AN INVESTIGATION OF THE COGNITIVE, ENVIRONMENTAL AND PERSONAL DIFFERENCES IN THE READING PERFORMANCE OF PRESCHOOL CHILDREN

Dissertation

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CHAPTER I
INTRODUCTION

Background of the Study

Importance of Reading

Written language is the "currency of civilization" wrote Huey in 1908. Before industrialization, citizens could live adequately while remaining illiterate. But, with social changes such as factory jobs, automobiles and the privilege of voting, words on paper became an essential part of existence. Every citizen from farmer to cabdriver found it necessary to be able to read and write. "Printed matter has been so diffused, and all that we do is so concerned with it, that a very considerable proportion of most people's waking time is taken up with the contemplation of reading symbols." (Huey, 1908). The right to read in our technological society became equated with the other basic human necessities.
With the invention of printing and the enforcement of compulsory school attendance laws, the comprehension of printed media came within the possible reach of every citizen. It was reading that gained the limelight as the first of the three R's. Understandably, it was reading that became, "The most important subject in our early American schools and it has continued to be the most important subject all through the years of our national growth" (Smith, 1965). It is not surprising, then to find research in reading suddenly blossoming with the emergence of the scientific movement in education.

Importance of a Positive Approach in Research

Before Thorndike (1910) published the handwriting scales, only 34 studies concerned with reading were to be found. With the application of measuring devices to the reading field, over 200 reading studies appeared within ten years (Gray, 1960). Of prime concern is not so much the quantity, though that is certainly significant, but the types of research interests being manifested.
Early researchers, before 1925, attempted "to understand the process of reading" (Gibson and Levin, 1975), focusing on "what we do when we read" thus trying to "...unravel the tangled story of the most remarkable specific performance that civilization has learned in all of its history" (Huey, 1908). With the advent of standardized tests, the focus shifted from understanding the process—or what was happening—to measuring the product—or what had happened. Tangential efforts took researchers into mazes of no return, testing children who learned by phonic approaches and comparing them with those who learned by whole word approaches, testing a silent reading approach against an oral one, even delineating several hundred types of comprehension (Simons, 1971).

Then within a period of seven years, Chomsky published Syntactic Structures (1957), Berko presented her study of the acquisition of children's linguistic structures (1958), and Flavell translated the work being done by the Geneva School (1963). Each presented a fresh insight into the linguistic and cognitive growth processes. Reading research
appears to have "shifted gears". The basic cognitive processes of which reading is one manifestation once again is being examined.

Research on Beginning Reading

When standardized reading tests pointed to the fact that many students had not learned to read adequately, research attention focused on remedial aspects, seeking answers to such questions as, "Why is the student not learning?" One answer provided was that children were not properly prepared before being introduced to reading. Thus was born the concept of reading readiness. Tests were developed to measure this readiness toward reading with the goal of attempting to predict success in initial formal teaching. Such tests focused on the components of the reading act such as discriminating auditory and visual stimuli, following directions, coordinating visual and motor skills, blending sounds, vocabulary, and distinguishing phonemes. These entities were considered to be among the sub-skills essential for success in reading (Farr and Anastasiow, 1969). Such delineations of the underlying components of the reading act informed but
but did not satisfy. The parts never exactly added up to the whole.

With fresh input afforded by the cognitive and linguistic theorists, reading researchers could ask a different type of question: "How are children acquiring the ability to read?" Thus research in beginning reading could shift from the investigation of children who had not learned to read to the study of children who do read. More specifically, one major area of inquiry is an attempt to understand the child who not only reads, but who does so before formal training, with the hope of determining how and why such growth came about.

Studies of Early Readers

Educators were shocked in the early '60's when Dolores Durkin demonstrated beyond a doubt that not only could preschoolers learn to read, but that the number who did so on their own was noteworthy. After proving that this was so in Oakland, California, she reiterated the facts in a similar research effort in New York City. The primary purpose of both studies was to find how many children actually learned to read before entering
school, what effect that early reading had on later reading achievement, and what factors promoted early reading.

Each of Durkin's studies involved a large school district, random sampling, and matching for control. The first surveyed all children (more than 5,000) entering the first grade in Oakland, California. A total of forty-nine were identified as readers and were given a battery of tests. The second research effort was conducted in New York City, where testing initially encompassed over 4,000 students, with 156 early readers emerging. From this corpus, thirty children were randomly selected and matched for control on three variables. The predictors that were examined included questions from a home interview, a teacher rating scale, the Bender-Gestalt, Minnesota Tests of Creative Thinking, and intelligence as measured by the Revised Stanford Binet.

Both Durkin studies were unique in that they were longitudinal, conducted primarily to examine the long-range scholastic value of early reading. Results presented shocking conclusions: early
readers need not have above average intelligence, and may have parents who were foreign born. It was also determined that the educational level of each parent may be important, as may be the size of the family, the relationship of siblings, the hours spent watching TV, the type of activities the child engages in, the quality of the home reading experience, and the parent's confidence in their ability to teach their child to read.

While Durkin's two studies gave educators their first wholesale validation that children can and do learn to read before entering school, these studies only point to possible factors which may help determine why the early reader could and did learn to read. The standardized procedures to measure cognitive level of functioning according to Piagetian theory and assimilation of print exposure from the environment were not available at the time of her research.

Another large-scale, longitudinal study which may be compared to the Durkin studies is that reported by Briggs and Elkind (1973) as being in progress. This endeavor encompassed two
successive one-year pilot projects and a final three- to six-year longitudinal study, begun in the fall of 1973. These researchers focused on the cognitive, perceptual, social and personality trait differences between children who read early and those who do not, seeking also to determine if there are differences between those who learned on their own and those who were taught.

What appears to have emerged from the Briggs/Elkind pilot studies is the existence of an "operativity" factor primarily composed of conservation scores and a reflection-impulsivity accuracy score. Also reported was a "perceptual integration" factor composed of the decentralization measure and selected responses on the Rorschach Inkblot Test. While the first pilot study contained only sixteen early readers and their controls, the second included approximately 40 with matched controls and the final longitudinal study was planned for 50 pairs of children. As of spring, 1977, the results of this final work had not been published.

In the Briggs/Elkind final study, changes in procedure were to include a substitution of the
verbal sub test from the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) for the Peabody Picture Vocabulary Test. It was also planned that six items from the Goldschmidt-Bentler Concept Assessment Kit-Conservation would be included along with 24 miscellaneous tests.

The results of such a research effort, when finally reported, will indeed be a milestone for early reading. The stated intention of matching 50 controls more closely using verbal IQ, age, sex, and socio-economic level is commendable, as is the size of the sample involved. Yet, one is reminded of Durkin's (1974) conclusion that, "What six years of research with the same subjects pointed up is that it is ludicrous to think that a researcher can 'match' groups of humans.... the concept of 'control' [is] untenable...."

While the Briggs/Elkind studies are of extreme interest, when completed many questions will still remain unanswered. For example, the findings will not speak to differences between early readers and non-early readers on the concrete operational (Piagetian) measures of conservation of
area and length. They will not objectively answer such questions as, "What is the difference in the quality and quantity of literary experience between early readers as compared to non-early readers?"

The new study will not adequately depict the part played by the child's personal initiative. While Durkin's Screening Test and MacGinitie's vocabulary and comprehension tests may be highly reliable, the resulting raw scores will lack the wide range needed for true measurement of the continuum non-reader to proficient reader.

A research investigation was conducted by Moira McKenzie (1974) at The Ohio State University investigating the thinking processes of 21 first and second graders some of whom were early readers, some non-early readers. The students were matched on mental ability by means of the Slosson Intelligence Test (SIT) and determined to be readers by administration of the Slosson Oral Reading Test. Other instruments employed included "Sands" for concepts of print, measures of Class Inclusion and Logical Addition for concrete operationality, the miscue analysis for a quantification of process, a
phonological study for linguistic development, and informal questions asked of the children to probe their thinking processes.

Though the McKinzie study attempted to compare readers and non-readers on dimensions not previously probed, the small groups of seven, the relative inadequacy of the SIT, and the lack of a standardized wide-range reading achievement measure make directional implications untenable.

Shirley Ruth Rauscher (1970) investigated the relationship of Piaget's theory of operational thinking to reading ability in kindergarten and first grade. She compared the test of cognitive level with the New York City Prereading Assessment Test (NYCPA) as predictors of end-of-year reading achievement. The NYCPA included vocabulary and visual discrimination subtests. A random selection of 16 classrooms produced the sample. Piagetian tests, being individual, were administered over a period of two months. No attempt was made to measure or compare other intelligence factors. She found that the Piagetian Measures had a "high correlation" (.30 and .39)
with end-of-year reading achievement on the Gates MacGinitie subtests, but were not a better predictor than the NYCPA.

At the 1977 International Reading Association Miami Beach Convention, DeYoung and Waller of the University of Waterloo presented results from their study of the relationship between Piagetian operative competence and early reading. By matching the age, sex, and IQ (PPVT) of ten nonreaders with readers from both kindergarten and first grade samples, and testing the subjects with a battery of Piagetian, pre-reading and reading tasks, they concluded that there was strong evidence for the support of the belief that operative competence is related to reading achievement. Conservation and seriation were found to be the best predictors.

While DeYoung and Waller divided readers from nonreaders on a measure of silent sentence comprehension, they used as their criterion "pre-reading" a subtest from the Metropolitan Achievement Test (MAT). Their forty subjects were, therefore, compared only on being able to indicate alphabet
when given a verbal stimulus and the ability to choose which word of four matched a picture.

Piagetian operative competence was evaluated, not with one of the available standardized tests, but by use of materials constructed by the researchers. Still, reliability for the conservation measures was high (.92). These tasks included equality and inequality of number, substance, length, area, internal volume, displaced volume, and transformed volume. Not included were evaluations of the child’s conservation in the areas of weight, continuous quantity, discontinuous quantity, or two dimensional space.

Raw scores were used as data on Piagetian subtests, while standardized scores were used for both the MAT and PPVT. Analysis of the data included Pearson correlations, multiple regression analysis, a multivariate and a univariate analysis of variance, canonical correlations, and follow-up analysis of separate Piagetian subtests.

While the quality of the DeYoung/Waller research is indisputable, many questions remain. Are visual discrimination and word identification
sufficient for determining reading subskills? Would a greater variety of conservation tasks have added to test efficiency? Might it be better, as Durkin (1974) suggests to use raw scores for both conservation and reading measures? Are ten subjects per group enough from which valid conclusions may be drawn?

If it is reasonable to assume that the ability to learn to read requires some level of cognitive maturity coupled with an active interaction with environmental experiences, it would appear that adequate measures of all variables might differentiate between the child who becomes an early reader and the one who does not. No previous study has satisfactorily sampled the cognitive structures present within the child along with the environmental components needed to allow reading to occur spontaneously.

Statement of the Problem

The ability to read, in an industrialized society is essential to satisfactory existence. The scientific movement afforded educators means with
which to measure the level of reading attainment but became "bogged down" when the product being measured proved ineffective for predictive purposes. Recent advances in the allied fields of psychology and psycholinguistics allow alternative approaches to the study of reading acquisition.

Interest in beginning reading originally focused upon negative results, studying what those children lacked who had not learned to read adequately. Current research efforts are attempting to approach the question positively, asking how a child who is learning to read is accomplishing the task. The Durkin studies demonstrated that at least some children could read at early ages, even before entering the formal school environment. Yet, her studies, as with each of the others cited, failed to adequately account for the quality of the print experiences which the child assimilated from the environment. While Briggs and Elkind, DeYoung and Waller, McKenzie, and Rauscher used the findings of recent research efforts concerning a different type of cognitive measure, Piagetian tests, each failed to assess the full effects of environmental exposure.
An investigation was needed that quantifies cognitive functioning from both a traditional psychometric and a Piagetian frame-work, that includes concomitant measures of the amount and types of environmental assimilation, and adequately determines the stage of reading maturity through the use of a wide-range standardized reading instrument.

Purpose of the Study

The purpose of this study was to examine the relationship of selected cognitive, environmental, and personal factors to the ability to read before first grade entry.

