental testing population, that class would not be identified with the particular school board, the school or the teacher. In other words, it would only be statistically represented in relation to the independent and dependent variables of style of short-term memory, type of reading materials and achievement in oral reading as defined in the research study, the findings of which I trust, will be of universal value to the individualization of grade one reading programs in the elementary schools.

I would be pleased to enlarge further on any detail of the research or on any ambiguity which is related to the filling out of the accompanying survey sheet in your school. My home phone number is 825-1396.

Again, thank you for your co-operation!

Sincerely,

Robert M. Whittle,
Principal, C.B.E.

APPENDIX 2

SURVEY TO IDENTIFY GRADE ONE READING PROGRAMS

The identification survey attached to this appendix accompanied the preceding introductory letter to principals of schools.

Holt Rinehart's Language Patterns program represented the alphabetic materials (M_2) in the research while all other publishers' materials represented the semantic materials (M_1) method.

IDENTIFICATION OF GRADE ONE READING PROGRAMS

THE PRINCIPAL _____

THE SCHOOL _____

THE BOARD _____

Please identify each of your grade one classes on the table below if they meet the following conditions: (1) began their reading program in September 1972 (2) are not in a split-grade situation e.g. 1-2.

<u>Teacher's Name</u>	<u>Reading Materials Used in Core Program</u>
A. (E.g.) Mrs. A. Smart)	Nelson Language Development Reading Program - <u>Funny Surprises, Kittens and Bears, etc. .</u>
B. (E.g.) Miss B. Good	Ginn Integrated Language Series, <u>Mr. Muggs, Up The Beanstalk, etc..</u>
C. (E.g.) Mrs. G. Whizz	Language Patterns Program - Holt Rinehart <u>Listening Letters, Laughing Letters, etc..</u>
1. _____	_____
_____	_____
_____	_____
_____	_____

2. _____

3. _____

4. _____

5. _____

Please return the completed survey as soon as possible in the self-addressed and stamped envelope which is attached.

Again, thanks for your help.

Sincerely,

Robert M. Whittle,
Principal, C.B.E.

APPENDIX 3

LETTER TO PARENTS OF POTENTIAL SUBJECTS

The following letter was presented to principals of participating schools as a model. Not all principals felt compelled to communicate such information to parents.

_____ Public School,

_____ 1973.

Dear Parents: re research project in beginning reading

With the agreement of the research committee of the Carleton Board of Education and the school principal, your child's class was randomly selected from a population of grade one classes in the Ottawa area to participate in a short testing program to occur during the month of May. In short, each child in the class will be individually tested in verbal memory and in oral reading by an experienced teacher for a period of about ten minutes.

Results of the testing will be confidential and the anonymity of the subject, the class, and the school is guaranteed. It is the nature and frequency of the scores which are of interest to the research project which has as its purpose, the development of theory and practice for the individualization of programs in the teaching of beginning reading.

Finally, your willingness in allowing your child to participate would be truly appreciated. If, however, you wish to exclude your child from the project a phone call or a note to the school stating your wishes would suffice.

Again, thank you for your co-operation.

Sincerely,

Robert M. Whittle,
Principal, C.B.E.

APPENDIX 4

THE TESTING INSTRUMENTS

THE TESTING INSTRUMENTS

A sampling of test descriptions and examiner's scoring records for the instruments measuring the aptitude and achievement variables used in the study follow below.

1. The Two I.T.P.A. Subtests.

Both of the following tests assess the child's aptitude in reproducing a sequence of auditory or visual stimuli¹. They are tests of short-term sequential memory.

Auditory Sequential Memory — This test assesses the child's aptitude in reproducing from memory sequences of digits increasing in length from two to eight digits. The digits are presented at the rate of two per second and the child is allowed a second trial of each sequence if he fails on the first presentation. More credit is earned for success in the first than on the second trial.

Psycholinguistic age norms and scaled score norms are provided for ages two years, one month to ten years, three months.

Visual Sequential Memory — This test assesses the child's aptitude in reproducing from memory sequences of

¹ Samuel A. Kirk et al., Examiner's Manual, Illinois Test of Psycholinguistic Abilities, revised edition, Urbana, University of Illinois Press, 1968, p. 12.

non meaningful figures increasing in length from two to eight figures. The child views each sequence of figures from a booklet for five seconds and then must arrange a corresponding number of chips of the figures in the same order. Again the child is allowed a second trial for each sequence if necessary but more credit is earned from a successful first attempt.

