A COMPARISON OF TWO METHODS OF TEACHING WORD RECOGNITION TO KINDERGARTEN STUDENTS

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A Comparison of Two Methods of Teaching Word Recognition to Kindergarten Students

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Abstract

Recent studies have suggested that teaching methods which emphasize letter-sound associations are important to beginning readers. The current study tested a Spelling-drill and a Sentence-practice method of reading instruction, and investigated factors which are correlated with word recognition ability in thirty-six kindergarten students. It was hypothesized that the Spelling-drill Group would perform better than the Sentence-practice Group.

The experiment was completed over four sessions. In the first session, a battery of tests was administered: the Peabody Picture Vocabulary Test -- Revised (PPVT - R), the Rosner Auditory Analysis Test, a Rapid Automatized Naming Task (RAN), an Auditory and a Semantic Word Retrieval Task, and a Pretest of the words that were taught and tested during the experiment. For the second and third sessions, subjects were randomly assigned to one of two groups, a Spelling-drill Group, taught sixteen target words by a drill method, or a Sentence-practice Group, taught the same sixteen words by a sentence-context method. A spelling test of the target words was given at the end of each training session. During session four, all subjects were tested to determine recognition of target, incidental (words embedded in sentences that were not explicitly taught), and transfer (new words from the same family that had not been taught) words. The Wide Range Achievement Test -- Revised (WRAT - R) was also administered during the final session.

The mean number of words recognized was higher for the Spelling-drill Group, but the difference was not statistically significant. However, when groups were restricted to subjects who knew all the letters of the alphabet on the RAN task, the Spelling-drill Group, as predicted, identified significantly more target words than did the Sentence-practice Group. The Spelling-drill Group spelled more words correctly and identified more target and transfer words than did the Sentence-practice Group. The results suggest that a drill method that teaches about sounds that letters make by using repetitions of words from the same family is an effective method of teaching both early word recognition and spelling.

Previous findings that word recognition correlates with the Rosner, PPVT, and the RAN were replicated. As predicted, both phonological awareness measures, the Rosner and auditory retrieval, were found to be significantly positively correlated with the reading measures.

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List of Symbols and Abbreviations

ANOVA	Analysis of variance (univariate)
F	Fisher's F - Ratio
M	Mean (arithmetic average)
p	Probability Level (Alpha)
SD	Standard deviation

CHAPTER 1
INTRODUCTION

A Comparison of Two Methods of Teaching Word Recognition to Kindergarten Students

Introduction

Failure to learn to read is the most common academic problem associated with the classification of Learning Disability (Taub, Fine, & Cherry, 1994). Research suggests that 4 to 10 % of children do not accomplish the task of reading (Mann, 1986). Many studies have attempted to identify the specific difficulties underlying reading problems, but these studies have had limited success and inadequate remediation for reading problems persists in the educational system.

Immense efforts have been made to determine the antecedents of reading acquisition. The process of learning to read is extremely complex and researchers continue to search for factors that are prerequisite to sounding out and articulating new words. Educators and researchers must tread with great caution when pointing out factors that are necessary ***prerequisites*** to sounding out words. Many of the complex skills which are involved with the manipulation of sounds and print are likely to be either facilitators or consequences of learning to read (Backman, 1983).

Individuals with difficulties with reading and spelling are identified early in the primary grades, and are frequently placed in remedial or special-needs classes. The extra help received frequently does not solve their problem with learning to read. In fact, special-services placements often result in additional problems such as low self-esteem,

labelling, lack of motivation, frustration, and teasing by peers. Once these individuals with persistent reading difficulties reach sixteen years of age, they frequently drop out of school and become dependent upon the social welfare system or find themselves in trouble with the justice system. In fact, research shows that 30 to 70 % of young offenders and inmates have experienced learning problems (Koopman, 1983). Nearly 50 % of adolescent suicides have previously been diagnosed as having learning disabilities (Rourke, 1989). These statistics are quite staggering and should not be overlooked.

Of critical importance to individuals with reading difficulties, is early diagnosis and intervention. The earlier a problem is identified, the higher the likelihood that appropriate intervention will have a positive impact on a child's education. In this study, I chose to work with kindergarten students because the majority of them were non-readers and had not received formal reading instruction.

A vocabulary measure, tests of short-term memory, and an achievement test were administered. Subjects were randomly assigned to one of two groups, a Spelling-drill Group, or a Sentence-practice Group. After two 15 min training sessions, all subjects were tested to determine recognition of taught words and to determine ability to transfer. Ability to transfer refers to ability to identify a word not taught during the two training sessions, but from the same word family that was drilled. For example, the "ad" family was taught using the words "sad," "dad," "mad," and "bad." In testing ability to transfer, the words "lad" and "glad" were presented to explore if the students could identify new

words from the "ad" family. Thus, the experiment permitted a comparison of how the two groups responded to the two training periods of word identification instruction.

Statement of the Problem

Chaos exists in the definition of reading and reading disability (Siegel & Morrison, 1986). The definition of a reading disability, or dyslexia as it is sometimes called, is a definition by exclusion (Vellutino, 1978). This definition entails ruling out mental retardation, brain damage, emotional disorders, lack of cultural opportunity, and sensory deficits as the primary causes of reading problems and requires that the reading disabled individual be of average to above-average intelligence. There is strong evidence, however, that IQ scores are irrelevant to the definition and analysis of reading disability (Siegel, 1988). Siegel found language and short-term memory processes that are deficient in the disabled reader to be independent of IQ level. A detailed analysis of the specific skills and information processing abilities was found to be more appropriate for the definition of a reading disability, rather than IQ scores. In the Netherlands, the Committee on Dyslexia of the Health Council, has arrived at the following working definition:

> ***"Dyslexia is present when the automatization of word identification (reading) and/or word spelling does not develop or does so very incompletely or with great difficulty."*** (Gersons-Wolfensberger & Ruijssenaars, 1997, p. 209)

The term ***automatization*** refers to the establishment of an automatic process characterized by a high level of speed and accuracy. It is carried out unconsciously; makes minimal demands on attention; and is difficult to suppress, ignore or influence.

The definition means that dyslexia is characterized in practice by severe and persistent retardation in reading and spelling and by resistance to the usual teaching methods and remedial efforts (Gersons-Wolfensberger & Ruijssenaars, 1997).

Regardless how one defines a reading problem, a clear understanding of the skills that are either prerequisite to or consequences of reading is absent, and appropriate strategies for teaching reading have not been developed. Without such knowledge. appropriate diagnoses and interventions cannot be developed and teaching methods for average or above average children may not be optimal. This study attempted to address the problem of best methods for teaching word recognition. The problem was addressed by considering individuals who have not received formal reading instruction. A variety of memory tasks were implemented to determine skills an individual has prior to reading instruction. In addition, subjects were randomly assigned to one of two treatment methods, a sentence-practice method or a spelling-drill method, both designed to teach word recognition. Pre- and posttest word recognition measures were taken and a comparison of the two methods were completed to determine if one method of teaching word recognition skills to kindergarten students was better.

CHAPTER II

REVIEW OF THE LITERATURE

Learning to Read

Learning to read is a skill that requires some effort to acquire (Smyth, Morris, Levy, & Ellis, 1990). Various cognitive processes must be accomplished before an individual becomes adept at reading. In reading acquisition, an individual must learn about letters and sounds, and must learn that words are created by mixing various combinations of letters and sounds. Prior to first stages of reading, children normally learn the alphabet (26 letters in the English language) (Foorman, Francis, Fletcher & Schatschneider, 1998). When children are exposed to print, they learn to recognize each letter and eventually know the letter name. Initially, children learn to spell their own names and words such as 'mom' and 'dad'. Thus, some early word identification is based on the "whole word" method. Other words are frequently learned in association with names they have already mastered.

Grasping the concept that words are broken down into a finite set of sounds is usually the next stage. Phonemes are the basic units of sound in a specified language that distinguish one word from another (e.g., |p|, |b|, |d|, |t| as in "pad," "pat," "bad," "bat," in English). Non-disabled readers can segment words into their constituent phonemes and can "sound out" words (Adams, 1990). An individual is normally 5 or 6 years old before the ability to segment words into individual phonemes is acquired (Snowling, 1987). This ability is an important step in becoming a skillful reader since

the process of reading involves decoding information. Skilled readers learn letter-sound associations and through practice, are able to establish associations between sound and meaning of words (Adams, 1990). When an individual has awareness of what a phoneme is and can divide words into the component phonemes in the context of words heard or remembered, the individual is said to have "phonemic awareness" (Snowling, 1987).

During the process of learning to read, characters must be decoded into sound representations, the sounds must be stored in memory, and finally the stored sounds must be blended to form words (Wagner & Torgenson, 1987). A child must first learn that symbols on a page represent letters and that the letters form clusters that form words. After a letter-to-sound knowledge develops, new words can be learned through associations with previously learned words. When a new word is observed the reader readily recognizes the sequences of letters and converts them into phonemes. Phonemes are blended to form words and the reader is able to identify the word. Skilled readers master the word recognition process to a level that involves decoding letters with a certain degree of automation.