The cognitive measures chosen included both intellectual structure and content. Selected were traditional psychometric intelligence test, a Piagetian test of concrete operativity, an inventory of knowledge about children's literature, and a measure of the types of assimilated reading concepts.

The child's initiative in approaching reading was tapped by means of a questionnaire completed by the parents concerning whether the child asked
for help and whether books and magazines were freely chosen for personal use. Sex and age were two other personal variables considered.

The environmental components chosen for this research included socioeconomic variables believed to have an influence on reading acquisition and television viewing practices.

Hypotheses

1. The measures of cognitive attainment (Verbal IQ, Conservation, Taking Inventory of Children's Literary Background, Concepts About Print) are not significantly related to the total reading score or to the part scores.

2. The measures reported by the parent of the child's initiative in reading and writing (Attempts to Spell, Asks Help in Spelling, Attempts to Write Words, Time Reading Children's Magazines, Time Child Looks at Books, Books from Library by/for Child) are not significantly related to the total reading score or to the part scores.

3. The measures of television viewing (Time Watching TV, Time Watching Sesame Street, Time
Watching Electric Company are not significantly related to the total reading score or to the part scores.

4. The socioeconomic variables (Father's Education, Father's Occupation, Mother's Education, Time Father Reads to Child, Time Mother Reads to Child, Magazines in the Home, Books in the Home) are not significantly related to the total reading score or to the part scores.

5. The personal variables (Sex and Age) are not significantly related to the total reading score or to the part scores.

Definition of Terms

Conservation -- The cognitive ability to retain the amount or quantity of a structure though it changes perceptually. To conserve implies the ability on the part of the perceiver to construct an internal regulatory system which compensates for perceived change.

Pre-operational -- A stage of cognitive development as presented by Piaget which follows the sensori-motor period and precedes the concrete
operation period, generally existing from age two to seven. It is a period when perceptions tend to be centered, characterized by the inability to attend to transformations. Thought during this stage lacks reversibility. Beginning with simple object concepts, the child develops toward the ability to conserve, to understand causality, time, and space.

Concrete Operations - A stage of cognitive development as described by Piaget which follows the pre-operational period at about the age seven and extends to age eleven. The child evidences a mental organization capable of adding, multiplying, arranging objects and establishing correspondence. This is done with concrete rather than abstract materials. The ability to solve conservation problems marks the child's entry into the concrete operations stage.

Scope and Limitations of the Study

Only the shift, from pre-operational to concrete operational thinking, in the cognitive maturational processes as described by Piaget, was examined. Only the verbal portion of the WPPSI was administered for the determination of verbal intelligence.
Reading ability was explored using a standardized, individually administered test, with no attempt being made to analyze the types of miscues. No distinction was made between readers who used a whole word or phonic approach or readers who could manage the print orally but not silently.

The children who comprised the sample were not randomly selected, but were chosen because of availability in day care centers during the summer of 1976 and because of the willingness of a parent to both complete a questionnaire and sign a permission form for testing. Because of these narrowing factors, the sample may not represent the entire population of preschoolers. Furthermore, since the sample was gathered from day care centers, all subjects had working mothers. No attempt was made to determine the present or past marital status of the home.

Other variables such as a child’s personality, cognitive style, and stage of linguistic development, which may affect the ability to read early, were not explored.
Summary

Attention is being focused again on the cognitive and environmental components affecting the learning to read process. One major impetus for this change has been the advancement of Piagetian cognitive theory, which emphasizes the quality of children's reasoning rather than the quantity. With this added framework within which to describe how intelligence functions, the process of learning to read could take on new dimensions. The present investigation uses both the insights derived from Piagetian theory and a newly developed form of the traditional intelligence test while examining the interacting effects of selected environmental measures on the attainment of early reading.

Overview of the Study

Chapter I presented the background and need for the study including a statement of the problem and purpose.

Chapter II will present a review of the literature pertinent to this study.

Chapter III will describe the procedures used in this study, including the subjects, the variables considered, and the tests administered.
Chapter IV will present the results of this research along with a discussion of the findings.

Chapter V will provide a summary, conclusions, and interpretations based upon the study. Recommendations for further research are also presented.
CHAPTER II

RELATED LITERATURE

Introduction

For fifty years, investigators have concerned themselves with beginning reading with the hope of determining exactly what could be taught a child or what experiences could be made available that would allow for success in the first reading attempts. One approach has been to examine the act of reading to determine the skills seemingly required and then to establish the presence or absence of those skills within each prereader. A second approach has been to compare, at the end of one or more years of schooling, those children who successfully learned to read with those who did not to determine the components essential to reading success. Both approaches have produced taxonomic lists of subskills.

Other researchers approached the "ready-to-read" question from an environmental viewpoint asking, "What experience can we provide this child that will affect his readiness to read?" Still others have asked, "How can we determine when a child has enough 'ripened' components to allow him to be successful in reading?" All four
approaches to early reading research have repeatedly produced comparable results: lists of prerequisite skills. As Gibson and Levin (1975) remark, "Something is missing in these analyses. They do not as presented, reach toward adaptive cognitive strategies of extraction of higher-order structure or the development of independent analysis and organization" (p. 260).

If reading is considered an act of communication, in this case through visual stimulus, a different kind of question is appropriate. Instead of focusing on what the eye sees, research must dwell on what the mind does with what it sees. Goodman (1970) has hypothesized that reading communication takes place through a cue-sampling process. The reader selects relevant surface information, processes it through his own previously developed base structure and thus attaches meaning. A study of reading, then, necessitates a close look at the cognitive structures present within the child. Those structures are the framework through which a child processes this communication. That framework has been affected by environmental input.
Therefore this present research into early reading has explored both cognition and environment and this review of related investigations has focused on these two major aspects.

The literature is organized into the following sections:

1) Research inquiries probing the relationship between cognition and reading from both the traditional psychometric viewpoint and the more recent Piagetian stance.

2) Investigations which have attempted to demonstrate relationships between environmental factors and success in beginning reading.

Many research efforts have overlapped both areas. While both the traditional and Piagetian framework attempt to measure the fluid, genetically determined, basic abilities, each is considered unique for purposes of this review.

Research Relating Reading and Cognition

At present, there exist two basic approaches to the measurement of mental development: one a
psychometric, the other a criterion referenced assessment (Meyers, 1972).

In the psychometric approach, items have been "placed in an order of difficulty not because they are inherently more complex or inclusive or abstract, but because they are empirically determined to be failed or passed by particular proportions of people" (Meyers, 1972a, p. 5). On the other hand, tests based on Piagetian theory require functioning rather than simple knowing. They appear to be based on process rather than knowledge. They investigate the organizational structure that underlies performance. Both Piagetian and traditional psychometric approaches to the measurement of mental development appear worthy of investigation as predictors of early reading.

Since both are tests of cognitive maturity, it is appropriate to ask if they measure the same thing. While research which includes both does indicate a positive relationship, the correlation between the two, at the preschool and first grade levels which is the focus of the present study,
ranges from .19 (Hathaway, 1972b) using the Verbal subtest of the Wechsler Intelligence Scale for Children (WISC) to .55 (Elkind, 1961) using the picture arrangement subtest. It is not surprising, then to find that factor analyses show, "...the two types of measures are neither totally distinct nor totally identical" (Hathaway, 1972a, p. 40).

Walter Hathaway (1972a) studied the degree, nature and stability over grades 1 and 2 of the relationship between traditional psychometric and Piagetian measures of mental development. The information collected from 104 middle class children was factor analyzed and found to produce three primary mental abilities. While both types of tests contributed to the first factor, "general-psychometric and verbally-mediated intelligence", the first factor was largely defined by the traditional IQ test. A second unique factor was "Piagetian-operational intelligence" while a third factor was overwhelmingly associated with school performance. Hathaway reported (1972b) that these two cognitive measures correlated .51 and .52 at kindergarten and first grade when the WISC verbal subtest was
employed and decreased to .40 and .48 when the Lorge-Thorndike (L-T) was administered.

Comparable findings emerged for both Kaufman (1971) and Meyers (1972b). Kaufman factor analyzed a test battery of L-T, Gessell School Readiness, and the Piagetian measures of conservation, class inclusion, logic and geometric problems. Each type of instrument loaded onto separate factors. Yet Kaufman concluded that any of the three was about as good a measure of what was common to them all, while each retained some specificity. Meyers, in testing 5 1/2 year olds on conservation, WPPSI, Raven Progressive Matrices, and Illinois Test of Psycholinguistic Ability (ITPA), found that some tasks loaded on factors containing the other tests but that "there was a high degree of specificity for the Piagetian tasks in relationship to the various psychometric instruments" (p. 200).

**Intelligence and Early Reading**

The educational literature of the 1920's and early 1930's revealed the growing concern about the large number of elementary children who were not
learning to read and particularly the appalling number of children who were failing the first grade (Smith, 1964). If some had not learned to read while others had, under the same instruction, then the fault must be within the child. He must not have been ready. Since the hypothesis of "neural ripening" pervaded American thought during the first half of the century, it was logical to assume that at some set point in maturational development, reading could successfully take place. It was logical to turn for quantification of such a stage to the newly developed tests measuring mental growth. Perhaps mental age was the "magic number" - the point at which a child was "ripe enough" to read.

Grace Arthur (1925) reported the progress in reading of 171 first grade pupils who were grouped according to mental age. The scores on end-of-year tests indicated that not only was MA a very important factor but a .5 MA appeared necessary for first grade achievement. Then, when Morphett and Washburne concluded (1931) that teachers could decrease reading failures and increase teaching efficiency by waiting to instruct in reading until
the student reached a mental level of 6.5, as measured by the Detroit First-Grade Intelligence Tests, the case appeared closed. In reality, Morphett and Washburne had only stated that, by following the practice of postponing reading until the MA equaled 6.5, 78 percent might be expected to make satisfactory progress.

For 30 years educators promulgated their false assumption. Then in May of 1959 Durkin began publishing intelligence data on children who were reading before entry into first grade. In the Oakland, California study she found children reading with IQ's as low as 91 while in the New York City study a low of 82 was reported for early readers. The icon IQ was shattered as the sole indicator of readiness to read.

William Gray (1960) in summarizing the results of numerous studies in the intelligence-predicts-reading question, concluded that there was a "clear evidence of a positive correlation between progress in reading ability and mental capacity," but that, "there are factors other than intelligence that influence progress in reading". Helen Robinson
(1955) had stated that either there were other factors influencing reading success or else, "our current intelligence tests are not valid" (p. 263). This was upheld by Pikulski (1974) in a review of frequently employed assessment measures of reading readiness. After citing the recent studies which employed the Peabody Picture Vocabulary Test (PPVT), Stanford-Binet Intelligence Test (S-B), and the WPPSI, he concluded that intelligence test results can predict later reading achievement but are generally no better than other measures of readiness.

Relationship increases. Durkin (1966a) reported that, though the relationship of intelligence to progress in reading at the beginning of first grade was .40, by the end of the second year of school the correlation had grown to .80. Her New York study began with a correlation of .24 for the 156 early readers and increased to .52 by the end of second grade. She pointed out that this correlation between IQ and reading in all instances increased with time in school. This increase had been substantiated by Gates (1921); Bond and Wagner (1960), and cross-culturally by Thorndike (1973b).
Verbal measures preferred. If reading is a cognitive act, corresponding to thinking, it would appear that verbal indices, rather than performance, might more aptly tap that portion of intellectual functioning required. Gray (1960) and Harris (1970) indicated that verbal portions of IQ tests repeatedly produced higher correlations with reading progress than nonverbal. Strang (1943) documents a "striking" difference when the California Test of Mental Maturity is used. She concludes, "Apparently, the language part of the intelligence test measures one kind of mental ability and the non-language another type. There is some indication that the language type of test may be the better measure of basic mental ability" (p. 356). Robert Thornkide (1973a) states:

It has been suggested here that performance on a wide variety of reading tasks calls primarily for some one common ability; that this ability can be distinguished only with difficulty from that represented in general measures of verbal intelligence or scholastic aptitude, and may be thought of as verbal reasoning....(p. 146)

In fact, such a close connection is seen between reading and speaking that some authorities have
concluded that most children are able to learn to read in their fourth year assuming that "there is little difference between learning, as it were 'to read' spoken words and learning to read printed words" (Gates, 1954, p. 334). The reason given for this not occurring is that parents speak instead of writing.