Psycholinguistic age norms and scaled score norms are provided for ages two years, one month to ten years, three months.

ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES

RECORD FORM

3rd EDITION

DEVELOPED BY DANIEL A. KIRK, JAMES J. MC CARTHY, AND WINIFRED D. KIRK

Name: _____ Sex: M F Date: _____
 Address: _____ Birthdate: _____
 Telephone: _____ CA: _____
 School: _____ Teacher: _____ Grade: _____

Test Data:	Test	Date	CA	MA	IQ

Reason for Referral: _____

Examined by: _____

3 CONSECUTIVE SUCCESSES
OR 2 CONSECUTIVE FAILURES

VISUAL SEQUENTIAL MEMORY

SCORE

1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
DEMONSTRATION I	DEMONSTRATION II	7.	8.	*12.	13.	*17.	18.	*22.	23.		
	4.	9.	10.	14.	15.	19.	20.	24.	25.		
	*5.	11.	16.	21.							
	6.										

3 CONSECUTIVE SUCCESSES
OR 2 CONSECUTIVE FAILURES

AUDITORY SEQUENTIAL MEMORY

SCORE

*DEMONSTRATION		1st	2nd	1st	2nd	1st	2nd
a. 2-2	b. 2-1	*6. 2-7-3-3	7. 6-3-5-1	*15. 7-4-8-3-5-5	16. 2-9-6-1-8-3	24. 4-9-6-3-5-7-1	25. 3-1-9-2-7-4-8-8
		8. 8-2-9-3	9. 1-6-8-5	17. 5-2-4-9-3-6	18. 4-7-3-8-1-5	26. 9-6-3-8-5-1-7-2	27. 4-7-3-1-6-2-9-5
		10. 4-7-3-9-9	11. 6-1-4-2-8	19. 6-9-5-7-2-8	20. 3-6-1-9-2-7-7	28. 8-2-5-9-3-6-4-1	
		12. 1-5-2-9-6	13. 7-3-1-8-4	21. 5-3-6-9-7-8-2	22. 8-1-6-2-5-9-3		
		14. 5-0-6-2-7		23. 2-7-1-1-9-1-6			

2. Gray Oral Reading Tests²

Forms A, B, C and D of the Gray are all similar in organization, length and difficulty and measure achievement in mechanical oral reading and comprehension.

Each form of the test consists of thirteen passages which have been organized to measure achievement in grade equivalents from one to twelve. The difficulty of each passage is based on range and density of vocabulary, syllable length of words, sentence structure and maturity of concept.

The child is asked to begin reading a passage a grade or two below the expected level and if no errors are counted, continues ahead until seven or more errors are made on each of two successive passages.

The examiner can observe type and number of oral reading errors and the time for reading each passage. Both time and the total number of errors are used in the norms to determine grade equivalent in oral reading. Additional scores which can be obtained in comprehension of literal questions are not figured in the norming procedure for obtaining a grade equivalent but are considered useful in the diagnostic purposes of the test passages.

² William S. Gray, Gray Oral Reading Tests, Manual of Directions for Administering Scoring and Interpretation, (ed.), Helen M. Robinson, Indianapolis, Bobbs-Merrill, 1967, 30 p.

Tables have been established for each of the four forms separately for boys and girls in order to permit the conversion from total raw passage scores to grade equivalents.

I go up.
 I come down.
 Come here, Mother.
 Come and play with me.

2. Gross Mispronunciation	_____
3. Partial Mispronunciation	_____
4. Omission	_____
5. Insertion	_____
6. Substitution	_____
7. Repetition	_____
8. Inversion	_____
Total Errors	_____

Time _____ Seconds

Questions	Answers	
___1. What was the girl in this story doing?	Swinging <i>or</i> going up and down (1) Showing her mother how she could swing (½)	_____
___2. Who was she talking to?	(Her) Mother (1)	_____
___3. What two things did the girl ask Mother to see her do?	Go up and come down <i>or</i> I go up and down (1)	_____
___4. Who was Mother to play with?	The girl (question <i>her or me</i>) (1)	_____

Number Right _____

A. 2. A boy said, "Run, little girl.
 Run with me to the boat."
 They ran and ran.
 "This is fun," said the boy.
 "Look," said the girl.
 "I see something in the boat.
 It is my kitten.
 She wants to play."