On the other hand, there are individuals who do not master the word recognition process and these unskilled readers frequently experience a variety of problems. These individuals often experience difficulty with comprehension since they must spend a great deal of time identifying the words. The importance of automaticity in freeing up attentional resources which can be used for comprehension cannot be overemphasized here. Insight into word recognition and phonological awareness has generally been gained through the study of individuals who have reading problems.

Specific Skills that Contribute to Basic Reading Problems

Individuals with reading difficulties differ in the development of the specific skills that contribute to basic reading problems (Lyon, 1985). Recent literature strongly suggests that the presence of phonological awareness is a hallmark of good readers while its absence is a consistent characteristic of poor readers (Adams, 1990; Hurford, Darrow, Mote, Schauf, & Coffey, 1993; Mann, 1993). It has been suggested that phonological awareness is part of a larger skill known as phonological processing that includes coding and retrieving verbal information. Research indicates that deficits in processing the phonological features of language explain a significant proportion of beginning reading problems and correlated difficulties in reading comprehension, background knowledge, memory and vocabulary differences (Liberman & Shankweiler, 1985; Mann & Brady, 1988; Rack, Snowling, & Olson, 1992; Torgesen, Wagner, Simmons, & Laughon, 1990; Wagner & Torgesen, 1987).

It has been suggested that a deficit in phonological processing plays a causal role in the emergence of reading disabilities (Rack *et al.*, 1992; Rack & Olson, 1993; Wagner & Torgeson, 1987). In a review of the literature, Wagner & Torgesen (1987) stated: "***Phonological processing*** refers to the use of phonological information (i.e., the sounds of one's language) in processing written and oral language" (p. 192). Although the precise nature of phonological processing and reading ability is not fully understood, research suggests that phonological awareness and retrieval of phonological information from long-term memory are particularly important processes in the development of beginning reading skills (Felton, 1993; Felton & Brown; 1990; Felton & Wood, 1989).

Phonological awareness (also referred to as linguistic awareness or phonemic awareness) is one type of phonological processing that involves a metalinguistic awareness of the speech-sound structures of language (Felton, 1993). An array of tasks has been devised to operationalize the concept of phonemic awareness. Tasks that require tapping out the number of sounds in a word, reversing the order of sounds in a word, and blending sounds presented in isolation can be used to test for phonological awareness (Lewkowicz, 1980). Individuals with reading difficulties frequently have difficulty with many phonological awareness tasks such as tapping tasks, sound-to-word matching, word-to-word-matching, recognition of onset and rime, isolation of a designated sound. phonemic segmentation, counting the phonemes, blending, deleting phonemes, specifying which phoneme has been deleted, and phoneme substitution (Lewkowicz, 1980; Mann & Brady, 1988).

Individuals with reading difficulties have been found to be slower at naming series of familiar stimuli, such as digits, letters, and objects (Cornwall, 1992; Denckla & Rudel, 1976). Continuous naming tasks such as the Rapid Automatized Naming (RAN) test have been found to distinguish normally achieving students from students with reading difficulties. It has been suggested that rapid naming tasks reflect the ease with which an individual can access the sound and meaning of a written word (Clark, 1988).

Poor readers frequently have difficulty with rhyming and may be unable to think of words that rhyme with aurally presented words. Rack (1985) used a rhyme judgement task where four combinations of word pairs were presented aurally to dyslexic and to reading-age-match controls. The word pair combinations consisted of rhyming and

orthographically similar words, non-rhyming but orthographically similar words, rhyming but not orthographically similar words, and words which neither rhymed nor were similar. Subjects were required to decide which pairs rhymed. The dyslexics were found to be significantly slower than controls in giving a positive response to rhyming pairs. They took longer to report a positive response to rhyming pairs that were orthographically distinct than to rhyming pairs that were orthographically similar. For example, a dyslexic individual required more time to respond to the word pair HEAD/SAID than the word pair HEAD/DEAD.

Katz (1986) also found that children with reading disabilities have problems in naming objects and in performing certain tasks that require phonological processing or phonological awareness. Poor readers had the greatest difficulty with low frequency words or proper names. Poor readers have also been found to score lower on the Boston Naming Test which provides information about an individual's knowledge of the phonetic characteristics of object names (Rubin, Zimmerman & Katz, 1989; Wolf & Obregon, 1992). Subjects are required to name a set of objects of increasing difficulty. Rubin *et al.* (1989) found that subjects scored similarly on the initial phoneme recognition task and subsequent naming of objects. However, good readers were found to name significantly more objects and to outperform poor readers when required to manipulate the sounds of the prompts given.

Difficulty in retrieving words is another characteristic of poor readers. Hann (1995) compared the ability of good and poor readers to retrieve words using visual, auditory, and semantic cues. Good readers were found to retrieve more words for all

three cues, but the difference was much less for the semantic cue. Research completed using auditory analysis tests, word retrieval tasks, and various reading measures corroborate these findings (Power, 1995; Rumbolt, 1993). They too have found that little difference exists between good and poor readers in response to semantic cues. The low performance of poor readers in retrieving words in response to visual cues is not surprising, as this is a type of spelling knowledge measure. However, the fact that the auditory retrieval was low as well is very interesting. The auditory retrieval task is a rhyming test and subjects logically do not have to know how to read or spell to do this test.

Most tests of phonemic awareness are significantly and positively related. Yopp (1988) suggests that phonemic awareness should be divided into two levels: "Compound Phonemic Awareness" and "Simple Phonemic Awareness." Simple Phonemic Awareness was defined by using the following highly related tests: segmentation, blending, sound isolation, and phoneme counting. Compound Phonemic Awareness was defined by using a phoneme deletion test and a word-to-word matching test which were highly similar. In the deletion test, the respondent was required to recall the remaining sounds and to blend them. In the word-to-word matching test, the respondent was required to isolate a sound in a given position in a second word and to compare it with a sound already isolated in the first word. The requirement of holding a given sound in memory while performing a second operation differentiated Simple Phonemic Awareness from Compound Phonemic Awareness. Yopp found that kindergarten students had higher Simple Phonemic Awareness than Compound Phonemic Awareness (i.e., students scored higher on

phoneme blending than phoneme deletion). According to Yopp (1988), the Rosner test of phoneme deletion may be the most valid measure of Compound Phonemic Awareness. Since the greatest interest in phonemic awareness concerns reading acquisition, Yopp suggested that a combination of tests encompassing the two levels of phonemic awareness would hold greater predictive validity for the initial steps in reading acquisition.

In sum, difficulties in naming, rhyming, tapping, coding, retrieving auditory information and other tasks which operationalize the concept of phonological awareness are related to reading difficulties. There is evidence that significant gains in phonological awareness can be achieved through appropriate teaching, and that the gains in phonological awareness directly affect the ease of reading acquisition and subsequent reading achievement (Ball & Blachman, 1991; Byrne & Fielding-Barnsley, 1989; Cunningham, 1990). Cunningham (1990), for example, has shown that training in phonemic awareness is most beneficial when children receive explicit instruction in application, value, and utility of phonemic awareness for reading.

Teaching Reading

Is there a ***best*** method for teaching children to read? Most children learn to read proficiently regardless of the choice of teaching method (Snowling, 1996). There has been great debate over the relative merits of code-emphasis instruction and meaning-emphasis instruction in the early teaching of reading (Adams, 1990; Foorman, Francis, Novy, & Liberman, 1991). Code-emphasis instruction focuses on teaching relationships

between letters and sounds and meaning-emphasis instruction focuses on teaching the child to process the text for meaning. In code-emphasis approaches the use of word-specific information for word identification is stressed, whereas in meaning-emphasis approaches, context and picture cues are stressed.

Recent studies have shown that early readers who have received code-emphasis instruction generally outperform those instructed in meaning-emphasis methods (Felton, 1993; Foorman *et al.*, 1991, 1998; Snowling, 1996). Felton (1993) found that children who received code-emphasis instruction scored higher than children who received meaning-emphasis instruction on a variety of reading and spelling measures at the end of first and second grades. She suggested five instructional guidelines: (1) provide direct instruction in language analysis, (2) provide direct teaching of the alphabetic code, (3) teach reading and spelling in conjunction with each other, (4) provide intensive reading instruction, and (5) teach for automaticity. Similarly, Foorman *et al.* (1991), found letter-sound instruction mediated progress in first-grade reading and spelling. Foorman *et al.* varied the amount of daily letter-sound instruction given to 80 first-grade children and later administered tests of phonemic segmentation, reading, and spelling. They found that children in classrooms with more letter-sound instruction improved their spelling and reading at a faster rate than children in classrooms with less letter-sound instruction.