Conservation and Early Reading

Defining conservation. Jean Piaget's theory of the developmental growth of intelligence states that every child passes sequentially through four stages in his growth toward cognitive maturity: a sensorimotor period generally found from birth to age two, a preoperational period encompassing the second to seventh years of life, a concrete operational period usually found within the seventh to eleventh years of age, and a formal operations period found between ages 11 and 15.

Progression from one stage to the next is dependent on the interaction of experience, social learning, maturation, and equilibration (an internal process aimed at cognitive balance which allows stimuli to be assimilated). Experience and social learning are principally environmental, while maturation and equilibration are more of genetic origin.
In the preoperational stage, the child's thinking is dominated by intuition. He is unable to trust his thought processes if they disagree with his perceptions. Thus, when presented with two identical glasses of water, the equivalence of the amounts in each container is agreed upon, the preoperational child will watch one glass being poured into a different sized container and state that one container has more. A child who has attained the concrete operational stage will state that the glasses still contain the same amount of water and will explain why, thus demonstrating: He can view the events as a series of states (transformations); He is no longer centering on one perceptual aspect (centration); and He is able to mentally reverse the process to its original form (reversibility).

According to Wadsworth, "Conservation is the conceptualization (schematization) that the amount or quantity of a matter stays the same regardless of any changes in shape or position" (1972, p. 76).

Characteristics of conservation tasks. Phillips (1974, p. 13) has presented four criteria for a conservation task:
1. There is an invariant factor which is held constant throughout the task.

2. A subject-established equivalence is elicited on the invariant factor.

3. There is an observable change of the task equipment, but no change in the invariant factor.

4. The correct answer is obtained only by logical reasoning: arguments based either on identity or one of two forms of reversibility (negation and reciprocity).

Cross-cultural validation of conservation.

Bentler (1972) reported on the development of conservation in children between the ages of 4 and 8 in six different cultures: Australia, Great Britain, Holland, New Zealand, Poland, and Uganda. Using the Conservation Assessment Kit (CAK) and at least 250 children from each country (25 boys and 25 girls at each age 4 to 8) he found reliability at each age and sex level ranged from .85 in Uganda to .90 in both Australia and New Zealand. The internal consistency was acceptable at all ages, across both sexes for all countries, being .91 for 5 year olds and .89 for 6 year olds. Correlations between
behavior and explanation scores were .77 and .79 for the same two age groups indicating a measurement of the same construct. Thus Bentler concluded that the CAK was an instrument which reliably indicates conservation attainment across cultures.

Relating conservation to reading ability. Though Piaget has not specifically discussed the print reading process as it might be related to his stages of cognitive maturation, scholars have hypothesized a relationship between the emergence of the ability to conserve and that of being ready to learn to read. Attempts have been made to verify their concomitant development and to establish or refute an hypothesis that the development of a conservation thinking process is a prerequisite state to being able to learn to read.

Cannon (1973) proposed a description of the print reading process based on Piagetian concepts of mental functioning. He contended that directed thinking is an integral part of reading and that language is the most common means used to direct thinking. The ability to read develops genetically
from mental operations associated with spoken language and develops in the same manner as spoken language.

The first report this researcher could find suggesting a connection between conservation and reading was the conclusion reached by Almy (1966) that there was a, "substantial correlation between performance in conservation tasks and progress in beginning reading" (p. 139). She further stated her belief that this indicated, "to some extent, similar abilities are involved." Her conclusion was a simple recommendation that a program to develop readiness for reading should include the nurturance of logical thinking. Beginning with this small suggestion great hypotheses have grown.

Elkind (1974) concluded that early readers are at a higher level of perceptual regulation and concrete operations. He stated, "it seems fair to say that learning to read probably involves at least three factors: the necessary regulational and operational abilities, social motivation...and a program of instruction" (p. 176). This conclusion is reached by reasoning that reading involves
perceptual activity, even that the initial stages of reading acquisition involve both perception and logical ability. Therefore, to learn to read must require the attainment of the maturational stage described as concrete operations.

Elkind bolsters his argument by using phonics as one example. The pairing of a phoneme with differing graphemes and a grapheme with differing phonemes is likened to Piaget's problems of logical multiplication. (Simpson, 1972; and Wanet, 1971, also present this example.) Another reason proposed is that the ability, in fluent reading, to predict words which grammatically are acceptable is a task of constructing spatial seriations. Further, he states that reading prefixes, suffixes, and tenses appears to be "schematization of part and whole" (p. 168).

Raven and Salzer (1971) propose that the "non-conserving child cannot handle altered circumstances very well" and thus:

He should not be expected to view a wide variety of events and then identify their common characteristics. In presenting the young reader with upper-and lower-case letters, different type faces, manuscript and cursive writing, variations
in the rendering of particular alphabet letters, and all of these in many different combinations and contexts, those responsible for initial reading instruction constantly expose children to transformed situations and expect them to isolate the single common attribute which is the key to solving the problem. (p. 635)

The same authors also state that, since classification becomes operational during the concrete stage, the pre-operational child will not be able to learn when rules and their application are required. Therefore, they conclude that the change in thinking style from near total dependence on perception to reliance on thought may be the mental growth needed for learning to read "and that its appearance constitutes 'readiness'" (p. 634).

A number of researchers have explored the relationship between conservation and early reading. Much of their work has attempted to establish the attainment of the ability to conserve as a predictor of end-of-first grade reading achievement (Rausher, 1970; Kaufman & Kaufman, 1972; Brekke & Williams, 1975). Other studies involved subjects from multiple grade levels, including kindergarten in determining the concurrent relationship of Piagetian conservation with attainment of reading skill (Dombrower & Marsh, 1972; DeYoung & Waller, 1977; Heatherly, 1972; DeVries, 1974; and McKenzie, 1974). Only the Briggs and Elkind (1973) and the DeYoung and Waller (1977) studies compared conservation and reading ability in preschoolers.
Conservation as a reading predictor. Rausher compared Piagetian measures with the New York City Prereading Assessment Test (NYCPA) as reading predictors of end-of-year Gates MacGinitie vocabulary and comprehension subtests. The sample consisted of a random selection of 85 kindergarten and first grade Negro children, half of whom were on free lunches. The multiple correlation coefficients, using both measures as predictors, ranged from .77 to .80 on the subtests of vocabulary and comprehension. This correlation was higher than when the NYCPA was used alone, yet the relationship between the two predictors, though positive, was "weak". Her conclusion was that "Piaget Measures, while not better predictors of reading than NYCPA in this study, had high correlations with reading achievement" (p. 6112).

Kaufman and Kaufman (1972) compared a Piagetian Battery (PB) with the Gesell School Readiness Tests (GSRT) as to predictability of end-of-first grade achievement. The Stanford Achievement Test (SAT) was the criterion for their 80 subjects from above average socioeconomic backgrounds.
Raw scores were not used for predictors or criterion. Nevertheless, a correlation of .58 between SAT and PB was found with a multiple correlation (PB and GSRT) attaining .68. Their conclusion was that even though the Gesell and Piagetian theories are supposedly quite disparate, "the differences in viewpoint may be of more semantic than practical interest" (p. 534).

To determine the extent that achievement on conservation tasks predicts the reading ability in first grade children, Brekke and Williams (1975) tested 72 students, ages 5-10 to 7-7, from four upper-midwest classrooms. The children were given, during the first month of school, Gates MacGinitie Reading Tests: Readiness Skills (GMRT), SRA Primary Mental Abilities Test (PMAT), and tests of conservation of number and substance. The criterion reading, administered eight months later, was Gates MacGinitie Reading Test: Primary A. Five tasks assessed conservation ability with conservers being those who succeeded on all five. Analysis, therefore, was binary coded as 1 or 0. Only 18 conservers were found.
Conservation correlated .521 with reading readiness and .279 (p<.05) and .351 (p<.01) with vocabulary and comprehension respectively. The researchers determined that a strong relationship existed between conservation, IQ, and reading readiness and that singly, and in combination, they were significant predictors of reading achievement. Nevertheless, Brekke and Williams concluded that "the relationship between conservation and reading achievement is not independent of reading readiness and intelligence" (p. 98).

Conservation correlates with reading. Dombrower and Marsh (1972) tested 60 students in Project Follow Through classes, 20 each from grades k, 1, and 2. All were from lower socioeconomic families, 53 black and 7 Mexican American. Using the Goldschmid-Bentler Concept Assessment Kit (CAK) Form A, they attempted to determine relationships between conservation and reading, with the Cooperative Primary Reading Tests as one of their criteria.

Conservers were so designated by a score of 4 or better on the CAK. (It must be noted that a
total score of 12 is possible on this form). Even with this low threshold only one in k, 7 in first grade, and 13 in second grade were found to conserve. The reading and conservation scores correlated .307 but did not reach significance. Therefore, Dombrower and Marsh concluded that no relationship was found for conservation and reading.

DeYoung and Waller (1977) investigated the relationship between Piagetian operative competence and the ability to read sentences. Their sample included 20 children each from kindergarten and first grade. Each grade level contained 10 readers and 10 nonreaders matched for age, sex and intelligence on the Peabody Picture Vocabulary Test. Researcher-made Piagetian-type tests encompassed conservation, seriation, classification, and perceptual decentering. Initial screening for reading/nonreading was carried out using a criterion of 80 percent accuracy on the Sentence Reading subtest of the Metropolitan Achievement Test Primer (MAT). Their results provide strong support for the conclusion that early readers score higher than non early readers on conservation.
DeYoung and Waller then investigated the extent to which operative competence related to the MAT subtests of Reading, Listening, and Numbers. Sentence reading no longer being considered, the criteria for reading became the alphabet and word matching subtests. Raw scores were used for Pearson correlations. Conservation was found to correlate with MAT "reading" at .36 (p < .05). Thus they concluded that "operative competence is related to prereading skills...and the best predictors are Seriation and Conservation" (p. 27). It must also be noted that two readers of 20 were judged not to be operational.

Anna Heatherly (1972) studied the attainment of conservation in relation to the ability to form hypotheses (reason logically) about the probable content of story material among first and second grade children. In doing so, she was attempting to relate reading performance to the developmental level of Piagetian cognitive structures. She explored hypothesis testing in the reading situation with such questions as "What do you think this story will be about?" and "How do you think the story will end?"
She tested for conservation by administering
Piagetian-type tasks of conservation of mass, liquid
class inclusion and number. Her 120 six to eight
year olds were evaluated using appropriate Gates
MacGinitie Vocabulary and Comprehension Reading
Tests.

Heatherly found the correlation between con-
servation and hypothesis testing to range from .18
to .41 and between conservation and reading to range
from .42 to .47 (p < .001). She reasoned thus: "If
meaning is to be the prime objective, that is, if
reading is to be synonymous with thinking, then the
results indicate that the attainment of conservation
is the necessary prerequisite for comprehension of
the story (p. 99).

One of the questions that DeVries (1974) sought
to answer was "To what extent do school achieve-
ment tests and Piaget-type tasks measure the same
knowledge" (p. 755). Using the MAT and 15
"Piaget-type" tasks (PTT) she tested 143 children
of varied intellectual abilities. Her high IQ and
average IQ subjects ranged in age from 5 to 7
years, while the low IQ subjects were 6 to 12 years
old but with mental ages of 5 to 7. Of the 15 PTT, four measured different types of conservation. MAT scores were obtained from school records and interpolated for the date of the PTT testing. No overlapping was found to exist between PTT and MAT scores indicating that, "school achievement is almost entirely unrelated to the development of reasoning on Piagetian tasks."

Moira McKenzie (1974) investigated children's concepts about language, their reading strategies, and operative level of attainment. Two groups of seven subjects were matched for C.A. and M.A. with one group containing precocious readers another non-readers. A third group was composed of older readers. All three groups of seven were matched for range of M.A. by use of the Slosson Intelligence Test. Reading was defined as being able to score at least a grade point of 2.0 on the Slosson Oral Reading Test. For Piagetian tasks, McKenzie administered Class Inclusion and Logical Addition. Finding that children in all three groups had simple inclusion and that some from each could complete the logical addition task, this researcher
concluded, "It was apparent from the data that ability to succeed in logical addition was neither sufficient nor necessary for ability to read" (p. 155).