TYPES OF ERRORS	NUMBER
1. Aid	_____
2. Gross Mispronunciation	_____
3. Partial Mispronunciation	_____
4. Omission	_____
5. Insertion	_____
6. Substitution	_____
7. Repetition	_____
8. Inversion	_____
Total Errors	_____

Time _____ Seconds

Questions	Answers	
___1. Where did the boy want the girl to run?	To the boat (1)	_____
___2. Who said it was fun to run?	The boy (1)	_____
___3. What was in the boat?	A kitten <i>or</i> her kitten (1) Boy's kitten (½)	_____
___4. Who saw the kitten first?	The girl (1)	_____

APPENDIX 5
THE RAW DATA

Table VIII.-

I.T.P.A. and Gray Oral Raw Data Conversion for School I
Semantic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable (Gray)	
	A.M.*	Memory V.M.	Age A.A.**	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	43	22	157.6	128.2	14	1.8
	33	23	151.8	144.4	41	4.8
	34	22	159.7	129.8	19	2.0
A ^o V ^o	26	20	101.1	107.4	15	1.9
	27	20	108.3	103.5	21	2.0
	27	22	108.3	119	12	1.7
	34	20	143	101.1	11	2.0
	28	19	118.7	102.5	22	2.0
	25	22	105.1	128.2	30	3.2
A ^o V ⁻	27	16	115.1	88.6	5	1.4
	28	16	121.7	89.7	9	1.6
	40	17	155.6	93.6	21	2.0
	29	16	117.6	82.3	20	2.0
	28	18	117.8	97.5	27	2.8
A ⁻ V ^o	17	20	72.5	108.75	7	1.5
	17	20	67.4	101.16	13	1.8
	16	25	65.87	147.05	7	1.5
	30	25	90	156.2	13	1.8
	20	26	84.6	160.2	16	1.9
A ⁻ V ⁻	22	14	64.1	82.05	8	1.5
	20	18	74.1	87.6	12	1.7

* Auditory Memory

** Auditory Quotient

Table IX.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 2
Semantic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable (Gray)	
	A.M.*	Memory V.M.	Age A.A.	**Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	52	25	146.4	168.8	8	1.5
	37	25	157	160.25	12	1.7
	35	22	157.6	126.2	25	2.2
	33	21	156	118.9	16	1.9
	31	21	137.5	117.5	17	1.9
	37	22	144.7	117.6	24	2.5
A ⁰ V ⁰	26	22	106.1	123.4	13	1.8
	26	24	107.5	156.2	15	1.9
	25	19	106	106.4	4	1.3
	27	18	156.2	100	13	1.8
A ⁰ V ⁻	33	18	148	94	13	1.8
	30	15	131.6	84.8	1	1.2
	28	17	109.1	85	4	1.3
	31	17	139.2	93.6	2	1.2
	25	15	103.8	84.8	4	1.3
A ⁻ V ⁰	33	19	144.7	96.4	18	2.0
	34	19	146.4	97.6	6	1.4
	18	18	79	102.6	9	1.6
	22	22	84.7	116.6	5	1.4
	23	23	96.6	153.9	5	1.4
A ⁻ V ⁻	18	18	81.4	92.48	5	1.4
	15	18	63	92.8	4	1.3
	20	14	78	75.2	16	1.9
	15	17	65	90.2	21	2.1
	20	19	78.5	97.6	6	1.4
	24	18	93	93	12	1.7
	18	18	76.9	92.8	18	2.0
	16	19	87.4	98.7	0	1.1
	20	18	84	98.7	6	1.4
	17	17	74.3	94	3	1.3

* Auditory Memory

** Auditory Quotient

Table X.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 3
Semantic Materials.