Goswami (1986) suggested that reading by analogy is one of the first methods that beginning readers use. Goswami has found that analogy reading develops before sequential decoding (Goswami 1986, 1988, 1990, 1991). Clue words such as ***beak*** were presented with words such as ***bean, beal, beak, peak, neak, lake,*** and ***pake***. Some of

these words were analogs to the clue word and others were not. The clue words were presented above the test words and were pronounced prior to requesting the subject to pronounce the clue word. Goswami found that subjects read more analogs correctly than control words. She also found that analogs sharing the same rimes were correct more frequently than analogs sharing other word parts. A ***rime*** is the obligatory part of a syllable; it consists of a vowel and any consonant sounds that come after it. Even nonreaders identified a few words by analogy. Thus, reading instruction programs that aim to teach children new words by pairing them with known words may be beneficial in the early teaching of reading.

Ehri and Robbins (1992) continued this investigation by assessing the reading capabilities of kindergarten and first-grade children. Subjects were distinguished as those who could and could not recode consonent-vowel-consonent sequences (CVC's), respectively referred to as decoders and nondecoders. Subjects were assigned to a rime analogy or a control condition. Ehri and Robbins tested whether rime analogy subjects would be able to read more transfer words than control subjects and whether this difference would be observed between decoders and nondecoders. Consistent with Goswami's findings, it was found that reading unfamiliar words by analogy is an easier process which can be carried out by beginners more readily than reading unfamiliar words by phonologically recoding the words. However, in order for beginning readers to read words by analogy, they must have some phonological recoding skills. Thus, it is quite important for children to acquire some letter-sound analytical skills at the outset and to understand how letters symbolize sounds, how to divide words into subunits, and how to

blend parts of known words with new words (Ehri & Robbins, 1992). In a similar study, Bruck and Treiman (1992) examined the effects of analogy training using grade one students and concluded that analogy-based training is limited. Bruck and Treiman suggested that children need instruction not just on the relations between groups of graphemes and groups of phonemes, but also on single graphemes and single phonemes.

In a recent literature review, Snowling (1996) considered the contemporary approaches to the teaching of reading. Teaching approaches which emphasize 'phonics' have been found to have more positive outcomes than contextual and meaning-based methods, especially in the development of decoding and spelling skills (Adams, 1990; Snowling, 1996). An examination of interventions for poor readers suggests that the preferred method of remediation should involve a combination of reading and phonological awareness training and should make explicit links between the two (Foorman *et al.*, 1998). Programs which aim to prevent reading failure through early intervention should also place emphasis on phonological awareness training (Foorman *et al.*, 1998). According to Snowling (1996), the most effective teaching methods combine reading instruction with phonological awareness. Snowling also iterates that there is nothing incompatible about using 'phonics' and 'whole-language' approaches to reading (Adams, 1990).

Other studies which favor more explicit methods of teaching letter-sound relationships and decoding are constantly emerging. Children who are familiar with letter-sound relationships have been found to have a better start in learning to read and write than other children (Adams, 1990; Baumann, 1984). Therefore, according to

Morrow (1997), the question is no longer, "Do we deal with these skills in the development of early reading?"; rather, the question is exactly what skills are we talking about, when do we introduce them, how do we teach them, and how much time do we spend instructing them?

In the study reported here, a Spelling-drill method (i.e., code-emphasis) and a Sentence-practice method (i.e., meaning-emphasis) were compared. Consistent with research favoring code emphasis, the Spelling-drill method was designed to teach early word recognition based on sound-letter associations. The target words were taught in word families (i.e., "cat," "rat," "mat") with the expectation that the early "reader" would infer associations between letters or letter patterns and sounds. Based on methods which use context cues, a Sentence-practice method was designed in which early word recognition was taught by teaching target words within meaningful sentences. The premise of this method was that early "readers" learn new words through meaning.

Major Hypotheses and Research Questions

The present experiment addressed a number of research questions. First, this experiment permitted a comparison of two methods of teaching individuals how to read. The first method, the Spelling-drill method, entailed teaching letter-sound associations using word family drills. Three words from the same family (i.e., "cat," "rat," "mat") as the target word were drilled for pronunciation and spelling three times. The second method, the Sentence-practice method, involved teaching target words that were embedded in sentences. All target words were presented within a sentence and were pointed out to the subject. Subjects were asked to repeat the sentence and to point out the target word. It was hypothesized that performance on the posttest would be superior for the Spelling-drill Group because the method paired spelling and attention to individual letters with the words. The expectation was that the subjects would infer associations between letters or letter patterns and sounds. I also predicted that the Spelling-drill Group would outperform the Sentence-practice Group when required to identify new words (i.e., transfer), again because the Spelling-drill method paired spelling and attention to individual letters with the words. The method was expected to enable subjects to "sound out" unfamiliar words.

Secondly, the present experiment enabled an examination of the relationships between various tasks correlated with early word recognition. These tasks included RAN (i.e., processing speed), auditory and semantic retrieval, PPVT (a vocabulary measure), and WRAT - R (the Wide Range Achievement task). WRAT - R, as well as the pretest and posttest scores, measured reading skill. On the basis of previous research on

phonological processing skills, it was predicted that the phonological awareness measures (auditory retrieval and the Rosner Auditory Analysis) would be positively correlated with the reading scores (pre- and posttest, and WRAT - Reading). Since vocabulary knowledge and semantic knowledge are similar, it was also predicted that the PPVT and semantic retrieval would yield a high positive correlation with each other and with the reading measures.

CHAPTER III

DESIGN OF THE STUDY

Participants

A total of thirty-six kindergarten students (14 females and 22 males) from a grade K to 12 school in the St. John's area participated in the study. The mean age of the subjects was 5 years, 11 months and ranged from 5 years, 6 months, to 6 years, 9 months. Two of the subjects were repeating grade kindergarten and three of the subjects were receiving help from a speech-language pathologist. A letter was sent home to parents explaining the study and parental permission was attained. A copy of the letter and the consent form are presented in Appendix A.

Measures

Peabody Picture Vocabulary Test - Revised (PPVT-R)

The Peabody Picture Vocabulary Test -- Revised (PPVT-R) (Dunn & Dunn, 1981) is a multiple-choice test designed to evaluate a person's receptive vocabulary in Standard English. The test was untimed and did not require the subject to read. The examiner introduced the test by asking the subject to look at some pictures. There were four pictures on each page and the examiner pointed this out to the subject. The examiner pronounced a word and asked the examinee to point to the picture of the word that was said. Three training plates were used to ensure that the subject understood the task. The starting point was determined by the age of the subject. The task ended when the subject

made six errors out of eight consecutive responses. The test took approximately 10 to 15 min to administer.

Rosner Auditory Analysis Test

The Rosner Auditory Analysis Test requires the subject to delete specific phonemes from words. The examiner pronounced a word, for example "cowboy." The examinee was asked to repeat the word to ensure that it was heard correctly. Next, the examinee was asked to say the word again, but to remove a part of it. In the "cowboy" example, the examinee was asked to remove the "boy" sound. The appropriate response was "cow." The examinee was required to remove sounds from various locations of words. For example, the child was required to say "man" without the /m/ sound, or say "tone" without the /n/ sound. Three sample items were given prior to testing. If the subject did not understand the task, the test was discontinued. The test ended after the subject made five consecutive errors. This task took approximately 5 to 10 min to administer. The instructions for this task were followed exactly as outlined in Appendix B.

Rapid Automatized Naming

Subjects were presented with three pages of characters. The first page contained 20 one-digit numbers, the second page contained 20 letters, and the third page contained ten one-digit numbers and ten letters that were mixed. Subjects were required to name the characters as quickly as possible, without speaking so fast that the items could not be

understood. The purpose of this task was to determine the child's knowledge of letter names, measure speed of processing, and to assess any errors that an individual made. A stopwatch was used to time each subject after the experimenter said, "Go." The exact instructions, the three pages of characters, and the score sheet for this task are presented in Appendix C. This task took approximately 5 min to administer.

Auditory Word Retrieval Task

In this task three common sounds were chosen as sound cues for retrieval. The cues were [æt] as in bat, [i:] as in see, and [aɪt] as in night (auditory cues are represented by the International Phonetic Alphabet or IPA). Subjects were instructed that they would hear three sounds presented one at a time. They were asked to report as many words they could think of containing the same cue sound. The subjects had 30 sec to respond to each cue and they were told that they might be asked to provide a definition of a word or to use a word in a sentence. Providing a definition or putting the word in a sentence ensured that the subject knew the meaning of the word. Before the word retrieval task began, subjects were provided with the example: "If I said the sound [ɪŋk], what words would you say that have the [ɪŋk] sound?" Subjects were told that appropriate answers were 'pink,' 'drink,' 'sink,' and 'think.' The task began with the reading of the first sound cue. This task took approximately 3 to 5 min to administer.