Briggs and Elkind (1973) reported preliminary findings from a pilot study of 16 early readers who were matched with controls on the variables of age, sex, intelligence and socioeconomic level. Among 25 variables studied was conservation, using six individual tasks from the Goldschmid-Bentler kit. Though all mean differences from each sub-task and the total scores favored the readers, only two were significant at $p < .01$ and two at $p < .05$. The authors interpreted their results as providing support for an hypothesis that learning to read presupposed attainment of concrete operationality.

**Summary**

The research relating reading and cognition in preschoolers was made possible initially by the development of standardized testing measures and their movement into the educational domain. While early interest focused on the student who did not learn to read when given instruction, attention
sharply veered when Durkin exposed the fact that not only was it possible to learn to read at an early age, but that such an accomplishment can and does happen naturally.

In general, these studies indicated that intelligence tests are very low in predictive value at the preschool level, but tend to increase for each successive grade during the elementary years. Piagetian tests of cognitive maturity, when measuring conservation in preschoolers, is a better correlate of reading than the intelligence test, but is far from perfect. Comparisons between studies become extremely difficult as researchers employ many differing measures and frequently devise their own unstandardized assessment instruments.

Research Relating Reading and the Environment

The role of the environment in facilitating reading behaviors in the preschooler is of recent research interest. As long as it was considered best for children to learn to read "correctly" under the tutelage of a pedagogue, early readers were hidden, the environment that produced them being considered aberrant. With the revolution in
thinking brought about by the pioneering work of Durkin in the 1960's, emulation of those home environments which produced optimal conditions for reading began to appear. The question "Is it really possible for children to learn to read before school?" now having been answered, the next logical query appeared: "What brings it about?"

Before definitive research can begin, the corpus of variables must first be delineated. Then, those which appear to have the highest probability of a direct influence may be studied in greater depth. The search for variables is far from over. While Della-Piana (1968) has reviewed the contribution parents bring to reading achievement at all grade levels, this review has focused on what is known concerning the environmental contribution to preschool reading. The variables presently being considered are categorized as (1) variables generally associated with socioeconomic status and (2) variables of the child's own person: sex and personal initiative.

It is a well-established fact that reading achievement and social class intertwine. Gibson
and Levin (1975, p. 4) state that, "failures to read are distributed unevenly in the population, since the preponderance of failures occurs among poor children in urban schools." Miller (1970), investigating the effect of children's daily home schedules, reported that his lower-lower social class grouping performed least well on reading readiness and two first grade achievement tests. On the other hand, Entwistle (1971, p. 161) states, "We see proficient readers in those groups for whom reading has importance—middle-class and upper-class groups."

Chomsky (1972) observed that for the youngest of her group of children (age 6) many reading measures varied directly with socioeconomic level.

Finding that performance differences are related to social class helps only in a general way to increase knowledge of the variables that precipitate reading development (MacGinitie, 1975). What is left to be uncovered are the direct influences which underlie such broad indices.

**Mother's Role**

In Durkin's two studies, the direct role of the parents in effecting early reading surfaced. The
interview question, "Who was the most influential person in the early learning?" was answered Mother as the sole source by 19 of the 49 in California. The New York study produced a 93% similar response. As Durkin (1966b, p. 26) concluded, "none of the subjects learned to read early all by himself." "It is the mothers who are the key" (p. 138). Their help was the most common source of learning. What were those mothers like, and how did they affect their child's reading behavior? More of them were college graduates, as compared to mothers of non-early readers (see also Elkind, 1974). More of them read to their child. They provided an environment with available reading materials. They also appeared confident in the concept of their role as educator.

Durkin (1963) concluded that it was not just having books around, or being educated or even reading to the child. There was an interacting difference:

the reading done for the early readers was more often of a kind that could help a child learn to read. For instance, parents of early readers tended more often to
discuss pictures and to point out particular words as they read. According to these parents, their behavior was a response to questions the children asked, questions centering, at different times, on the identification of words, on word meanings, and on the spelling and the printing of words. (p. 147)

It was this difference that James Flood (1977) attempted to define in his study of parental styles while reading to children. By having the parents tape themselves while reading a selection to their own child at home, a number of distinctive interactive features were discerned and quantified. These were then correlated to the child's score on a prereading measure which included, among other measures, alphabet and word recognition. Indices which emerged as significant were (1) total number of words spoken by the child, (2) number of questions answered by the child, (3) warm-up questions asked by the parent, (4) post story evaluative questions and (5) positive reinforcement by the parent.

Why would reading to a child help him to become a reader? Lyons (1972) points out that the listening child has the opportunity for increasing his vocabulary, for developing sensitivity to
language, and for hearing a different register, since conversation language patterns differ from the printed forms. McCormick (1977) reviews the research on the effects of reading aloud to children, concluding that, "Research now provides evidence of the direct relationship between reading aloud to children and reading performance, language development, and the development of reading interests." This was further substantiated by Carol Chomsky's (1972) study of the linguistic competence of children 6 to 10 years of age. By averaging the scores made by the children within each attained linguistic stage, and relating those to the number of correct answers given on a multiple-choice questionnaire over children's literature (Taking Inventory of Children's Literary Background by Charlotte Huck) a highly positive relationship was determined. Also found to correlate positively in this study was the number of books familiar to the child, found by having the parent and child at home check a Master Book List. Counted from this check-list were those found to be in the top level of syntactic complexity. Chomsky determined that "The child who reads (or listens to)
a variety of rich and complex materials benefits from a range of linguistic inputs that is unavailable to the non-literary child" (p. 23), and that exposure to the more complex language available in books went hand in hand with increased knowledge of the language.

**Father's Role**

The influence of the father on the child's early reading ability is less able to be documented as positive. In Durkin's second study only 3% of the time was the father named as the most influential person to the early reader, while he was given 13% of the time by non-early readers. Yet, Elkind (1974) reported finding that significantly more of the fathers of early readers read frequently to their children. This coincides with Henry's (1974) research aimed at determining whether boys read to by fathers two or three times a week, six months prior to first grade entry, would score higher than those read to by mother. The criteria was letter naming and word recognition (both isolated and in context). Henry's research found that father-read-to
boys had significantly higher mean scores on words in context.

The fathers in the King and Friesen (1972) study were found to have another type of affect on early readers. When comparing 31 kindergarten readers and their controls in Calgary, Canada, it was discovered that the father's occupation was "important" (higher) for the group of readers, along with the mother's education (found also by Durkin). Here again, the greater part of help in learning to read was not the father (reported by only 10) but by the mother (indicated by 18 cases).

Though no preschoolers were included in the international study by Thorndike (1973b), the results speak to the universality of the factors being considered. The dominant predictors of reading ability were found to be socioeconomic status and reading materials in the home. The SES composite of factors for fifteen countries included both father's occupation and education. Other SES factors were mother's education and reading resources in the home which included number of books, owning a dictionary, and subscription to a daily newspaper.
Thorndike felt confident in concluding "In final summary, then, the clear result is that good home and environmental backgrounds provide strong differentiation between countries and, within countries, between students" (p. 179).

**Television's Role**

The effects of viewing television on early reading or non-early reading is more inconclusive. While Durkin's New York study reported that the early readers watched television for six or more hours per week and viewed fewer programs of the nursery-school-kindergarten type, King and Friesen (1972) found little difference in the average time spent watching television. Other studies indicate that this media does have an impact on the preschool child. The Brzeinski and McManus (1964) report on the Denver preschool readiness television project, which involved 300 parents and preschoolers found that a 16 week Tuesday evening program accelerated students' abilities with letters, sounds, and word recognition. This growth, if the student received continued accelerated reading instruction, placed him significantly ahead of the control group even after six years.
Also believing in the possible aid of TV as a source of instruction, Vernon (1965) was to list its lack in the home during preschool and the early school years as an environmental handicap to mental development. He reasoned that the lack of television viewing constructed perceptual and conceptual deprivation. In the same vein, Ball and Bogatz (1965) found that the time spent by their 943 subjects watching TV positively correlated with learning and that the skills best learned were the ones which received the most time and attention of the programs. These researchers also found that disadvantaged children produced superior gains while those who discussed the programs with their mother excelled all.

Perhaps the most conclusive evidence is afforded by James Flood's dissertation (summarized in Rupley, 1977). After developing a prereading index for preschool children and administering it to 36 subjects, 25 concomitant variables were probed. Those found to be most highly related to the prereading score were educational TV recognition and the number of materials in the home.
Child's Initiative

Gibson and Levin (1975, p. 557) have said, "The only magic in learning to read is the magic that the child supplies when a rich and responsive environment gives him the chance." That rich environment in Durkin's California study included a blackboard in every prereaders' home. The progress toward reading began with an interest in scribbling, progressing from aimless scribbles to copying letters and copying printed words. The result was that the child could read the words he had written. The New York Study found that 93% of early readers, compared with 73% of non early readers, were given help with printing and 73% compared to 27% with spelling. Thus Durkin dubbed the early readers as "paper and pencil kids."

The motivation for this scribbling, according to Gibson and Yonas (1968) is the making of traces (marks), the controlling of the trace, and the ability to see new display variables. In their study, of 14 children ages 15 to 38 months the scribbling time was measured using the same materials with the exception of pens. One pen left a trace and one
did not. When the trace was not immediately visible, scribbling activity was reduced significantly. Therefore, it was concluded, scribbling appears to be its own reward.

In a review of motivation in learning and in particular learning to read (Gibson and Levin, 1975) it is pointed out that children possess "intrinsic" motives for learning, a prototype of curiosity, that is displayed in language learning as scribbling. They argue that the culturally impoverished inner-city child may have a low level of intrinsic motivation due to the previous lack of satisfaction that comes "from resolving apparent contradictions and learning about a predictable, orderly world" (p. 268). They point out that a powerful factor for learning is the reduction of uncertainty, the finding of a higher-order structure, or rule, coupled with the trend for economy in processing information.

Gray (1960) presented the more traditional view: "In the environment lie the stimuli which may affect him. His interests select and make more effective certain portions of his environment which thereby become actual stimuli leading to increased
word knowledge" (p. 1104). Thus, Mason and Blanton (1971) found that when stories were read aloud to prereaders, once they learned to read, their choices of books centered upon either the same stories read to them, or books of the same type.

As Geyer (1972) pointed out, "For reading to occur, the reader must intend to read the display and he must 'pay attention' to its meaning...while 'intention' in reading has not been subjected to much experimental research, the processes of selective attention have been studied extensively in other contexts and modalities" (p. 556). See also Samuels, 1973.

Child's Sex

Many researchers have documented what first grade teachers have always known: Girls read better than boys. Dykstra (1966, p. 21) tested over 600 boys and girls and found that "girls are more mature in readiness for reading at the beginning of first grade". This sample consisted of girls who were significantly younger than the boys though IQ was equal. Further, at the end of first grade, "highly
reliable differences in favor of girls were found in word recognition and paragraph reading.

Neither Johnson (1973) nor Thorndike (1973) found this to be true cross culturally. Johnson studied sex differences in four English speaking nations: Canada, England, Nigeria, and the United States. More than a thousand children in grades 2, 4, and 6 participated. It was demonstrated that in two countries boys scored higher on most tests while in Canada and the United States girls were generally higher. Thorndike, in his population of 10 year olds from 15 countries, found correlations of reading comprehension with sex to be small and inconsistent. Yet he does point out that there was found "a superiority of girls in a majority of countries - 11 of 14" (p. 78). Both researchers suggest cultural influences make these differences.

Summary

The research linking preschool readers with environmental variables which appear to have effected this learning is of very recent origin. Not until Durkin had convinced the educational world that her first study was not an exception but a
statement of reality could educators focus on causative factors. While early studies indicated that children of all socioeconomic levels were becoming early readers, most investigations have disagreed.

The parent's role in early reading behavior is most directly the result of having an educated mother who surrounds the family with reading materials, reads to the child, and interacts in particular ways with the preschooler. The father's role is somewhat more clouded with his contribution appearing to be his occupation. Yet, it has been made evident that father-read-to-boys can score significantly higher on reading that involves words in context than mother-read-to boys.