Style	Aptitude Variable (<u>I.T.P.A.</u>)				Achievement Variable (<u>Gray</u>)	
	* A.M.	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	32	22	140.4	119	24	2.5
A ⁰ V ⁰	25	23	100	142.6	29	2.6
A ⁰ V ⁻	32	19	135	94.2	27	2.8
	26	18	102.3	92.8	22	2.2
	31	18	130	71.4	8	1.5
A ⁻ V ⁰	20	21	86.8	123.6	24	2.1
	15	27	66.2	156.2	4	1.3
	17	20	69	103.5	0	1.1
	19	23	70	130	0	1.1
	18	20	70.5	102.3	0	1.1
	24	24	89.6	143.7	2	1.2
	18	25	70.5	147	7	1.5
	21	21	85	117.5	2	1.2
	24	23	92.8	139.2	5	1.4
A ⁻ V ⁻	20	18	75	88.6	11	1.7
	20	16	75	79.5	20	2.0
	14	17	64.1	94.8	18	2.0
	24	18	95.12	95.12	6	1.4
	17	17	60	88	7	1.5
	18	19	69.7	95.3	1	1.2
	20	13	95.6	88.4	8	1.5

* Auditory Memory

** Auditory Quotient

Table XI-

I.T.P.A. and Gray Oral Raw Data Conversion for School 4
Semantic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable(Gray)	
	A.M.*	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	29	20	130	113.1	18	2.0
	31	22	141	112.3	20	2.0
	32	26	140	140.8	16	1.9
	50	21	140.4	110.5	37	3.5
	36	21	146.4	111.9	11	1.7
	34	22	159.7	129.8	16	1.9
	26	21	113.1	123.7	26	2.3
	29	22	114.4	120.4	13	1.8
A ^o V ^o	25	19	103	102.5	8	1.5
	33	19	155	100	7	1.5
	34	21	153.6	102.4	8	1.5
A ^o V ⁻	27	13	109.6	89.1	0	1.1
	37	21	154.6	98.8	20	2.0
	28	17	117.2	91.3	16	1.9
	29	16	133	93	17	1.9
	30	17	125.3	89.1	27	2.8
	37	18	155.6	98.7	17	1.9
A ⁻ V ^o	16	18	71.7	100	11	1.7
	19	27	81.8	162.3	0	1.1
A ⁻ V ⁻	19	15	81.8	87	9	1.6
	15	18	63	92.8	7	1.5
	23	17	96.1	94.9	15	1.9
	22	15	91.1	84.8	1	1.1
	14	17	67.4	74.4	11	1.7
	17	18	71.6	96.2	8	1.5

* Auditory Memory

** Auditory Quotient

Table XII.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 5
Semantic Materials.

Style	Aptitude Variable (<u>I.T.P.A.</u>)				Achievement Variable (<u>Gray</u>)	
	* A.M.	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	35	33	153.7	156.2	2	1.2
	30	22	126.8	121.9	8	1.5
	37	21	159.5	122.0	16	1.9
	35	22	159.7	129.8	10	1.6
A ⁰ V ⁰	25	18	106.4	101.2	3	1.3
A ⁰ V ⁻	35	13	139.7	69.31	7	1.5
	25	14	103.7	81.01	0	1.1
	27	15	107.0	78.8	1	1.2
	28	16	113.0	83.3	22	2.2
A ⁻ V ⁰	13	21	75.9	118.9	8	1.5
	19	20	80.7	111.5	12	1.7
	23	23	90.3	140.9	9	1.6
	21	21	78	110.5	29	3.0
	22	30	93.3	162.3	10	1.6
A ⁻ V ⁻	22	18	91.1	98.7	3	1.3
	20	17	84.6	94.8	7	1.5

* Auditory Memory

** Auditory Quotient

Table XIII.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 6
Semantic Materials.