Semantic Word Retrieval Task

Three categories from Battig and Montague's category norms for verbal items were used for this task (Battig & Montague, 1969). The categories were animals with four legs, parts of your body, and things to eat. Subjects were told, "If, for example, you were given the category, 'types of fruit,' you could respond with such items as 'apple,' 'banana,' 'pear,' and 'orange.' Subjects were given 30 sec to name as many items as possible belonging to each category. Testing began with the reading of the first category name. This task took 3 to 5 min to administer.

Pretest of Experimental Words

A pretest of all the words that were taught and tested during the experiment was given to determine whether the words were known prior to the experiment. The subjects were asked to do the best they could to say the words on the page, starting with the first word at the top. They were instructed that if they were unsure of a word, it was acceptable to guess. They were required to read the words vertically down the page. The exact instructions for this task are presented in Appendix D. Appendix E contains the list of words that were taught and tested. The examiner had a separate sheet for recording the responses. This task took approximately 3 to 5 min.

Wide Range Achievement Test -- Revised (WRAT - R)

The Wide Range Achievement Test -- Revised (WRAT - R) (Jastak & Wilkinson, 1993) contains three subtests (Reading, Spelling and Arithmetic) that were administered

to each subject. The Reading subtest measured the ability to recognize and name letters and to pronounce isolated words. The Spelling subtest measured the ability to copy letters, write one's name, and write single words from dictation. The Arithmetic subtest measured skills such as counting, naming number symbols, solving oral problems, and performing written computations. The WRAT - R is divided into two sections: Level I (ages 5-0 to 11-11) and Level II (ages 12-0 to 74-11). Level I was administered in this study and took approximately 10 to 15 min. The WRAT - R was chosen because it was quick and easy to administer, and it provided standard scores for three major achievement areas of word recognition, arithmetic, and spelling.

Design and Procedure

This study used the classical experimental design described in the 19th century by J.S. Mill and formalized mathematically by the English statistician Sir R. A. Fisher. The design was rigorous and permitted conclusions about relationships between letter-sound associations and early word recognition. Subjects were randomly assigned to one of two treatment groups and comparisons of pre- and post-measures were completed. Both groups were shown exactly the same target words the same number of times but different methods were used with each group.

Experimentation with each individual was conducted over four sessions. All tasks were completed individually in a distraction-free room at the child's school. During the first session, a battery of tests was given. The tests were the Peabody Picture Vocabulary Test -- Revised (PPVT - R), a Rapid Automatized Naming Task (RAN), the Rosner Auditory Analysis Test, a Semantic Word Retrieval Task, an Auditory Word Retrieval Task, and a pretest of the words that were taught and tested during the experiment. All subjects received the tests administered in the order listed above.

For the second and third sessions, subjects were randomly assigned to one of two groups, a Spelling-drill Group, taught sixteen target words by a drill method, or a Sentence-practice Group, taught sixteen words by a sentence-context method. Eight target words were taught during each of the two training sessions (sessions two and three). For the Spelling-drill Group, the second session began with the experimenter reading out a sentence that was printed in large letters (20 pt. Times New Roman Font) on a sheet of white paper. A sample page is presented in Appendix F. The experimenter and

the subject shared the same sheet. The presented sentence contained a target word. For example, "The boy is sad." was one of the sentences used to teach the target word "sad." Three words from the same family as the target word were drilled for pronunciation three times and drilled for spelling three times. "Dad," "mad," and "bad" were used as the words from the same family as "sad." The words "sad," "dad," "mad," and "bad" were presented on a page six times (three times in regular word form and three times spelled out using spaces -- "s a d") each in random order. The sentence "The boy is sad." was presented on the same page three times. It appeared on the top, in the middle, and on the bottom of the page. The trainer would pronounce the sentence and then ask the subject to repeat the sentence. The trainer then pointed to the word "sad" and asked the subject to repeat the word. Then, the trainer pointed to spaced version of sad -- "s a d" and had the subject spell out the letters. Next, the trainer pointed to the drill words such as "dad" and pronounced it. The subject was then required to repeat the word "dad" and to spell out the letters "d a d." This was followed until all four words "sad," "dad," "mad," and "bad" had been pronounced and spelled three times each.

The subject was required to pronounce the sentence in the middle of the page when the first half of the words from the "ad" family had been drilled. After all of the words had been drilled, the subject was required to pronounce the sentence at the bottom of the page. Help was given if necessary. At the end of the session, a spelling test of the eight target words taught was given. If the subject could not recall the target words, the examiner helped the examinee with spelling. During session three, two more sentences were drilled three times and eight new target words were learned. The same procedure as

for session two was followed. There were two combinations of sentence order and word drill which were randomly selected. One half of the Spelling-drill Group received one order, and the remaining half received the other combination. Sessions two and three took approximately 15 min each.

For the Sentence-practice Group, subjects received the same target words presented the same number of times as did the Spelling-drill Group. However, the target words were not drilled and spelling was not practiced. All target words were presented within a sentence and were pointed out to the subject. Four sentences appeared on each page and there were a total of six pages for each session. At the beginning of the second session, the trainer read out a sentence. Subjects were asked to repeat the sentence and to point out the target word. There were sixteen different sentences in total and eight of these sentences were presented during session two. Each of the eight sentences was presented on three occasions in random order. At the end of the second session, a spelling test of the eight target words was given. The remaining eight sentences were presented during session three and were followed by a spelling test of the words. There were two different combinations of sentence order for the Sentence-practice Group which were randomly chosen. One half of the Sentence-practice Group received one combination and the other half were presented the other combination. Sessions two and three were approximately 15 min each. All sentences, target words, drill words and a brief description of how they were presented to each group appears in Appendix G.

During session four, all subjects were given a posttest to determine whether they recognized the taught words and the incidental words. Incidental words were the words

that were embedded in the sentences, but which were not explicitly taught. Two new words from each family that had not been drilled were tested for transfer. The target words, incidental words, and the transfer words were presented without the sentence and the subject was asked to pronounce the words. A list of the target words, incidental words, and transfer words are presented in Appendix E. The Wide Range Achievement Test -- Revised (WRAT - R) was administered during this session after the posttest was completed.

Scoring

For the Rapid Automatized Naming task (RAN), six measures were recorded: the time in seconds to read each page of numbers, letters, and the mixture of number of letters, as well as the number of errors made on each of the three pages. Failure to pronounce a number or letter was scored as an error. The PPVT - R and the WRAT - R were scored according to the standard instructions in the appropriate manuals. All PPVT - R and WRAT - R measures are reported as age-based standard scores.

For the two word-retrieval tasks, the total number of responses was counted. Frequently, during the auditory retrieval task, the subjects would report letter names as words that rhymed with the cue sound. Thus, letter names were counted as acceptable responses in scoring the auditory retrieval task. For the auditory retrieval task wrong sounds, repetitions of the stimulus cue, repetitions of retrieved responses, and neologisms were scored as well. Wrong sounds were words that did not rhyme with or did not contain the cue sound. If for example, during the cue sound [æt] (as in bat), a subject

reported the word 'bait,' the word 'bait' would be scored as a wrong sound because it does sound like the [æt] sound. A repetition of the stimulus cue was scored when the subject repeated the cue sound. Neologisms were responses that were not real words -- responses that the subject made up. For the semantic retrieval task, wrong categories and repetitions of retrieved responses were scored as well. Wrong categories were inappropriate responses based on the semantic cue. If for example, in response to the cue "things to eat," a subject reported "sneakers," this would have been scored as a wrong category. Repetitions of retrieved responses were repeats of the same response during a 30-sec interval. For example, if the subject reported "apples" on two occasions during the "things to eat" cue, the second occurrence of "apples" would be scored as a repetition. The pretest and posttest scores were the total number of words pronounced correctly. For both tests the maximum possible score was thirty.

Statistical Analyses

Pearson Product Moment correlations were calculated to determine the interassociations between all measures. One-way analyses of variances (one-way ANOVAS) were conducted to determine whether the groups were equal prior to treatment. Two one-way ANOVAS were completed to test whether there was a difference in gain scores based on method of instruction. All thirty-six subjects were used for the first ANOVA but the groups were restricted to those subjects that knew all the letters of the alphabet on the RAN task for the second ANOVA. The rationale for separating the subjects based on knowledge of the alphabet was driven by consistent research findings which emphasize the importance of the basic alphabetic principle very early in the course of reading instruction (Adams, 1990).

One-way ANOVAS were also completed to compare males and females on all measures. A comparison of the word type (target, incidental, or transfer) recognized for both groups was completed. Also, subjects were divided into good and poor "readers" on the basis of ***time*** taken to read out the letters on the RAN task, and an analysis comparing each group on the various tasks was completed.