While television has proven to be a positive factor in reading accomplishment, it appears that those children from disadvantaged groups tend to benefit most. Being a female, in the United States, almost guarantees an earlier, better reader. This has been found to be culturally bound. The role played by a preschooler's curiosity, his intrinsic motivation to view his own productions, and his
innate desire to make order of the world are just beginning to be within the boundaries of research possibility.
CHAPTER III

METHODOLOGY

The design of this study and the procedures used to collect and analyze the data are presented in this chapter. The objective of this research project was to explore the cognitive, environmental and personal differences which exist among preschoolers who possess varying degrees of reading ability. The relationship between each of the variables and their interaction with reading ability was explored. This chapter is divided into four sections: the subjects, the instrumentation, data collection, and data analysis.

Subjects

Sixty pre-school children, 28 boys and 32 girls from the Columbus, Ohio area comprised the sample. The age range of the children was 60 months to 79 months with a mean of 68.167 and a standard deviation of 4.450. None of the subjects
had attended first grade or a preschool in which formal reading instruction had been conducted. Verbal intelligence ranged from 84 to 135 with a mean of 111.333 and a standard deviation of 12.192.

Contacts were made by telephone with area day care centers and individual parents known to have preschoolers. Ninety responses were received and protocols on each were begun. Subjects were eliminated due to incomplete information on the questionnaire, age, absence during the testing period due to illness or vacation and, in one case, inability to complete testing due to apparent emotional maladjustment.

Children who had received no formal schooling were selected for two reasons. First, it has been suggested by some educators that the ability to read presupposes the attainment of Piaget's cognitive level of concrete operations. Many researchers have provided data indicating that this stage emerges in most children around the age of seven. If five and six year old early readers have advanced into the concrete operations stage, some conformation would exist that such a maturational
level preempts learning to read. Second, such a sample would more closely represent the influence of home environment, eliminating the influence of differing first grade teaching methodologies.

Instrumentation

The instruments for this research were chosen following a critical review of the tools available for each category of need: reading achievement, verbal intelligence, Piagetian level of functioning, assimilated concepts about reading print, knowledge of children's literature, and environmental influences.

Reading Achievement

The Reading Recognition and Reading Comprehension subtest of the Peabody Individual Achievement Test (PIAT) were used to provide data. The use of these subtests allows quantification of a wide-range of reading skills: matching alphabet letters, naming letters, reading individual words, and sentence comprehension. Its construction was purposely designed for optimum sensitivity at the lower level, with individual items included based on item discrimination and difficulty indices.
Individual words are read aloud while sentences are read silently. Comprehension is checked on the silent reading subtest by having the subject select the best meaning for the sentence from four drawings. Besides being untimed, and thus revealing power, the instrument is both quick to administer and completely objective.

Students with an age range of 4 to 21 years (N=2,889) from nine geographic divisions comprised the standardization sample. Retest reliability, with one month between sessions, ranged from .78 to .89 for kindergarten and first grade for reading recognition and comprehension. Standard error of the measurement, rounded to whole numbers, was 2 at both kindergarten and first grade levels.

In the present research effort, the two subtests Reading Recognition and Reading Comprehension were employed. Since the Reading Recognition subtest actually includes letter recognition, alphabet naming, and word reading, these three components were considered as separate subtests for this study. Therefore, five scores were obtained for each subject on the criteria measures of (1) Letter Matching
(2) Alphabet Naming (3) Words Read (4) Sentences Read and (5) Total Correct. For each criterion raw scores were tallied. While the instructions for administration, as given in the PIAT Manual were followed, the computation of number correct and use of the conversion tables were not adhered to.

**Verbal Intelligence**

The Wechsler Preschool and Primary Scale of Intelligence (WPPSI), verbal subtest only, was administered individually. This verbal portion of the WPPSI is a short test constructed for and validated on young children. It includes Vocabulary, Information, Comprehension, Arithmetic, and Similarities.

Using the split-half technique, reliability for the Verbal IQ (using age groups comparable to the present study) varies from .93 to .95. Two hundred children for each age group, 5, 5 1/2, 6, and 6 1/2 were used. Stability over time, employing 50 five year olds and a mean retest interval of 11 weeks was determined to be .96 on the Verbal Scale.

Concurrent validity of the WPPSI Verbal was obtained by administering it and three other
individually administered intelligence tests: the Stanford-Binet Intelligence Scale, (S-B); the Peabody Picture Vocabulary Test, (PPVT); and the Pictorial Test of Intelligence (PTI) to 98 children. The sample ranged in age from 69 to 73 months. Correlations of .76 (S-B), .57 (PPVT), and .53 (PTI) were computed.

Briggs and Elkind (1973) following two pilot studies using other standardized measures of intelligence, admonished future researchers to use verbal scores.

Piagetian Level of Functioning

Concept Assessment Kit - Conservation (CAK) was administered to provide assessment of the developmental progression of the child's thinking from a prelogical to a logical mode. In Piaget's theory, the change from non-conserving to conserving is evidenced by the ability to recognize that though an object changes in perceived form, it in actuality remains unchanged in relation to other properties. The CAK provides standardized instructions, materials, and scoring procedures. Each child's conservation behavior and explanation are scored
and checked for eight differing tasks: two-dimensional space, number, substance, continuous quantity, weight, discontinuous quantity, area and length.

Reliability was determined by administering Scale A and C to 36, 37 and 34 children in kindergarten, first, and second grade respectively, then administering Scale B and C two weeks later. The Kuder-Richardson (K-R) 20 internal consistency reliability for Scale A was .96, for Scale C .95.

Concepts About Print

Concepts About Print, using the child-book "Sand" was administered individually to obtain a measure of the child's assimilation of basic concepts about reading print. Since the examiner and child interact in a situation synonymous with a parent-child reading situation, it was felt that such a measure would tap into the shared-book experiences of the home environment.

Twenty-four questions are asked while the examiner is reading the book "Sand" to the child. They cover such concepts as where to begin reading, which direction to read, the correctness of picture
and word placements, punctuation and alphabet.

(See Appendix A for a complete listing of the content covered.)

Test, re-test reliability using 40 children ages 5 to 7 was .95 (Clay, 1972). Validity, based on a word reading task administered to 100 six year olds was found to be .79.

Knowledge of Children's Literature

Selected questions from Taking Inventory of Children's Literary Background by Charlotte S. Huck (1966) was administered verbally to each child to determine how much information had been assimilated from reading experiences with Mother Goose rhymes, poetry, folk tales, fables, and modern stories.

This researcher, with Dr. Huck's direct guidance, made selections from the 60 original questions in the inventory, the resultant test being composed of 40 items. The criteria for inclusion within this study included: 1) appropriateness for preschool children in 1976, 2) inclusion of and a proper balance of types of literature, 3) elimination of those items which were known to have been made
into movies or television dramatizations, and 4) consideration of the attention span of the preschool child. Carol Chomsky (1972) reported this instrument to be "an excellent single measure of reading exposure..." (p. 25). This multiple-choice questionnaire probes a child's internalization and memory of the children's literature to which he has been exposed.

Environmental Influences

As an aid in determining socio-economic level and educational level of the parents along with other environmental factors present within the home, a questionnaire was completed by a parent of each child. (See Appendix A.) Such questionnaires have been found highly informative in previous research (Durkin, 1966; Briggs and Elkind, 1973; Chomsky, 1972; Thorndike, 1973b). The questions asked parents included those items found significant in previous research studies, along with items of specific interest to the investigator.

Data Collection

Telephone contact was made with several area day care centers. Five were quickly found which contained enough children of the required age span. A personal interview with the director of each
center followed at which time individual schedules were established. Parent Questionnaires and Permission for Testing forms were left with each director who handled the dispersion and collection. At each center, a separate room was scheduled for the use of testers at times which did not conflict with lunch, naps, swimming, or TV.

Four interns from the School Psychology Program of The Ohio State University were located to administer the WPPSI. Three other experienced teachers of reading were found to help with the reading related tests. Though the psychologists could, and did, administer both intelligence and reading tests, the reading teachers gave only the reading related measures.

Since the Piagetian measure, Concept Assessment Kit—Conservation, required specific background knowledge and training, only the principal investigator and Sister Jo Ann Betzold administered these. Sister Betzold had participated in previous Piagetian testing at The Ohio State University, had finished her training as a School Psychologist, and
had had many years of teaching experience both in the regular classroom and in a reading clinic.

Each child was given all tests within a two week period; most were completed within a few days. Since the total time required for testing was approximately an hour and forty-five minutes, the children were examined for short periods at a time, which required return trips to the testing room. Day Care Centers schedule field trips, swimming lessons, and celebrate birthdays. Thus, the major problem encountered was child availability. Attrition rate of the subjects was due to parents picking children up early and children being absent due to illness, vacation, or mother's day off. Thus, ninety subjects began the testing process but only sixty completed within the limits set for the study.

Data Analysis

Parent Questionnaire

The questionnaire (Appendix A) to the parents proved to be the most difficult measure to quantify. Some questions produced straightforward answers: "How many years of school have been completed
by the father of this child?", while others produced, at times, mystifying results: "Approximately how many books are in the home?" netted one answer of "Too many. We are moving." The responses which were unable to be put into numerical terms caused that child's entire protocol to be dropped from the research since the computer program being used allowed for no missing data.

By use of the U.S. Department of Labor's Dictionary of Occupational Titles, question 3 concerning the father's occupation was assigned a number:

1. Professional, technical, and managerial
2. Clerical and sales
3. Service
4. Farming, fishery, forestry, and related
5. Processing
6. Machine trades
7. Bench work
8. Structural work
9. Miscellaneous

Due to the higher occupational levels receiving the lower numerals, negative correlations resulted
as relationships increased. Therefore, to aid with
data analysis, the numerals were considered to be
reversed. Thus, each table herein presented
includes the adjusted figures.

Those questions requiring an answer of "time
per week" were translated into minutes for com-
puter efficiency. Such answers as "varies", "some-
times", "seldom" proved difficult to quantify. The
questions requiring the parent to state how many
hours were spent watching TV, Sesame Street, and
the Electric Company posed a different type of
problem. The parents could report what was viewed
at home but could only indicate what they thought
went on at day care. A check with each day care
center director was required to verify each of
these questions.

The question asking for the number of magazines
in the home led some parents to reply the number of
magazines taken per month, while others estimated
the number in the home at the time. A type of uni-
form quantification was obtained by translating
"magazines per month" to the number that could be
estimated which would accumulate over one year.
The question asking for the number of books in the home produced an estimate (who would expect the parent to actually count) and thus may have measured the parent's perception. The answers were taken at face value. If "100-200" was the response, 150 was established as the best possible answer. "Stacks" could not be quantified.

**Concept Assessment Kit - Conservation**

The scoring procedure for Form A of the Concept Assessment Kit - Conservation was carried out exactly as described in the Manual. One point was given for behavior, when the subject said the two objects were the same. One point was given for explanation if his conservation behavior was scored as correct and he comprehended one of the three principles: invariant quantity, compensation, or reversibility. For Form C, contrary to the test Manual, the same scoring format as for Form A was followed by this researcher: one point assigned for each behavior and explanation task. Form C contains an assessment of conservation of area and length, resulting in a total of a possible four additional points in this research.
Taking Inventory of Children's Literary Background

Taking Inventory of Children's Literary Background by Charlotte Huck was originally intended for children older than the preschool group involved. Because of time limitations, due to the short attention span of the subjects, items were eliminated from the original test. Some questions were deleted because of the interests of preschoolers, others because of redundancy of type of literature. The resulting questionnaire contained forty items.

The questions were read by the examiner to the student and marked by the examiner on the protocol. At no time was the student required to read. If there was hesitation, the question and the three possible answers were repeated. All possible attempts were made to not cue the student by means of intonation.