Style	Aptitude Variable (<u>I.T.P.A.</u>)				Achievement Variable (<u>Gray</u>)	
	* A.M.	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	38	22	139.7	113.6	22	2.2
	39	22	150	121.9	17	1.9
	36	22	146.4	119	12	1.7
	27	23	112.3	144.4	9	1.6
	37	22	151.8	123.4	49	5.2
	43	21	157.6	120.5	11	1.7
	32	20	151.2	111.5	26	2.7
	33	26	144.7	147	24	2.1
	46	21	148.2	113.2	3	1.3
A ⁰ V ⁰	32	20	138.8	102.3	10	1.6
	44	10	150	100	7	1.5
	46	21	148.2	101.2	24	2.1
	25	26	100	152.4	28	2.9
	27	21	103.4	106.8	36	4.2
	26	26	108.8	158.2	6	1.4
	27	20	109.3	103.5	19	2.0
A ⁰ V ⁻	38	19	146.4	97.6	11	1.7
	29	15	125	83.7	23	2.3
	28	16	118.7	87.5	2	1.2
	29	18	123.4	96.2	8	1.5
A ⁻ V ⁰	20	23	77.6	137.6	19	2.0
	18	21	74	116	8	1.5
	24	25	80.6	142	8	1.5
	17	20	72.5	108.7	1	1.2
A ⁻ V ⁻	20	12	70.8	73.4	1	1.2
	18	16	71.4	83.3	7	1.5
	18	15	75	83.3	7	1.5
	17	18	58	78	4	1.3

* Auditory Memory

** Auditory Quotient

Table XIV.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 7
Semantic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable(Gray)	
	A.M.*	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	34	21	161.8	123.6	13	1.8
	28	24	114.4	150.5	7	1.5
	35	23	150	142.6	11	1.7
	27	26	113.7	156.2	17	1.9
	34	21	144.7	110.7	22	2.0
	39	21	151.8	150.4	23	2.3
	37	24	146.4	148.8	8	1.5
	28	25	117.2	154.3	24	2.5
A ^o V ^o	28	14	146.1	100	12	1.7
	40	18	157.6	100	21	2.1
	32	19	143.3	100	8	1.5
A ^o V ⁻	32	19	140.4	97.6	18	2.0
	29	17	126.2	94.8	9	1.6
	33	18	155.6	98.7	4	1.3
A ⁻ V ^o	17	21	75.3	122.0	16	1.9
	20	20	84.6	111.5	16	1.9
	24	20	95.1	106	7	1.5
	25	21	97.6	111.9	13	1.8
	17	23	70.7	142.6	24	2.1
A ⁻ V ⁻	12	18	52.2	88.6	10	1.6
	19	18	78.7	94.5	3	1.3
	19	18	71.5	88.6	3	1.3
	24	18	91.7	91.7	3	1.3

* Auditory Memory

** Auditory Quotient

Table XV.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 8
Alphabetic Materials.

Style	Aptitude Variable (<u>I.T.P.A.</u>)				Achievement Variable (<u>Gray</u>)	
	* A.M.	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	30	25	130	156.2	4	1.3
	29	23	126.5	148.1	7	1.5
	29	21	120.4	113.2	0	1.1
	29	24	126.4	150.6	4	1.3
A ⁰ V ⁰	27	21	103.4	106.7	33	3.7
	28	19	123.3	106.4	10	1.6
	25	20	105.1	111.5	2	1.2
A ⁰ V ⁻	31	17	126.4	85	0	1.1
	26	17	108.8	93.6	0	1.1
A ⁻ V ⁰	25	21	93.1	106.8	2	1.2
	21	18	89.7	100	4	1.3
	14	21	63.2	118.9	0	1.1
	21	21	80.9	111.9	0	1.1
	23	21	87.2	109.3	0	1.1
	20	23	80.4	142.6	0	1.1
	28	25	98.9	130.2	0	1.1
	21	27	81.9	150.6	10	1.6
	20	20	83.5	110.1	0	1.1
A ⁻ V ⁻	19	16	77.7	86.4	1	1.2
	12	18	52.2	88.6	0	1.1
	24	16	98.7	88.6	0	1.1
	18	18	75.9	98.7	1	1.2
	24	17	92.8	88	1	1.2