CHAPTER IV

FINDINGS, DISCUSSION, AND SUMMARY

Correlational Data

Table 1 shows the Pearson Correlation matrix. The three reading measures (pretest, posttest, and WRAT - Reading) and the spelling achievement measure (WRAT - Spelling) were all significantly and positively correlated with one another. As predicted, the reading measures were positively correlated with phonological awareness as measured by the Rosner Test and also by auditory retrieval. The Rosner correlated more strongly with actual word reading (the pretest and the posttest) than with WRAT - Reading and Spelling.

The Rapid Automatized Naming (RAN) score represents the total amount of time taken to name the 60 characters in the RAN task. A subject with a high score on the RAN named the letters at a slower rate than a subject with a low RAN score. The RAN task was significantly negatively correlated with all reading measures. Thus, subjects who named the letters at a fast rate and attained a low score on the RAN task generally scored high on the reading measures. It should be pointed out that the RAN was significantly negatively correlated with both retrieval measures. However, in contrast to the Rosner, the RAN correlated more highly with WRAT - Reading and Spelling than with actual word reading (the pretest and the posttest).

Auditory retrieval was significantly positively correlated with all reading measures and with the RAN, but not with the Rosner. Auditory retrieval was not significantly correlated with either semantic retrieval or the PPVT suggesting separate

retrieval mechanisms for word knowledge and for sound. Semantic retrieval was significantly positively correlated with PPVT and WRAT - Reading. However, of the reading measures, the WRAT - Reading measure was the only one significantly positively correlated with the Semantic Retrieval task. As predicted, the PPVT yielded strong correlations with all reading measures. WRAT - Math also correlated strongly with all reading measures and with the RAN, but correlated less strongly with auditory and semantic retrieval. The PPVT, the Rosner and the Semantic Retrieval yielded the fewest number of significant correlations with the other measures.

To summarize, all the reading measures were found to be intercorrelated. Comparing these correlations with the other measures, it can be concluded that the Rosner, RAN, PPVT, and auditory retrieval are all strongly correlated with early word recognition. These tasks may share phonological characteristics which are correlated with reading.

Table 1

Pearson Correlation Matrix of all Test Measures

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. RAN	1.000	-0.313	-0.504**	-0.462**	-0.229	-0.342*	-0.384*	-0.751***	-0.768***	-0.700***
2. Rosner		1.000	0.219	0.237	0.363*	0.619***	0.580***	0.380*	0.370*	0.211
3. Semantic Retrieval			1.000	0.311	0.333*	0.251	0.238	0.363*	0.303	0.365*
4. Auditory Retrieval				1.000	0.239	0.484**	0.402*	0.485**	0.341*	0.413*
5. PPVT - R					1.000	0.464**	0.464**	0.563***	0.473**	0.326
6. Pretest						1.000	0.949***	0.604***	0.505**	0.486**
7. Posttest							1.000	0.684***	0.545**	0.544**
8. WRAT Reading								1.000	0.818***	0.771***
9. WRAT Spelling									1.000	0.652***
10. WRAT Math										1.000

Note. RAN represents total time. PPVT - R represents Peabody Picture Vocabulary Test -- Revised standard scores. Correlations were calculated using WRAT Math, Read, Spell as standard scores as well.
*$p < .05$. **$p < .01$. ***$p < .001$.

Experimental Data

Table 2 summarizes the means, standard deviations, and ranges for all measures by group and presents the results from the one-way ANOVAS. The results indicate that there were no significant differences between groups on any measure and indicate that random assignment to experimental condition was accomplished.

Table 2

Summary of All Measures by Group (N = 36)

	Spelling-drill Group (N=18)			Sentence-practice Group (N=18)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
RAN total	129.22	73.61	40-273	103.22	77.25	46-309	1.07
PPVT - R	90.56	12.09	79-122	86.83	11.09	65-105	0.93
Pretest	2.83	4.90	0-20	2.17	4.27	0-19	0.19
Rosner	3.50	3.45	0-14	3.44	3.38	0-11	0.00
Semantic total	14.89	5.80	5-26	15.94	6.18	6-31	0.28
Auditory total	4.72	3.95	0-13	5.94	4.33	0-16	0.78
Posttest	4.72	7.22	0-29	3.28	3.95	0-18	0.55
WRAT Math	93.33	15.25	72-125	96.28	14.88	68-120	0.34
WRAT Read	96.50	14.49	74-136	96.17	14.39	59-108	0.01
WRAT Spell	98.22	10.26	81-123	97.61	15.55	54-113	0.02

Note. RAN represents total time. PPVT -- R represents Peabody Picture Vocabulary Test -- Revised standard scores. WRAT Math, Reading, and Spelling are presented as standard scores as well.

A comparison between the words identified by the Spelling-drill Group and the Sentence-Practice Group was completed using one-way ANOVAS. Table 3 presents a summary of the target words, transfer words and incidental words recognized by each group, and total gain scores (i.e., posttest score minus the pretest score). The Spelling-drill Group correctly identified more target words, more transfer words, and had a larger gain score than did the Sentence-Practice group, but the differences were not statistically significant. The Sentence-practice Group yielded a higher mean score of incidental words than did the Spelling-drill Group, but the difference was not statistically significant.

However, when groups were restricted to subjects who knew all the letters of the alphabet on the RAN task (i.e., subjects who did not make any errors reporting the letters on the task), the Spelling-drill Group, as predicted, recognized significantly more target words than did the Sentence-practice Group. The rationale for restricting the subjects to those who knew all the letters of the alphabet comes from the research suggesting that knowledge of the alphabetic principle is a necessary prerequisite to word identification (Adams, 1990). The Spelling-drill Group also had a significantly higher gain score than did the Sentence-practice group. Table 4 presents a summary of the target words, transfer words, incidental words and total gain scores attained by each group for the restricted sample and shows that the Spelling-drill Group performed significantly better in identifying target words and had a significantly higher total gain score than the Sentence-practice Group.

A significant difference between the gain scores of the Spelling-drill Group and the Sentence-practice Group was also attained when **time** to read letters during the RAN

task was used to restrict groups to those individuals that took longer than 29 s (seconds) to read out the letters. A third ANOVA was completed and the Spelling-drill Group (N=6, M=4.33, SD=2.88) recognized significantly more new words than did the Sentence-practice Group (N=12, M=1.83, SD=2.04), F (1, 15) = 4.60, p = .0477. For this third ANOVA, the same subjects were used as for the second ANOVA with the exception of one subject in the spelling drill group whose time was greater than 29 s.

Table 3

Summary of Word Types Recognized by Group (N=36)

	Sentence-practice Group (N=18)			Spelling-drill Group (N=18)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
Target Words	0.778	0.943	0-3	1.444	1.947	0-6	1.709
Transfer Words	0.111	0.323	0-1	0.222	0.548	0-2	0.464
Incidental Words	0.778	0.943	0-4	0.389	0.502	0-1	2.387
Total Gain	1.111	1.323	-1-4	1.889	2.564	0-9	1.308

Table 4

Summary of Word Types Recognized by Group for Subjects that Knew all Letters of the Alphabet on the RAN Task (N=19)

	Sentence-practice Group (N=12)			Spelling-drill Group (N=7)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
Target Words	0.750	0.965	0-3	3.286	1.890	1-6	15.255**
Transfer Words	0.167	0.389	0-1	0.571	0.787	0-2	2.288
Incidental Words	1.000	1.044	0-3	0.714	0.488	0-1	0.457
Total Gain	1.083	1.564	-1-4	4.143	2.854	1-9	9.285**

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

Results of the spelling measures completed at the end of each of the two training days are presented in Table 5. These analysis were completed using the entire sample. On Day 1, the Spelling-drill group performed significantly better than the Sentence-practice group, F (1, 34) = 4.19, $p < .05$. On Day 2, the Spelling-drill group spelled more words correctly than the Sentence-practice group, but the difference was not statistically significant. The Sentence-practice Group scored higher on Day 2 than on Day 1, but the opposite occurred for the Spelling-drill Group.

A comparison of the order that word families were taught was also completed to determine if there were differences in order of presentation and whether certain word families were easier to learn than others. Table 6 represents the mean spelling scores per day by word family combination and group. The mean spelling score of the combination of words ending in AT and AN was higher than the mean spelling score of the combination of words ending in AD and ET on both training days for the Spelling-drill Group, but the difference was not statistically different. For the Sentence-practice Group, the mean spelling scores were higher for the AD and AT combination on both days. It should be pointed out that the Spelling-drill Group did better than the Sentence-practice Group on all combinations. This gives some estimate of reliability even though the results were not statistically significant for both days.