Analysis Procedure

Raw scores on all instruments, excepting IQ from the WPPSI, were used for analysis of the data. The Wherry Multivariate Analyses Package by Dr. Robert J. Wherry, professor emeritus of The Ohio State University, was employed for the computer
analyses. Program 33 TESCAN, Test and Scale Analysis, yielded the reliability coefficients of the tests administered. Program MULREG provided correlation data and multiple regression analysis. Program #38 WHWH 250 was chosen for the analysis of those factors present.
CHAPTER IV

RESULTS

The purpose of this study was to examine the relationship of cognitive, environmental and personal factors to the acquisition of reading skills in preschoolers who had not received formal training. Five instruments were administered to determine intelligence, conservation attainment, concepts about print, knowledge of children's literature and reading skills. A parent questionnaire was completed which included assessments of the home environment and the child's personal reading initiative. The tests used were subjected to reliability determination. Data were submitted to correlation analysis, factor analysis, and stepwise multiple linear regression to provide the evidence to refute the null hypotheses.

This chapter is divided into five sections. The first is devoted to establishing the reliability of four of the test instruments with this population.
The second examines the correlation between the predictors and the criteria. The third and fourth sections present the results from the factor analysis and the multiple regression analysis. The chapter concludes with a discussion of clustering and a summary of the findings as they relate to the null hypotheses.

Reliability of Test Instruments

The reliability of Taking Inventory of Children's Literary Background (Literary Background) had not been previously established; Concepts About Print had been validated only on a New Zealand population; and the Peabody Individual Achievement Test (PIAT) was considered in this research as five separate entities. Therefore, it was advisable to establish the reliability of these instruments for this specific population of preschoolers and to maximize reliability for improvement of the predictive potential of the multiple regression weights. Tescan Program 33 which employs the Kuder-Richardson No. 8 formula for estimating reliability dependent upon item statistics was employed.
Taking Inventory of Children's Literary Background

The reliability of Charlotte Huck's Inventory was originally computed to be .718 on this population. By rerunning the program after the deletion of twelve test items, a reliability of .783 was attained which is significant at the probability level of .001. This implies that this shortened version of Taking Inventory of Children's Literary Background is a reliable instrument for use with preschool children when administered verbally, on an individual basis.

Concepts About Print

The value of the reliability coefficient for Concepts About Print was found to be .85 using all items in the instrument. Trial elimination of three items resulted in no additional efficiency. Concepts About Print may be considered to be a reliable instrument for use with preschoolers, the obtained coefficient being significant beyond the probability level of .001. The number of test items reported in Table 4.1 is 21 due to elimination of three questions on which no variability was obtained.
### TABLE 4.1

Number of Test Items, Means, Standard Deviations, and Reliability of the Tests Used

<table>
<thead>
<tr>
<th>Test</th>
<th># Items</th>
<th>Mean</th>
<th>S.D.</th>
<th>KR#8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literary Background</td>
<td>28</td>
<td>16.483</td>
<td>4.125</td>
<td>0.783</td>
</tr>
<tr>
<td>Concepts About Print</td>
<td>21</td>
<td>11.183</td>
<td>4.027</td>
<td>0.850</td>
</tr>
<tr>
<td>Conservation</td>
<td>16</td>
<td>5.783</td>
<td>5.756</td>
<td>0.959</td>
</tr>
<tr>
<td>PIAT - Letter Matching</td>
<td>5</td>
<td>3.800</td>
<td>1.030</td>
<td>0.715</td>
</tr>
<tr>
<td>PIAT - Alphabet</td>
<td>9</td>
<td>8.117</td>
<td>1.550</td>
<td>0.865</td>
</tr>
<tr>
<td>PIAT - Words</td>
<td>28</td>
<td>2.567</td>
<td>5.500</td>
<td>0.974</td>
</tr>
<tr>
<td>PIAT - Sentences</td>
<td>21</td>
<td>1.767</td>
<td>3.976</td>
<td>0.965</td>
</tr>
</tbody>
</table>
Concept Assessment Kit - Conservation

Using all 16 items in this measure of the attainment of conservation, a reliability coefficient of .959 was obtained. The test authors, Goldschmid and Bentler, had reported reliabilities for Form A and C separately as .92 and .95. The obtained coefficient for the present population employed the two forms as a single instrument with both being scored identically, following instructions given by the test authors for the Form A test. It may be inferred from the obtained statistic that this instrument is a highly reliable measure.

Peabody Individual Achievement Test (PIAT)

Reading achievement was assessed with the PIAT subtests of reading Recognition and Reading Comprehension. The authors of this instrument report in the Manual that at kindergarten level the reliability coefficient for the Reading Recognition subtest was found to be .81 by re-administration to 75 kindergarten subjects and calculating Pearson product moment correlations on raw scores. They also indicate that the Reading Comprehension subtest
(silent sentence reading) was not subjected to reliability analysis using kindergarten subjects.

Since four components of these two subtests were considered in this research, each was separately subjected to reliability analysis. The Reading Recognition subtest contains three separate types of information: letter matching, alphabet naming, and word reading. The Reading Comprehension subtest required silent sentence reading. The reliability values obtained for each of these four components, as presented in Table 4.1, range from .715 to .974. This implies that the scores of each separate component are extremely reliable. It may be noticed that Table 4.1 reports five items used to establish the reliability of the Letter Matching subtest. On four of the available nine test items no variability among the subjects was achieved.

Correlation Between Predictors and Criteria

Cognitive Attainment as Predictor (Hypothesis 1)

Table 4.2 shows sizeable coefficients when the measures of cognitive attainment are correlated with the criteria. Concepts About Print reaches
Table 4.2 Correlation matrix presenting predictors and criteria: Letter Matching, Alphabet Recognition, Words Read, Sentences, and Total Raw Score on PIAT

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Letter Match.</th>
<th>Alpha. Words</th>
<th>Sent.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal IQ</td>
<td>.135</td>
<td>.203</td>
<td>.294*</td>
<td>.232</td>
</tr>
<tr>
<td>Conservation</td>
<td>.074</td>
<td>.022</td>
<td>.466***</td>
<td>.413**</td>
</tr>
<tr>
<td>Literary Background</td>
<td>.129</td>
<td>.265*</td>
<td>.302*</td>
<td>.268*</td>
</tr>
<tr>
<td>Concepts About Print</td>
<td>.608***</td>
<td>.456***</td>
<td>.601***</td>
<td>.583***</td>
</tr>
<tr>
<td>Attempts to Spell</td>
<td>.104</td>
<td>.067</td>
<td>-.115</td>
<td>-.129</td>
</tr>
<tr>
<td>Asks Help in Spelling</td>
<td>.253</td>
<td>.067</td>
<td>.093</td>
<td>.102</td>
</tr>
<tr>
<td>Attempts Write Words</td>
<td>.337**</td>
<td>.193</td>
<td>.125</td>
<td>.119</td>
</tr>
<tr>
<td>Time Reading Child. Mag.</td>
<td>.202</td>
<td>.081</td>
<td>.009</td>
<td>.009</td>
</tr>
<tr>
<td>Time Looks at Books</td>
<td>.156</td>
<td>.146</td>
<td>.465***</td>
<td>.437***</td>
</tr>
<tr>
<td>Books from Library</td>
<td>.360**</td>
<td>.245</td>
<td>.425***</td>
<td>.320*</td>
</tr>
<tr>
<td>TV</td>
<td>.214</td>
<td>.263*</td>
<td>.196</td>
<td>.126</td>
</tr>
<tr>
<td>Sesame Street</td>
<td>.129</td>
<td>.063</td>
<td>.047</td>
<td>-.007</td>
</tr>
<tr>
<td>Electric Company</td>
<td>.385**</td>
<td>.280*</td>
<td>.086</td>
<td>.122</td>
</tr>
<tr>
<td>Father's Education</td>
<td>.061</td>
<td>.099</td>
<td>.240</td>
<td>.137</td>
</tr>
<tr>
<td>Father's Occupation</td>
<td>.076</td>
<td>-.025</td>
<td>.180</td>
<td>.138</td>
</tr>
<tr>
<td>Mother's Education</td>
<td>-.073</td>
<td>-.018</td>
<td>-.042</td>
<td>-.016</td>
</tr>
<tr>
<td>Father Reads to Child</td>
<td>-.198</td>
<td>-.049</td>
<td>-.011</td>
<td>-.127</td>
</tr>
<tr>
<td>Mother Reads to Child</td>
<td>.076</td>
<td>.036</td>
<td>.077</td>
<td>.144</td>
</tr>
<tr>
<td>Magazines in Home</td>
<td>.116</td>
<td>.147</td>
<td>.166</td>
<td>.216</td>
</tr>
<tr>
<td>Books in Home</td>
<td>-.163</td>
<td>-.243</td>
<td>.063</td>
<td>.064</td>
</tr>
<tr>
<td>Age</td>
<td>.382**</td>
<td>.287*</td>
<td>.262*</td>
<td>.314*</td>
</tr>
<tr>
<td>Sex</td>
<td>.337**</td>
<td>.157</td>
<td>.285*</td>
<td>.298*</td>
</tr>
</tbody>
</table>

*p < .05; r > .255
***p < .01; r > .331
****p < .001; r > .416
the .001 significance level for all criteria, with coefficients ranging from .456 to .681. Literary Background attains significance at p. 05 with all criteria except Letter Matching. Conservation correlates highly with Words Read, Sentences Read, and Total Correct on the PIAT with r's ranging from .413 to .466 while IQ reaches the .05 level only with Words Read and Total Correct.

It should be noted that neither IQ nor Conservation are highly correlated with Letter Matching and Alphabet Naming, and that Literary Background reaches a significant level with only one of these two: Alphabet Naming. This is in sharp contrast to Words Read and Sentences Read, as the three predictors reached significance in all comparisons except between IQ and Sentences Read, which only approaches the .05 significance level.

Since the predictors correlate with at least one or more of the criteria, there is at least partial substantiation of Hypothesis one. There appears, however, to be a difference between Letter Matching/Alphabet/and Words, Sentences/Total. Thus, the criteria, at least for these cognitive variables, are functioning as a bifurcated dependent variable.
Initiative as Predictor (Hypothesis 2)

Three predictors (Books from the Library by/for Child, Attempts to Write Words, and Time Child Looks at Books) share a significant amount of variance with the criteria. Books from the Library is more uneven in its relationship, reaching the p .01 level with Letter Matching, not quite reaching significance with Alphabet Named, then attaining the p .001 level with both Words Read and Total Correct. Attempts to Write Words barely reaches the .01 level and then only when correlated with Letter Matching, the lowest level of the reading continuum. The Time Child Looks at Books, on the other hand, shares a significant amount of variance (p .001) with the more difficult tasks of Words Read, Sentences Read, and Total Correct. It is noticeably low in its relationship to the two easier predictors. Asks Help in Spelling is approaching significance (p. 253) when correlated with Letter Matching, but is consistently small and insignificant for the more difficult reading abilities.

When the reading subtests are viewed as a continuum of abilities beginning with the easier task of
letter matching and advancing to the most difficult (silent comprehension), interesting interactions are noted. Attempts to Spell, Attempts to Write Words, and Time Reading Children's Magazines have an inverse relationship with the reading continuum, beginning with a low positive relationship with Letter Matching, becoming less positively related to Alphabet Naming, moving to a low negative correlation with Words Read and to a slightly greater negative relationship to Sentences Read.

Evidently the child who is concentrating on individual letters (spelling and writing) is also "reading" children's magazines. But, the child who has become more proficient in reading words and sentences spends time looking at books. It appears that, at least in this sample, the number of books checked out either by or for the child per month shows little differentiation between those able to read and those unable to do so. Perhaps the non-readers are checking out picture or alphabet books. This would be possible since, by looking at Table Al in Appendix A, it may be seen that all four (Attempts to Spell, Asks Help in Spelling,
Attempts to Write Words, and Time Reading Children's Magazines are negatively correlated with the Inventory of Literary Background, a variable measuring assimilation of facts from Mother Goose Rhymes, Poetry, Folk Tales, Fairy Tales, Fables, and Modern Stories. On the other hand, Books from Library and Time Looks at Books are positively correlated with the Inventory of Literary Books reaching significance at the .001 level.

In general, then, it may be seen that these indicators did not predict reading except for the two independent variables involving books. Thus, the null Hypothesis two is upheld for three of the five predictors, is rejected for Attempts to Write Words only as it pertains to Letter Matching, and is rejected for the most part by the two predictors involving books.