* Auditory Memory

** Auditory Quotient

Table XVI.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 9
Alphabetic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable(Gray)	
	* Memory A.M.	V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	29	22	127	126.5	0	1.1
	34	20	157.6	111.5	6	1.4
	30	21	123.8	111.9	23	2.1
	27	21	113	111.9	20	2.0
	34	21	144.7	110.7	7	1.5
	33	24	146.4	148.7	11	1.7
A ^o V ^o	35	20	144.7	102.3	17	1.9
	28	20	118.7	108.7	0	1.1
	28	18	114.4	93.9	16	1.9
	49	19	153.7	103	6	1.4
	27	20	109.6	104.7	7	1.5
	35	20	139.7	108.8	0	1.1
A ^o V ⁻	28	20	109.4	91.9	15	1.9
	29	15	121.9	81.7	27	2.8
	29	17	117.6	87	2	1.2
	26	18	104.8	95.1	0	1.1
A ⁻ V ^o	16	21	70.8	118.9	0	1.1
	23	27	85.2	142.0	14	1.8
	23	22	93.75	125	0	1.1
	16	22	58.9	105.2	0	1.1
	23	20	91.4	106	0	1.1
	19	19	76	100	10	1.6
A ⁻ V ⁻	28	18	98.7	98.7	2	1.2
	20	17	78.5	88	0	1.1
	14	18	58.1	90.6	0	1.1

* Auditory Memory
** Auditory Quotient

Table XVII.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 10
Alphabetic Materials.

Style	Aptitude Variable (<u>I.T.P.A.</u>)				Achievement Variable (<u>Gray</u>)	
	* A.M.	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	24	20	114.70	127.9	2	1.2
	42	20	157.6	111.5	0	1.1
	28	24	111.7	147	0	1.1
A ^o V ^o	28	19	115.8	100	17	1.9
	26	23	102.3	139.2	3	1.3
	29	18	129.8	101.2	8	1.5
	26	20	104.8	106.0	0	1.1
	30	19	133.3	105.1	0	1.1
	25	20	105.1	111.5	0	1.1
A ^o V ⁻	28	16	117.2	86.4	0	1.1
	28	15	117.2	82.7	0	1.1
	35	18	146.4	92.8	10	1.6
	27	18	103.3	92.8	0	1.1
	32	15	151.2	85.8	8	1.5
	33	16	138.7	78.6	0	1.1
	31	18	137.5	97.5	0	1.1
	28	12	118.7	72.5	0	1.1
	38	15	151.7	82.7	0	1.1
	26	16	100.0	81.3	0	1.1
A ⁻ V ^o	17	20	69.04	103.5	18	2.0
	24	20	98.7	110.1	5	1.4
A ⁻ V ⁻	19	18	78.7	97.50	0	1.1
	24	15	97.5	83.7	0	1.1
	13	17	57.1	83.09	0	1.1
	17	18	69.0	92.8	3	1.3
	23	19	90.3	98.7	3	1.3
	24	15	82.9	71.2	0	1.1
	17	13	73.4	79	0	1.1

* Auditory Memory

** Auditory Quotient

Table XVIII.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 11
Alphabetic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable(Gray)	
	* Memory A.M.	V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	45	22	155.6	116.5	9	1.6
	30	21	131.6	118.9	9	1.6
	28	20	120.2	110.1	2	1.1
A ⁰ V ⁰	34	18	159.7	101.2	24	2.5
A ⁰ V ⁻	28	19	110.4	95.3	11	1.7
	27	18	108.3	92.8	1	1.1
	30	16	125.8	82.3	0	1.1
	34	18	144	91.7	9	1.6
A ⁻ V ⁰	23	20	89.2	103	18	2.0
	20	20	32.5	108.7	17	1.9
	18	25	66.6	138.8	9	1.6
A ⁻ V ⁻	22	16	96	93.3	12	1.7
	11	13	54.4	77.2	0	1.1

* Auditory Memory

** Auditory Quotient

Table XIX.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 12
Alphabetic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable (Gray)	
	* A.M.	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	28	22	114.4	120.4	0	1.1
A ^o V ^o	31	20	129.4	102.35	8	1.5
	34	19	155.6	103.79	18	2.0
	29	20	114.9	100	0	1.1
	28	20	113.09	103.5	0	1.1
	25	28	101.23	154.3	0	1.1
A ^o V ⁻	32	19	138.7	96.4	0	1.1
	30	19	123	96.6	11	1.6
	26	13	104.8	74.3	0	1.1
	47	18	138.2	87.6	0	1.1
	26	17	102.3	88.09	0	1.1
	32	18	135.6	89.6	0	1.1
A ⁻ V ^o	18	22	66.2	112.3	1	1.1
	25	21	94.2	108.04	13	1.8
	19	27	73.2	145.3	0	1.1
	25	23	92.3	131.4	13	1.8
	19	24	74	148.8	17	1.9
	21	23	82.9	142.6	24	2.5
	22	23	86.7	140.9	5	1.4
A ⁻ V ⁻	22	19	80	91.1	8	1.5
	18	18	68.1	88.6	1	1.1
	15	16	66.2	87.5	0	1.1
	24	18	92.8	92.8	3	1.3
	23	15	87.2	77.9	0	1.1
	18	13	69.7	70.9	0	1.1
	17	18	69.04	92.85	0	1.1

* Auditory Memory

** Auditory Quotient

Table XX.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 13
Alphabetic Materials.