Table 5

Comparison of Spelling Measure by Group for Both Training Days

	Sentence-practice Group (N=18)		Spelling-drill Group (N=18)		
Measure	**M**	**SD**	**M**	**SD**	**F**
Spelling (Day 1)	1.22	1.56	2.83	2.96	4.19*
Spelling (Day 2)	1.61	2.00	2.06	2.41	0.362

Note. *$p < .05$

Table 6

Comparison of Spelling Measure by Combination for Both Training Days by Group (N=9)

TRAINING DAY 1

	Sentence-practice Group (N=9)			Spelling-drill Group (N=9)		
Combination	**M**	**SD**	**Range**	**M**	**SD**	**Range**
AD/ET	1.33	1.94	0-6	2.56	3.00	0-8
AT/AN	1.11	1.16	0-3	3.11	3.06	0-7

TRAINING DAY 2

	Sentence-practice Group (N=9)			Spelling-drill Group (N=9)		
Combination	**M**	**SD**	**Range**	**M**	**SD**	**Range**
AD/ET	0.89	0.93	0-2	1.33	2.00	0-6
AT/AN	2.33	2.55	0-8	2.78	2.68	0-8

Table 7 shows the number of responses for each cue during the auditory retrieval task and presents an error analysis for each group. The entries in the lines labeled "cue" are the number of responses produced and the bottom four lines of the table present an error analysis. The results show there was no significant difference between groups on any measure.

Table 7

Summary of Auditory Retrieval Cue Responses and Errors by Group (N=36)

	Sentence-practice Group (N=18)			Spelling-drill Group (N=18)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
[æt] Cue	1.89	1.64	0-6	2.06	1.73	0-6	0.09
[I:] Cue	2.61	2.40	0-8	1.56	1.34	0-5	2.65
[aɪt] Cue	1.61	1.24	0-4	1.56	1.54	0-6	0.01
Repeat Cues	0.94	1.06	0-3	0.56	0.62	0-2	1.82
Repetitions	1.11	1.41	0-4	1.44	2.77	0-11	0.21
Neologisms	1.50	1.75	0-7	0.94	1.26	0-5	1.19
Wrong Sounds	3.00	3.66	0-15	2.89	2.74	0-9	0.01

Table 8 shows the number of responses for each cue during the semantic retrieval task and presents an error analysis for each group. The entries in the lines labeled animals, body parts and things to eat are the number of responses produced and the last two lines of the table present an error analysis. The results of one-way ANOVAS verify that the groups were not significantly different on the retrieval tasks.

Table 8

Summary of Semantic Retrieval Cues Responses and Errors by Group (N=36)

	Sentence-practice Group (N=18)			Spelling-drill Group (N=18)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
Animals	4.28	1.93	2-10	4.67	2.11	1-9	0.33
Body Parts	6.56	4.42	0-18	5.56	3.29	0-11	0.59
Things to Eat	5.11	2.52	2-11	4.39	2.03	1-9	0.90
Wrong Categories	0.56	1.54	0-6	0.22	0.55	0-2	0.75
Repetitions	0.56	0.98	0-3	0.94	1.89	0-7	0.60

Gender Differences

Table 9 summarizes the means, standard deviations, maximum and minimum scores by gender. The females performed better than the males on all tasks but the differences were not significant for nine of the measures. Females scored significantly higher than the males on the WRAT - Reading score only, F (1, 34) = 4.76, $p < .05$. An analysis of the auditory retrieval scores and the semantic retrieval scores comparing males and females was also completed. Table 10 represents a summary by gender for the auditory retrieval task. Females had a higher mean score for all three cues, but the differences were not significant. Females reported more neologisms than males while males made more repetitions of both the stimulus cue and retrieved words. Males reported significantly more wrong sounds than did females, F (1, 34) = 5.27, $p < .05$. Table 11 summarizes the semantic retrieval task by gender. Males reported more 'animals' and 'things to eat' than females, but the differences were not significant. Females reported more body parts. Males made more errors in the form of both wrong categories and repetitions. Again, the differences were not statistically significant.

Table 9

Summary of All Measures by Gender (N=36)

	Males (N=22)			Females (N=14)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
RAN total	122.95	82.93	46-309	105.64	63.63	40-273	0.44
PPVT - R	87.68	10.90	65-111	90.29	12.86	67-122	0.42
Pretest	1.86	3.97	0-19	3.50	5.33	0-20	1.11
Rosner	3.59	3.30	0-11	3.29	3.58	0-14	0.07
Semantic total	15.23	6.56	5-31	15.71	5.00	5-26	0.06
Auditory total	4.68	4.37	0-16	6.36	3.65	0-13	1.42
Posttest	2.68	3.85	0-18	6.07	7.65	0-29	3.12
WRAT Math	94.14	16.30	68-125	95.86	12.97	72-116	0.11
WRAT Read	92.41	13.39	59-108	102.5	13.74	81-136	4.76*
WRAT Spell	95.14	14.12	54-113	102.29	9.92	82-123	2.72

Note. RAN represents total time. PPVT - R represents Peabody Picture Vocabulary Test -- Revised standard scores. WRAT Math, Reading, and Spelling are presented as standard scores as well.
*$p < .05$

Table 10

Summary of Auditory Retrieval Cues and Errors by Gender (N=36)

	Males (N=22)			Females (N=14)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
[æt] Cue	1.64	1.59	0-6	2.50	1.70	0-6	2.40
[I:] Cue	2.05	2.28	0-8	2.14	1.51	0-5	0.02
[aɪt] Cue	1.45	1.30	0-4	1.79	1.53	0-6	0.48
Repeat Cues	0.91	0.97	0-3	0.50	0.65	0-2	1.92
Repetitions	1.36	1.50	0-5	1.14	3.01	0-10	0.09
Neologisms	1.18	1.65	0-7	1.29	1.38	0-5	0.04
Wrong Sounds	3.86	3.67	0-15	1.50	1.40	0-4	5.27*

Note. *$p < .05$

Table 11

Summary of Semantic Retrieval Cues and Errors by Gender (N=36)

	Males (N=22)			Females (N=14)			
Measure	**M**	**SD**	**Range**	**M**	**SD**	**Range**	**F**
Animals	4.50	2.26	1-10	4.43	1.60	3-8	0.01
Body Parts	5.63	4.32	0-18	6.71	3.10	0-11	0.66
Things to Eat	4.86	2.32	2-11	4.57	2.31	1-9	0.14
Wrong Categories	0.55	1.44	0-6	0.14	0.36	0-1	1.04
Repetitions	1.00	1.77	0-7	0.36	0.84	0-3	1.60

Other Interesting Findings

The means, standard deviations, and ranges of the six measures of the RAN are presented in Table 12. The mean time was greater for naming letters than for naming numbers or for reading the mixture of numbers and letters. The mean number of errors was highest for naming the letters.

Table 12

Means and Standard Deviations of the RAN Measures

Measure	M	SD	Range
Letter Time	44.44	36.42	12-167
Letter Errors	2.92	4.77	0-16
Number Time	34.42	20.62	12-94
Number Errors	0.78	1.42	0-6
Mixed Time	38.75	25.59	14-109
Mixed Errors	2.28	3.42	0-11

A comparison of the differences between good and poor "readers" was also completed. Using time taken to read out the letters on the RAN task, those subjects that reported the letters in 28 s or less were categorized as good "readers," and those that reported the letters in 29 s or more were categorized as poor "readers." Good "readers" (N = 18, M = 1.722, SD = 1.934) reported significantly more neologisms than did poor "readers" (N = 18, M = 0.722, SD = 0.752), F (1,34) = 4.18, p = .0487.

A comparison of the differences between good and poor "readers" on the pretest was also completed. Those that had a score of 2 or more on the pretest were categorized as good "readers" and those that scored below 2 were categorized as poor "readers." Good "readers" (N = 12, M = 2.000, SD = 1.477) reported significantly more neologisms than did poor "readers" (N = 24, M = 0.833, SD = 1.435), F (1,34) = 5.190, p = .0291. Other comparisons did not yield any significant differences.

Discussion

The main focus of this study was to compare two methods of teaching early word recognition to kindergarten students. Individuals exposed to the spelling-drill (i.e., code emphasis) method generally outperformed those who received the sentence-practice (i.e., meaning emphasis) method but the results were not statistically significant. When only those individuals who knew all the letters of the alphabet were considered, the Spelling-drill Group performed significantly better on word recognition than did the Sentence-Practice Group. This supports Adams (1990) emphasis of the importance of the alphabetic principle. The Spelling-drill Group also outperformed the Sentence-practice Group on spelling and on transfer, but the results were not statistically significant. An examination of the tasks which are correlated with word recognition replicated previous findings that reading correlates with the Rosner, PPVT, and the RAN (Dunn & Dunn, 1981; Rosner, 1971; Yopp, 1988). However, two new interesting findings emerged: a significant positive correlation between reading and auditory retrieval, and a significant positive correlation between math and reading.