Television as Predictor (Hypothesis 3)

Electric Company viewing time reaches significance when correlated with the two lesser reading abilities (Letter Matching .385 and Alphabet Naming .280). The only other significant correlation is found when comparing Alphabet Recognition
with Total TV watching. While all other correlations involving Total TV time and Electric Company are positive, though insignificant, Time Watching Sesame Street presents an inverse relationship to the reading continuum reaching a negative relationship with Sentences Read.

It would appear that the child who watches Electric Company consistently has learned or is learning to distinguish one letter from another and to give names for the alphabet letters. It also appears that the child who is able to read spends less total time before the TV set, at least from the parent's report.

Thus, Hypothesis three was rejected for the low lower readiness skills (excepting Sesame Street) but was upheld for the reading measures of Words and Sentences.

Socioeconomic Variables as Predictors (Hypothesis 4)

Not one of the predicted SES variables reached significance though Father's Education with Words and Total, and Magazines in Home with Sentences and Total approached significance. On the other hand, Alphabet Recognition correlated with Books in the Home negatively approaching significance.
It appears that neither the parents' education, father's occupation, the number of magazines or books in the home, nor time either parent reads to the child had a significant affect on the child's reading ability. There is no significant relationship between the variables as measured and any of the five criteria. Therefore, Hypothesis four is accepted in total.

Personal Variables as Predictors (Hypothesis 5)

Because both age and sex differences are commonly reported in the literature their affect on the reading criteria were included in this study. Age correlated positively with all reading variables ranging from .262 to .382. Each reading criterion had a positive relationship with Sex indicating a higher reading attainment at all levels by girls (coded 0 for boys and 1 for girls).

It appears fairly evident that, for this sample, the older a child was, the more able he was to respond correctly to reading and reading related tasks. It also is apparent that girls performed better than boys. Therefore, Hypothesis five is rejected in total for Age and accepted for Sex only for one of the five criteria: Alphabet.
Factor Analysis

None of the five hypotheses of this research addressed the issue of a differentiation existing between Letter Matching and Alphabet Naming on the one hand, and reading Words and Sentences on the other. Yet, the results reported in the correlation matrix (Appendix A Table 1) appear to indicate a bifurcation. Therefore, it seemed that a factor analysis would highlight the fact that the two tests were differentially predictive. Also, the clusters of r's among the 27 measures appear to indicate underlying factors operating. Factor analysis allows for determination of the number and nature of these underlying unities. Using Program 38, WHWH 250 of the Wherry Multivariate Analyses Program Package, five common dimensions emerged. Table 2, in Appendix A, presents these five factors following three minor rotations to effect slight improvement of the initial varimax rotation.

Before attempting a description of each factor separately, the loadings of all the variables on Factors A and B (Table 4.3) will be examined. In this table it is seen that Letter Matching and
TABLE 4.3

Loadings on Factors A and B of the 27 Variables Studied

<table>
<thead>
<tr>
<th></th>
<th>Factor A</th>
<th>Factor B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Matching</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Alphabet Naming</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Words Read</td>
<td></td>
<td>+++</td>
</tr>
<tr>
<td>Sentences Read</td>
<td></td>
<td>+++</td>
</tr>
<tr>
<td>Total Correct</td>
<td></td>
<td>+++</td>
</tr>
<tr>
<td>Verbal IQ</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Concept Assessment Kit-Conservation</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Inventory of Literary Background</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Concepts About Print</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Attempts to Spell</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Attempts to Write Words</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Reading Children's Magazines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Looks at Books</td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Books from Library by/for Child</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Time Watching TV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Watching Sesame Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Watching Electric Company</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Father's Education</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Father's Occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother's Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Father Reads to Child</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Time Mother Reads to Child</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magazines in Home</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Books in Home</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Age</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>

+ or - = Light loading (.20 to .50)
++ = Heavy loading (.51 to .80)
+++ = Exceptionally heavy loading (.81 or more)
Alphabet Naming load heavily on Factor A while B is saturated with the advanced reading components of Words, Sentences and Total Correct. It appears that two distinct levels exist: a level associated with letter discrimination and naming, and a level composed of word reading and sentence comprehension. The factors appear to divide the variables between them, sharing very few. In this population of preschoolers there were two distinct stages toward reading attainment with each having behavioral and environmental differences. This finding explained the differential support found for the various hypotheses in the previous section.

Factor A, Letter Achievement

<table>
<thead>
<tr>
<th>Variable</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Matching (PIAT)</td>
<td>.66</td>
</tr>
<tr>
<td>Alphabet Naming (PIAT)</td>
<td>.50</td>
</tr>
<tr>
<td>Watches Electric Company</td>
<td>.40</td>
</tr>
<tr>
<td>Age</td>
<td>.37</td>
</tr>
<tr>
<td>Attempts to Spell</td>
<td>.37</td>
</tr>
<tr>
<td>Concepts About Print</td>
<td>.32</td>
</tr>
<tr>
<td>Attempts to Write</td>
<td>.31</td>
</tr>
<tr>
<td>Sex</td>
<td>.30</td>
</tr>
<tr>
<td>Asks Help in Spelling</td>
<td>.28</td>
</tr>
<tr>
<td>Magazines in Home</td>
<td>.26</td>
</tr>
<tr>
<td>Father's Education</td>
<td>-.26</td>
</tr>
<tr>
<td>Books in Home</td>
<td>-.26</td>
</tr>
<tr>
<td>Time Father Reads to Child</td>
<td>-.20</td>
</tr>
</tbody>
</table>
For a closer scrutiny of the major contributors, Factor A has been rearranged with the factors in descending order. Five of the 13 loadings involve direct attention given to individual letters: matching, recognizing, attempting to spell and write. It would also appear that Electric Company and Concepts About Print have the same effect: a focus on the invariant properties of letters. Magazines found in the home appear to aid this lower level skill while books are not utilized by children at this stage.

It would seem that early letter learning and discrimination skills are closely linked to easily available media and materials: TV, magazines, paper and pencil. The negative loadings for Father's Education and Time Father Reads to Child would indicate that the beginning pre-reading abilities which appear to be learned best by younger females are not being actively taught by the father. (Appendix A, Table 1 had shown a high positive correlation of father's education with the amount of time Father spent per week reading to the subject.) This may indicate that the type of reading the educated father does with the child does not
contribute to letter discrimination, alphabet naming, writing and spelling. If the sample had been composed only of younger children, the results might have been different. Also, it must be remembered that "less educated" in this sample, implies less university schooling since the mean of Father's Education is 14.75 years and the SD is 2.38.

Factor A is apparently indicating prereading skills rather than reading per se and probably would correlate with other reading readiness measures.

Factor B, Reading Accomplishment

Table 4.5 Factor B, Reading Accomplishment with variables arranged in descending order of loading

<table>
<thead>
<tr>
<th>Variable</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (PIAT)</td>
<td>.97</td>
</tr>
<tr>
<td>Words Read (PIAT)</td>
<td>.93</td>
</tr>
<tr>
<td>Sentences Read (PIAT)</td>
<td>.87</td>
</tr>
<tr>
<td>Concepts About Print</td>
<td>.68</td>
</tr>
<tr>
<td>Child Looks at Books</td>
<td>.54</td>
</tr>
<tr>
<td>Letter Matching (PIAT)</td>
<td>.50</td>
</tr>
<tr>
<td>Books from Library</td>
<td>.49</td>
</tr>
<tr>
<td>Inventory of Literary Background</td>
<td>.40</td>
</tr>
<tr>
<td>Concept Assessment Kit - Conservation</td>
<td>.40</td>
</tr>
<tr>
<td>Alphabet (PIAT)</td>
<td>.34</td>
</tr>
<tr>
<td>Verbal IQ (WPSSI)</td>
<td>.33</td>
</tr>
<tr>
<td>Sex</td>
<td>.31</td>
</tr>
<tr>
<td>Age</td>
<td>.31</td>
</tr>
<tr>
<td>Father's Education</td>
<td>.24</td>
</tr>
</tbody>
</table>
While Factor A was loaded with the lower level components from the reading continuum, primarily those associated with attention to letters, Factor B is saturated with those variables related to the extraction of meaning from the visual array. It precludes knowledge of the higher order structuring of words, syntax, and semantics. It appears that the child who is looking at books is going to the library as one source of material, is being read to using those books (Concepts About Print), and is retaining a fair knowledge of the content (Literary Background). This is all aided by age (the older, the more opportunities that exist), by being female, and by having a father with more education. Both aptitude measures load positively on this factor also, indicating the necessity of higher level cognitive proficiency on the higher level components of the reading continuum.

Factor C, Home Environment

Factor C is a combination of higher socioeconomic level and corresponding intellectual level. It indicates that when a higher SES is present, higher scores can be expected on the cognitive maturational
<table>
<thead>
<tr>
<th>Variable</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother's Education</td>
<td>.68</td>
</tr>
<tr>
<td>Father's Education</td>
<td>.64</td>
</tr>
<tr>
<td>Inventory of Literary Background</td>
<td>.50</td>
</tr>
<tr>
<td>Concept Assessment Kit - Conservation</td>
<td>.50</td>
</tr>
<tr>
<td>Books in Home</td>
<td>.42</td>
</tr>
<tr>
<td>Father's Occupation</td>
<td>.36</td>
</tr>
<tr>
<td>Hours Reading Children's Magazines</td>
<td>-.33</td>
</tr>
<tr>
<td>Verbal IQ (WPPSI)</td>
<td>.32</td>
</tr>
<tr>
<td>Time Father Reads to Child</td>
<td>.32</td>
</tr>
<tr>
<td>Concepts About Print</td>
<td>.32</td>
</tr>
<tr>
<td>Sex</td>
<td>-.30</td>
</tr>
<tr>
<td>Magazines in Home</td>
<td>.28</td>
</tr>
</tbody>
</table>
measures of conservation, literary knowledge, verbal IQ, and print concepts. This factor appears to be more general and is independent of reading skills representing what is left over after the reading components are extracted.

This third factor may be interpreted to indicate that in homes with highly educated parents not only is the father in the higher occupational level but the children have higher basic intellectual abilities. These homes provide more books and magazines and fathers who read to their children. It appears that in such homes, the children are spending less time reading children's magazines and that more of these children are boys.

Factor D, Father's Relationship to Initiative

Table 4.7 Factor D, Father's Relationship to Initiative with Variables Arranged in Descending Order of Loading

<table>
<thead>
<tr>
<th>Variable</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asks Help in Spelling</td>
<td>.65</td>
</tr>
<tr>
<td>Attempts to Spell</td>
<td>.63</td>
</tr>
<tr>
<td>Inventory of Literary Background</td>
<td>-.52</td>
</tr>
<tr>
<td>Father's Occupation</td>
<td>.43</td>
</tr>
<tr>
<td>Father's Education</td>
<td>.35</td>
</tr>
<tr>
<td>Time Mother Reads to Child</td>
<td>-.24</td>
</tr>
<tr>
<td>Time ChildLooks at Books</td>
<td>-.23</td>
</tr>
<tr>
<td>Time Father Reads to Child</td>
<td>.23</td>
</tr>
<tr>
<td>Attempts to Write Words</td>
<td>.22</td>
</tr>
<tr>
<td>Verbal IQ (WPPSI)</td>
<td>-.21</td>
</tr>
</tbody>
</table>
Father plays a prominent role in this factor, lending his high education, occupational level and time reading to the child. Three of the measures of child initiative also load here: Asks Help in Spelling, Attempts to Spell and Attempts to Write Words. The factor is saturated with low loadings from the Inventory of Literary Background, Verbal IQ, time spent with mother reading, and time looking at books.

This factor indicates that when father's occupation and education are high, the father is most likely reading to the child. In homes with this quality of father interaction, the child is using initiative in the areas of spelling and writing. It must be pointed out that these attributes were found to indicate a lower level of reading maturity. In such instances, less time is spent with mother reading and less time is allocated to looking at books alone. There is further indication that such children are less verbal and knowledgeable about common children's literature.
Factor E, TV Watching

Table 4.8 Factor E, TV Watching

with Variables Arranged in Descending Order of Loading

<table>
<thead>
<tr>
<th>Variables</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours Watching TV</td>
<td>.61</td>
</tr>
<tr>
<td>Sesame Street</td>
<td>.58</td>
</tr>
<tr>
<td>Magazines in Home</td>
<td>-.30</td>
</tr>
<tr>
<td>Electric Company</td>
<td>.30</td>
</tr>
<tr>
<td>Attempts to Write Words</td>
<td>-.26</td>
</tr>
</tbody>
</table>

All three measures of television viewing saturate this factor heavily. The negative loadings of Magazines in the Home and Attempts to Write Words may indicate more time spent passively watching TV. This factor, as with the previous two, has nothing to do with whether the child can read or not.