Style	Aptitude Variable (I.T.P.A.)				Achievement Variable(Gray)	
	* A.M.	Memory V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	28	23	102	150	23	2.1
	32	22	137.2	139.5	15	1.9
	31	23	126.4	134.4	28	2.5
	33	22	161.8	131.5	17	1.9
	38	23	139.7	142	16	1.9
	35	24	153.7	156.2	23	2.3
	28	20	115	114.4	6	1.4
	34	23	144.7	137.6	14	1.8
A ^o V ^o	26	26	107.9	142	10	1.6
	38	20	141.3	100	4	1.3
	25	21	106.4	122	7	1.5
	40	18	157.6	100	18	1.7
	26	22	106.1	123.4	23	2.3
A ^o V ⁻	37	13	155.6	77.2	30	3.2
A ⁻ V ^o	21	27	78.1	142.6	22	2.0
	13	25	70.5	147	20	2.0
	22	24	87.8	152.4	10	1.6
	23	21	91.4	114.6	16	1.9
	25	33	94.2	143.6	7	1.5
	20	21	76.7	109.3	21	2.1
	19	29	80.7	160.2	9	1.6
	19	20	72.4	100	9	1.6
A ⁻ V ⁻	18	15	75.9	84.6	16	1.9
	20	17	86.8	97.3	29	3.0

* Auditory Memory

** Auditory Quotient

Table XXI.-

I.T.P.A. and Gray Oral Raw Data Conversion for School 14
Alphabetic Materials.

Style	Aptitude Variable (<u>I.T.P.A.</u>)				Achievement Variable (<u>Gray</u>)	
	* Memory A.M.	V.M.	Age** A.A.	Quotients V.A.	Passage Score	Grade Equivalent
A ⁺ V ⁺	36	27	159.7	162.3	18	2.0
	26	21	148.1	113.2	21	2.0
	38	22	146.4	119	14	1.2
	27	20	116.6	111.5	18	2.0
	45	22	148.1	120.4	26	2.3
	31	22	132.5	120.4	26	2.3
	46	21	146.4	111.9	20	2.0
A ⁰ V ⁰	20	21	116.2	169.3	26	2.3
	33	19	157.6	105.1	16	1.2
	33	21	143.0	109.3	20	2.0
	24	20	101.2	112.9	20	2.0
	25	19	103	102.5	2	1.2
A ⁰ V ⁻	27	19	107	96.4	29	2.6
	33	17	153.7	92.5	7	1.5
	2	17	114.4	89.1	10	1.6
	26	19	101.1	96.4	20	2.0
	40	17	151.3	91.3	25	2.6
	33	15	156.6	88.7	7	1.5
A ⁻ V ⁰	16	21	65.1	109.3	22	2.2
	21	22	81.9	120.4	0	1.1
	25	23	97.6	139.2	20	2.0
	24	19	95.1	100	30	2.7
A ⁻ V ⁻	22	18	82.7	89.6	7	1.5

* Auditory Memory

** Auditory Quotient

APPENDIX 6

ABSTRACT OF

The Interactive Effect of Style of
Short-Term Memory and Exposure to
Semantic and Alphabetic Materials
on Achievement in First Grade Oral
Reading

ABSTRACT OF

The Interactive Effect of Style of Short-Term Memory and Exposure to Semantic and Alphabetic Materials on Achievement in First Grade Oral Reading¹

The study was undertaken to examine the possibility of an interactive effect of style of learning and method of teaching upon achievement in oral reading at the end of grade one. The results of the study could provide direction on the choice of teaching methods suitable for individuals presenting different styles of learning and thus reduce to some degree the incidence of preventable reading problems in the schools. Some educators have held that such problems may have developed from an initial teaching program which ignored the individual's psycholinguistic capacities for organizing perceptual signals into meaningful language. Others have held that reading problems have resulted from teaching which ignored the phonic sounding out of words. Therefore, two factors, style of learning and type of beginning reading materials were considered as independent variables in the study which measured achievement in oral reading as the dependent variable.