It was hypothesized that performance on the posttest would be significantly higher for the Spelling-drill Group because the method paired spelling and attention to individual letter pattern or sounds with the words. As predicted, the mean score on the posttest was higher for the Spelling-drill Group than for the Sentence-practice Group, although the difference was not statistically significant. However, when groups were restricted to subjects who knew all the letters of the alphabet on the RAN task, the Spelling-drill Group, as predicted, recognized significantly more target words than did the

Sentence-practice Group. Thus, when the analysis is confined to children who are ready to learn to read, the results supported the hypothesis that the Spelling-drill Group would perform better than the Sentence-practice Group. Comparing the posttest scores, it was concluded that the Spelling-drill method was superior to the Sentence-practice method for teaching early word recognition to this kindergarten sample. These results are consistent with those sharing explicit instruction on letter-sound associations (Ehri and Robbins, 1992; Foorman *et al.*, 1991; Goswami, 1990).

I also predicted that the Spelling-drill Group would outperform the Sentence-practice Group on a spelling task at the end of each session and when required to identify new words (i.e., transfer). The method was expected to enable subjects to "sound out" unfamiliar words because it paired spelling and individual attention to letters with the words. The Spelling-drill Group outperformed the Sentence-practice Group on spelling for both training days. However, the results were statistically significant for only one of the two days. These findings suggest that teaching letter-sound associations by presenting words in families and having children sound out the letters is an effective method of teaching spelling to kindergarten students. These findings also suggest that teaching spelling in the early stages of reading might improve ***both*** spelling and word recognition. It appears that teaching both word identification and spelling to kindergarten students achieves two goals in one instructional approach. A method which accomplishes two objectives simultaneously is quite valuable for early instruction in word recognition.

Another prediction was that the Spelling-drill Group would outperform the Sentence-practice Group when required to identify new words (i.e., transfer). As

predicted, the Spelling-drill Group correctly identified more words than the Sentence-practice Group, but the differences were not statistically significant. If the training period was longer or if a greater appreciation of alphabetic knowledge was present, the results may have been different (i.e., consistent with the prediction).

Previous findings that word recognition correlates with the Rosner, PPVT, and the RAN were replicated. As predicted, both phonological awareness measures, the Rosner and auditory retrieval, were found to be significantly positively correlated with the reading measures. The positive correlation between word recognition and auditory retrieval is a new finding. In the past, rhymes have been found to be related to reading (Goswami, 1993). Goswami's experiments on reading by ***rime*** analogy have consistently shown that reading words by analogy develops earlier than reading words by decoding. When presented with various analogs of clue words, analogs sharing the same rimes were correct more often than analogs sharing other parts, indicating the greater phonological cohesiveness of onset and rime subunits. Goswami has found that children's early analogies reflect the level of their phonological knowledge when they enter school. Thus, a finding that auditory retrieval is significantly correlated to word recognition may parallel the connection of rime and analogy to phonological awareness.

The strong correlations between auditory retrieval and the reading measures are consistent with the findings of Hann (1995) and Power (1995). Hann (1995) found that auditory word retrieval correlated with reading skill at the junior high level and Power (1995) found that auditory word retrieval correlated with spelling skill at the university level. Both Hann and Power found that the semantic retrieval scores correlated less

highly with reading or spelling than did the auditory retrieval. The present study has shown the same result. Kindergarten students in this study showed a high correlation between auditory retrieval and word recognition ability, but again semantic retrieval was more weakly related to word recognition ability. These findings may be suggestive of some subprocess that affects reading and spelling ability. Suggestions that a developing word-retrieval or naming system offers a developmentally early analogue to the later acquired reading system have been made before (Ellis, 1985; Wolf & Obregón, 1992). Wolf and Obregón (1992) have found word retrieval and naming performance to be powerful tools in the prediction and study of specific subprocesses in reading pathology.

It is likely that a mechanism exists which impairs the decoding or retrieval of information. According to the phonological deficit hypothesis, a circumscribed deficit in phonological processing impairs decoding, preventing word identification (Shaywitz, 1996). The premise of the phonological deficit model is that the deficit is essentially a lower-order linguistic function which blocks access to higher-order linguistic processes. Thus, although the language processes involved in comprehension are intact, they do not become part of the reading process since they cannot be accessed. Exploration of the existence of a mechanism for decoding or retrieving information is beyond the scope of this thesis. However, it raises questions about the effect of early intervention in the diagnosis of reading problems and it increases the importance of researching appropriate methods of teaching early word recognition.

The other new finding in this study is a significant positive correlation between mathematics and reading. I propose that the same mechanism or process is used when accessing the name of both numbers and letters at the late kindergarten stage.

It was also hypothesized that the PPVT and semantic retrieval would yield a high positive correlation with each other and with the reading measures. As predicted, the semantic retrieval task and the PPVT were positively correlated, but they were the least predictive of word identification ability. The semantic retrieval task was also strongly correlated with the RAN. This finding may also suggest similar processing mechanisms for retrieval.

Not surprisingly, the pretest and the posttest were highly correlated. Thus, those who did well on the initial word identification task also performed well on the final word identification task. Spelling and reading were also found to be highly correlated. Of course, this is not a new or surprising finding, but it may have important practical implications for teaching both reading and spelling.

An interesting observation: a comparison of the two students who scored the highest on the pretest was completed. The two students had been randomly assigned to different groups. The individual who was in the Spelling-drill Group scored twenty on the pretest, and scored twenty-nine on the posttest. The individual who was in the Sentence-practice Group scored nineteen on the pretest, and scored eighteen on the posttest. Why did the individual in the Sentence-practice Group score have a lower score on the posttest? If time had permitted, it would have been interesting to put this individual in the Spelling-drill Group and to see whether he/she improved. I suspect that

the resulting posttest score would be much higher. In addition, it should also be pointed out that a negative gain score (i.e., a decline in performance) was observed for only two subjects both of whom were in the Sentence-practice Group.

Gender differences were also considered. The females performed better than the males on all tasks but the differences were not significant for nine of the measures. Females scored significantly higher than the males on the WRAT - Reading score only. An array of theses have been written on gender differences alone. Attempts to account for such discrepancies include differences in parental behaviours towards each sex (Roe, Drivas, Kragellis, & Roe, 1985), and the fact that verbal tasks such as reading and expressing feelings are viewed as female stereotypic behaviour (Perry & Bussey, 1984). The use of functional magnetic resonance imaging (fMRI) has revealed a surprising difference between males and females in the locus of phonological representation of reading (Shaywitz, 1996). Phonological processing in males engages the left inferior frontal gyrus, whereas in females, both the left and right inferior frontal gyruses are activated. These findings are the first concrete proof of gender differences in brain organization and may have implications for future educational practices. However, sex differences were not the focus of this study and are merely mentioned as an interesting observation.

Summary

The current study tested a Spelling-drill and a Sentence-practice method of reading instruction, and investigated factors which predict word recognition ability in thirty-six kindergarten students. It was hypothesized that the Spelling-drill Group would perform better than the Sentence-practice Group. The Spelling-drill Group did perform better than did the Sentence-practice Group but the differences were not statistically significant. Many of the subjects did not have the prerequisite skills to accurately test the hypothesis since forty-seven per cent of the subjects did not know all the letters of the alphabet. However, when the subjects who did not know the entire alphabet on the RAN task were removed, the Spelling-drill Group was found to perform significantly better than the Sentence-practice Group. Furthermore, during one training day, the Spelling-drill Group spelled significantly more words correctly than did the Sentence-practice Group. The results suggest that explicit training on letter-sound associations, where this training is organized according to families of rhyming words, is effective in promoting both word identification and spelling.

Some children enter school without knowing their alphabet and without being able to count. Others enter kindergarten with good knowledge of the alphabet and with the ability to identify various words. What should happen during the course of the kindergarten year? Forty-seven per cent of the subjects in my experiment did not know all the letters of the alphabet at the end of the kindergarten school year while others could readily identify new words. Automatic letter recognition is known to be important in learning to read (Adams, 1990). When a child requires a great deal of time to identify

each successive letter of a word, the concurrent activity of the word as a whole becomes reduced; the more time taken to identify each successive letter of a word, the less the individual can learn from reading about the spelling of the word as a whole. Thus, efforts to increase the automaticity of letter recognition should be made during the kindergarten year.

The recent findings favouring code emphasis need to be studied more carefully across age. The theoretical foundations of code-oriented approaches also need to be analyzed more carefully in order to increase our understanding of reading acquisition. Without a direct instruction component, some children will miss learning many important skills necessary for reading (Morrow, 1997).

Thus, in summary, the implications of future research for teaching children to read are clear. Word identification is essential for reading comprehension, and the Spelling-drill method explored in this study improves word identification. The basic premise is that instruction that promotes facility in word identification is crucial and that having children spell words in word families improves early word recognition. Instruction that facilitates phonemic awareness and alphabetical coding is vitally important to success in reading (Adams, 1990; Vellutino, 1991). But word identification and spelling are only part of what reading involves. Word identification is necessary but not sufficient for comprehension, and this study does not deal with comprehension. Comprehension is obviously the main purpose of reading and its importance cannot be over-emphasized. To promote comprehension the use of whole-language based activities in teaching

reading, such as the use of context for monitoring and predictive purposes, vocabulary building, or integration of concepts are essential (Adams, 1990; Vellutino, 1991).