From the literature was developed a theoretical rationale which defined 1) the perceptual modal integration

¹ Robert M. Whittle, doctoral thesis presented to the Faculty of Education of the University of Ottawa, Ontario, December 1976, xii-203 p.

necessary to the skill of reading, 2) the role of auditory and visual short-term memory in the process of oral reading and 3) the interrelationships among aptitude in short-term memory, the acquisition of word attack skills of analysis and synthesis and the linguistic structure of semantic whole word and alphabetic part word beginning reading materials.

In the first hypothesis five integrational patterns of auditory and visual sequential short-term memory were predicted to have a significant effect on achievement in oral reading at the end of grade one regardless of type of instructional materials. Both factors of degree of modality integration and strength of the auditory component led the investigator to predict the following order of achievement:

1. S_1, A^+V^+ , high modal integration, first
2. S_2, A^OV^O , normal modal integration, second
3. S_3, A^OV^- , visual deficit, third
4. S_4, A^-V^O , auditory deficit, fourth
5. S_5, A^-V^- , auditory visual deficit, fifth

The second hypothesis concerned an interactive effect with two types of teaching materials and aptitude in short-term memory upon achievement in oral reading. Thus two levels of teaching materials were identified as the method variable. Semantic or whole word materials were chosen because of the emphasis on meaning as the vehicle for

carrying the vocabulary development. Alphabetic or part word materials were chosen because of the emphasis on the linguistic control of the vocabulary. Theoretical postulations on method-aptitude interaction in beginning reading suggested two directions. First, in the initial stages of beginning reading, both methods would place different demands upon the psycholinguistic aptitude of the reader and secondly, achievement differences in oral and silent reading could be related to type of instructional materials. Finally, it was predicted that only style 4, the auditory deficit style, would experience superior performance in oral reading after exposure to alphabetic teaching materials. All other styles would benefit more from exposure to semantic teaching materials.

In the subsequent research investigation, fourteen classes of grade one pupils, half of whom had been taught to read with semantic materials and half with alphabetic materials were given 1) the auditory and visual short-term memory subtests of the I.T.P.A. and 2) the Gray Oral Reading Achievement Test.

The experimental design called for an analysis of variance utilizing a three factor nested design containing seventy cells where classes were nested in methods which were crossed with five levels of style. The A.N.O.V.A. was performed using the N.Y.B.M.U.L. program prepared by Jeremy

Finn. Scheffé post hoc comparisons were carried out to locate significant differences among the five levels of style contributing to the main effect upon achievement.

As predicted, aptitude in short-term memory had a significant effect on achievement in beginning oral reading and followed the anticipated order of achievement with style 1, A^+V^+ followed in turn by $S_2 A^0V^0$, $S_3 A^0V^-$, $S_4 A^-V^0$, and $S_5 A^-V^-$. No significant interactive effect of aptitude and materials upon oral reading achievement was obtained at the .95 level of confidence. However, the predicted direction of the disordinal interaction was present and was graphed accordingly.

Directions for further research called for similar method-aptitude studies with the other modality bound aptitudes of auditory and visual closure. Longitudinal studies over the primary years could assess 1) the development of the auditorially deficit reader ($S_4 A^-V^0$) and 2) the stability of method-aptitude teaching strategies with older students.

Two main conclusions were drawn. First, the study revealed that the process of beginning oral reading is partly dependent upon the subject's aptitude in sequencing and integrating signals which are both seen and heard. In addition, the study indicated that the alphabetic synthetic phonics materials method of teaching reading provided the

greatest amount of assistance to the auditorially deficit reader but had the opposite effect upon readers possessing other aptitudinal styles of short-term memory.

In order to reduce further, the risk of secondary or preventable reading problems in the schools, other aspects of the reader's learning style must be identified and related to the processes of both oral and silent reading. Then these aptitudinal style variables must be examined with differing types of instructional materials for an interactive effect on achievement in both oral and silent reading.