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Memorial
University of Newfoundland

Faculty of Education
Graduate Programmes & Research

Appendix A

Dear Parent/Guardian:

I am a Graduate Student in the Faculty of Education at Memorial University. I will be working with children at St. John Bosco School to investigate how memory affects the ability to learn how to read. I am requesting permission for your child to take part in this study.

Your child's participation will consist of completing vocabulary, word retrieval, and short-term memory tasks as well as an achievement test. I will meet with your child during four occasions. During the first day I will spend approximately one hour with him/her and complete an achievement test, a vocabulary test and tests of word retrieval and short-term memory. On day two and day three your child will be taught to read sixteen target words embedded in sentences. On day four, the final day of the experiment, your child will be tested for recall/spelling of the words taught as well as ability to recognize new words. Your child will be asked to participate and it will be made clear that he/she can discontinue at any time. Children usually enjoy participating in such activities.

All information gathered in this study is strictly confidential and at no time will individuals be identified. I am interested in the factors that affect reading performance. Participation is voluntary and you may withdraw your child at any time. This study has been approved by the Faculty of Education's Ethics Review Committee. The results of my research will be made available to you upon request.

If you are in agreement with having your child participate in this study, please sign on the opposite side of this sheet and return this copy to the classroom teacher. The other copy is for you. If you have any questions please do not hesitate to contact me at 722-8355, or Dr. Catherine Penney at 737-7687. If at any time you wish to speak with a resource person not associated with the study, please contact Dr. Linda Philips, Associate Dean, Research and Development.

I would appreciate if you would return this sheet to your child's homeroom teacher by Monday, May 12.

Thank you for your consideration of this request.

Sincerely,

Peggy Hann

St. John's, NF, Canada A1B 3X8 • Tel.: (709) 737-8587/3407 • Fax: (709) 737-4379

Consent Form

I, _____ hereby give permission for my child
(Name of Parent/Guardian)

_____ to take part in the reading study at St. John Bosco
(Child's Name)

School being undertaken by Peggy Hann. I understand that participation is entirely voluntary and that my child and/or I can withdraw permission at any time. All information is strictly confidential and no individual will be identified.

_____ _____
Date *Parent's/Guardian's Signature*

Please complete the following information about your child.

_____
Child's Full Name

_____
Child's Date of Birth

Mailing address: _____

_____

_____

Telephone number: _____

Appendix B

Rosner Auditory Analysis Instructions

Now we are going to play a game of removing sounds from words. I'm going to say a word and then tell you to take part of the sound off and say what's left. Here is how it will work. Say "COWBOY." (***Wait for response.)*** Now say "COWBOY" again but without the "BOY" sound. Say "TOOTHBRUSH." Now say "TOOTHBRUSH" again, but without the tooth sound.

If the child fails either of the two practice items, attempt to teach the task by giving the correct response, explaining why it is correct, and re-presenting the item. If either item is failed again, discontinue testing and score the test zero. If the items are answered correctly, then proceed. Testing for all subjects ends after FIVE consecutive errors. Present the remainder of the items in the same way. (E.g. Say "MAN." Now say "MAN" without the /m/ sound.)

Practice Problems

	Response	**Score 1, 0**
cow(boy)	_____	_____
(tooth)brush	_____	_____
(s)at	_____	_____

Score 1 for correct response; Score 0 for incorrect response.

Appendix C

Rapid Automatized Naming Task

Instructions

Read the instructions in *italics* exactly as written.

You are going to name some letters and some numbers aloud and I am going to see how long it takes. Try to speak clearly and quickly. Do not speak so fast that I cannot understand you. If you make a mistake, say the correct answer right away. There are three different pages. The first page is all numbers, the second page is all letters, and on the third page numbers and letters are all mixed up. Read across the page like this **(direct the child across the page).** ***When I say go, you start reading the numbers or letters out loud. Okay, Ready, Set, GO!!*** **(Start timing. Stop timing when the child finishes the last item on each page. Note the time.)**

7 8 6 2 1

6 3 8 1 6

5 1 5 0 2

4 5 3 4 9

P L G E N

U D C B Z

G A D L Y

H T B J H

B 1 M X F

5 J A P K

H 8 G K 3

5 Y B M D

Name:_____
Date of Birth:_____
Age:_____
Date of Testing:_____

Rapid Automatized Naming Score Sheet

Page 1 - Numbers		Page 2 - Letters		Page 3 - Mixed	
Response	**0 or 1**	**Response**	**0 or 1**	**Response**	**0 or 1**
7		P		B	
8		L		1	
6		G		M	
2		E		X	
1		N		F	
6		U		5	
3		D		J	
8		C		A	
1		B		P	
6		Z		K	
5		G		H	
1		A		8	
5		D		G	
0		L		K	
2		Y		3	
4		H		5	
5		T		Y	
3		B		B	
4		J		M	
9		H		D	

Numbers
No. of Errors:____
Time: ____ sec

Letters
No. of Errors: ____
Time: ____ sec

Mixed
No. of Errors: ____
Time: ____ sec

TOTAL NO. OF ERRORS: _____
TOTAL TIME: _____ sec

Appendix D

Pretest of Wordlist Instructions

"I want to see how many of these words you can read. Please begin here and read each word out loud as carefully as you can. When you come to a hard word, do the best you can. If you can't read it, say 'skip' and go on to the next one. Read down the page like this (*point down the page*)."

Appendix E

List of Target words, Transfer Words, and Incidental Words

These words were mixed up and subjects were required to say them out loud as they read vertically down a list.

Target words	Transfer Words	Incidental Words
sad		boy
dad		dog
mad	lad*	girl
bad	glad*	Garfield
		has
		is
pet		
get		
net	set*	
wet	met*	
fan		
man		
ran	tan*	
pan	plan*	
cat		
mat		
hat	bat*	
fat	sat*	

*** these words were not taught but were tested for transfer**

Incidental words are words that appeared in the sentences, but were not explicitly taught.

Appendix F

The boy is sad.

sad	**s a d**	**dad**	**d a d**
mad	**m a d**	**bad**	**b a d**
dad	**d a d**	**mad**	**m a d**

The boy is sad.

sad	**s a d**	**bad**	**b a d**
dad	**d a d**	**mad**	**m a d**
bad	**b a d**	**sad**	**s a d**

The boy is sad.

Appendix G

Spelling-drill Group	Sentence-practice Group
Each target word was drilled three times and spelled three times. After the target words were drilled, the subject was asked to write it out. 1. ad The boy is sad. The boy is sad. The boy is sad. sad , sad , sad; s a d, s a d, s a d dad, dad, dad; d a d, d a d, d a d mad, mad, mad; m a d, m a d, m a d bad, bad, bad; b a d, b a d, b a d 2. et A dog is a pet. A dog is a pet. A dog is a pet. pet, pet, pet; p e t, p e t, p e t get, get, get: g e t, g e t, g e t net, net, net; n e t; n e t, n e t wet, wet, wet: w e t, w e t, w e t 3. an The girl has a fan. The girl has a fan. The girl has a fan. fan, fan, fan; f a n, f a n, f a n man, man, man; m a n, m a n, m a n ran, ran, ran; r a n, r a n, r a n pan, pan, pan; p a n, p a n, p a n 4. at Garfield is a cat. Garfield is a cat. Garfield is a cat. cat, cat, cat; c a t, c a t, c a t mat, mat, mat; m a t, m a t, m a t hat, hat, hat; h a t, h a t, h a t fat, fat, fat; f a t, f a t, f a t	Each target word was presented the same number of times as in the Spelling-drill Group. However, they were within a sentence and each sentence was presented separately three times. The target word was pointed out in the sentence and the subject was required to write it out. 1. ad The boy is sad. The boy is sad. The boy is sad. Dad has a dog. Dad has a dog. Dad has a dog. The boy is mad. The boy is mad. The boy is mad. Garfield is bad. Garfield is bad. Garfield is bad. 2. et A dog is a pet. A dog is a pet. A dog is a pet. Get a dog. Get a dog. Get a dog. The girl has a net. The girl has a net. The girl has a net. Garfield is wet. Garfield is wet. Garfield is wet. 3. an The girl has a fan. The girl has a fan. The girl has a fan. The man has Garfield. The man has Garfield. The man has Garfield. A dog ran. A dog ran. A dog ran. The boy has a pan. The boy has a pan. The boy has a pan. 4. at Garfield is a cat. Garfield is a cat. Garfield is a cat. A dog is on the mat. A dog is on the mat. A dog is on the mat. The girl has a hat. The girl has a hat. The girl has a hat. The boy is fat. The boy is fat. The boy is fat.