It appears that when magazines are not in the home, the child spends less time with paper and pencil, attempting to write, and more time watching television.

Summary of Factor Analysis

Since none of the five hypotheses addressed the issue of a possibility of two separate sets of reading measures emerging, and the correlation matrix
had suggested this possibility, a factor analysis using all 27 of the variables being studied was completed. Five underlying clusters were determined to be operating: Letter Achievement, Reading Accomplishment, Home Environment, Father's Relationship to Initiative, and TV Watching.

Factors A and B emerged saturated with the reading measures, the first with the lower level skills, the second with the more advanced reading abilities, thus confirming the existence of a bifurcated reading continuum. Factors C, D, and E indicate relationships that are independent of reading factor loadings. Factor C is very definitely indicative of SES and E of TV viewing. D is less easily categorized.

Both Factor A and B indicate attainment of higher order structuring: Factor A of individual letters, Factor B of words, syntactic, and semantic information. It appears that the organization of reading behavior which develops toward mature reading ability includes two separately organized systems. The first system involves letter achievement, a higher order structure which includes
knowledge of distinctive features and the ability to categorize lower case and capital letters as equivalent by assigning to them a name. There is indication that the child's own performance (Attempts to Spell and Write) is involved in this mastery. The second system of higher order structuring involves rules for the perception of words, and a beginning use of textual redundancy. It appears that when Factor B is operating, the child has extended his knowledge of invariant properties so that it now includes the larger segments of words and sentences.

It must be noted that conservation loads on Factor B and is noticeably absent from Factor A (Table A2 reports a -.02 correlation). This indicates that the establishment of knowledge of the distinctive features of letters and the inclusion of capital and lower case letters into invariant categories does not appear to require the cognitive maturational stage of concrete operations.
Multiple Regression

There is another angle from which one may view this same set of correlative information. One may examine the data sequentially to see how much each new measure adds to the accuracy with which a specific criterion may be predicted. Each criterion being considered was submitted separately to a stepwise regression analysis using Program 21, MULREG, from the Wherry Multivariate Analyses Program Package at The Ohio State University.

Tables 4.9 through 4.13 examine each criterion in the order of Letter Matching, Alphabet Naming, Words Read, Sentences Read, and Total Correct. Each criterion is regressed on all the independent variables. Each table includes the multiple $R$, the predictor being entered, the increase afforded by the entry, the beta weights, the shrunken $R$, the $b$ weights, the $A$ weight, and the total variance accounted for.

Each criterion that is regressed on the 22 predictors was seen to have at least one variable which entered the equation negatively. This occurred for
Table 4.9  Multiple Regression Selection of Variables for Prediction of Criterion Letter Matching

<table>
<thead>
<tr>
<th>Step</th>
<th>Predictor</th>
<th>Multi R</th>
<th>Shrunken $R$ Population</th>
<th>Shrunken $R$ Cross Validation</th>
<th>Variance Accounted For Total Increase</th>
<th>Weights Standard Score</th>
<th>Raw Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concepts About Print</td>
<td>.608</td>
<td>.599</td>
<td>.580</td>
<td>.370</td>
<td>.595</td>
<td>.152</td>
</tr>
<tr>
<td>2</td>
<td>Concept Assessment Kit-Conservation</td>
<td>.676</td>
<td>.661</td>
<td>.639</td>
<td>.457</td>
<td>.087</td>
<td>-.334*</td>
</tr>
<tr>
<td>3</td>
<td>Time Watching Electric Company</td>
<td>.741</td>
<td>.725</td>
<td>.701</td>
<td>.549</td>
<td>.092</td>
<td>.268</td>
</tr>
<tr>
<td>4</td>
<td>Time Reading Children's Magazines</td>
<td>.773</td>
<td>.754</td>
<td>.727</td>
<td>.598</td>
<td>.049</td>
<td>.221</td>
</tr>
<tr>
<td>5</td>
<td>Age</td>
<td>.795</td>
<td>.774</td>
<td>.744</td>
<td>.632</td>
<td>.034</td>
<td>.228</td>
</tr>
<tr>
<td>6</td>
<td>Attempts to Write Words</td>
<td>.811</td>
<td>.787</td>
<td>.754</td>
<td>.658</td>
<td>.026</td>
<td>.180</td>
</tr>
<tr>
<td>7</td>
<td>Magazines in the Home</td>
<td>.826</td>
<td>.800</td>
<td>.764</td>
<td>.682</td>
<td>.024</td>
<td>-.153*</td>
</tr>
<tr>
<td>8</td>
<td>Time Father Reads to Child</td>
<td>.837</td>
<td>.809</td>
<td>.769</td>
<td>.701</td>
<td>.019</td>
<td>-.164</td>
</tr>
<tr>
<td>9</td>
<td>Books from Library by/for Child</td>
<td>.848</td>
<td>.818</td>
<td>.776</td>
<td>.719</td>
<td>.018</td>
<td>.158</td>
</tr>
<tr>
<td>10</td>
<td>Asks Help in Spelling</td>
<td>.852</td>
<td>.818</td>
<td>.771</td>
<td>.726</td>
<td>.007</td>
<td>.086</td>
</tr>
</tbody>
</table>

*Suppressor Variable

A Weight -2.492
one of two reasons: (1) the variable correlated negatively with the criterion, thus entered negatively on its own power or (2) the variable entered as a suppressor, thus increasing the prediction of selected variables which have entered the equation previously. Appendix A, Tables A3 to A7, illustrate the suppressor effects by graphically displaying the correlations between the variables and between the variables and the criterion.

**Prediction of Letter Matching**

The multiple $R$ coefficient for Concepts About Print alone accounts for 37% of the total variance of Letter Matching (Table 4.9). When the total battery of 10 measures is employed, 73% of the variance is accounted for. It may be noted that the two predictors involving magazines enter the regression only for Letter Matching and Alphabet Named.

All the predictors listed in Table 4.10 made direct positive contribution to the equation except Conservation, Magazines in the Home, and Time Father Reads to Child. Only Time Father Reads to
Child enters negatively in its own right. The other two serve as suppressors.

**Prediction of Alphabet Naming**

Concepts About Print again enters the regression first, accounting this time for only 20.8% of the variance. With the addition of 11 more variables the predictive efficiency is increased to 51%.

Table 4.10 reveals that all except four of the twelve predictors enter the equation positively. One of those four, Books in the Home, enters negatively in its own right, being negatively correlated with the criterion initially. The other three enter as suppressors.

A comparison of these first two criteria reveals six common entries: Concepts About Print, Concept Assessment Kit - Conservation, Time Watching Electric Company, Age, Books from Library by/for Child, and Asks Help in Spelling. While Concept Assessment Kit - Conservation enters both as a suppressor, Asks Help in Spelling acts as a suppressor only in Alphabet Naming. Apparently Attempting to Write Words aids letter recognition skills while Attempting to Spell aids alphabet learning.
Table 4.10  Multiple Regression Selection of Variables for Prediction of Criterion Alphabet Name

<table>
<thead>
<tr>
<th>Step</th>
<th>Predictor</th>
<th>Multi R</th>
<th>Shrunken R</th>
<th>Population</th>
<th>Cross Validation</th>
<th>Variance Accounted For Total Increase</th>
<th>Weights Standard Score</th>
<th>Raw Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concepts About Print</td>
<td>.456</td>
<td>.441</td>
<td>.408</td>
<td>.208</td>
<td>.085</td>
<td>.443</td>
<td>-.170</td>
</tr>
<tr>
<td>2</td>
<td>Books in Home</td>
<td>.541</td>
<td>.518</td>
<td>.479</td>
<td>.293</td>
<td>.085</td>
<td>-.371</td>
<td>-.003</td>
</tr>
<tr>
<td>3</td>
<td>Concept Assessment Kit - Conservation</td>
<td>.583</td>
<td>.551</td>
<td>.504</td>
<td>.340</td>
<td>.047</td>
<td>-.409*</td>
<td>-.110</td>
</tr>
<tr>
<td>4</td>
<td>Inventory of Children's Literary Background</td>
<td>.619</td>
<td>.581</td>
<td>.527</td>
<td>.383</td>
<td>.043</td>
<td>.330</td>
<td>.124</td>
</tr>
<tr>
<td>5</td>
<td>Time Watching Electric Company</td>
<td>.647</td>
<td>.604</td>
<td>.541</td>
<td>.419</td>
<td>.036</td>
<td>.167</td>
<td>.003</td>
</tr>
<tr>
<td>6</td>
<td>Time Watching TV</td>
<td>.663</td>
<td>.613</td>
<td>.540</td>
<td>.440</td>
<td>.021</td>
<td>.198</td>
<td>.041</td>
</tr>
<tr>
<td>7</td>
<td>Attempts to Spell</td>
<td>.679</td>
<td>.623</td>
<td>.540</td>
<td>.461</td>
<td>.021</td>
<td>.343</td>
<td>2.439</td>
</tr>
<tr>
<td>8</td>
<td>Sex</td>
<td>.690</td>
<td>.628</td>
<td>.534</td>
<td>.476</td>
<td>.015</td>
<td>-.227*</td>
<td>-.707</td>
</tr>
<tr>
<td>9</td>
<td>Age</td>
<td>.702</td>
<td>.634</td>
<td>.529</td>
<td>.493</td>
<td>.017</td>
<td>.161</td>
<td>.056</td>
</tr>
<tr>
<td>10</td>
<td>Books from Library by/for Child</td>
<td>.715</td>
<td>.641</td>
<td>.526</td>
<td>.511</td>
<td>.018</td>
<td>.213</td>
<td>.053</td>
</tr>
<tr>
<td>11</td>
<td>Time Reading Children's Magazines</td>
<td>.728</td>
<td>.649</td>
<td>.524</td>
<td>.530</td>
<td>.019</td>
<td>.167</td>
<td>.001</td>
</tr>
<tr>
<td>12</td>
<td>Asks Help in Spelling</td>
<td>.744</td>
<td>.663</td>
<td>.530</td>
<td>.554</td>
<td>.024</td>
<td>-.231*</td>
<td>-1.641</td>
</tr>
</tbody>
</table>

A Weight -.050

*Suppressor Variable
The variable Verbal IQ is noticeable for its absence as a predictor of either Letter Matching or Alphabet Naming.

**Prediction of Words Read**

Table 4.11 presents the regression equation for Words Read. With only three predictors (Concepts About Print, Hours Child Reads, and Conservation) 50% of the variance is accounted for. It requires six more independent measures to reach 61% of the variance of the dependent variable, Words Read. Three variables enter the equation negatively: Conservation Assessment Kit - Conservation, Asks Help in Spelling, and Mother's Education, but only the last enters negatively in its own right.

Here again, IQ is noticeable for its absence, while the parent's education is noticeably present in this equation but in none other.

**Prediction of Sentences Read**

Table 4.12 presents the best predictors for the criterion Sentences Read. Concepts About Print again enters the regression first, accounting for one third of the criterion's variance. With the addition of five more predictors, efficiency is
<table>
<thead>
<tr>
<th>Step</th>
<th>Predictor</th>
<th>Mult R</th>
<th>Shrunken R Population</th>
<th>Shrunken R Cross Validation</th>
<th>Variance Accounted For Total</th>
<th>Variance Accounted For Increase</th>
<th>Weights</th>
<th>Standard Score</th>
<th>Raw Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concepts About Print</td>
<td>.601</td>
<td>.592</td>
<td>.573</td>
<td>.361</td>
<td></td>
<td>.281</td>
<td>.383</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Time Looks at Books</td>
<td>.687</td>
<td>.673</td>
<td>.651</td>
<td>.472</td>
<td>.111</td>
<td>.290</td>
<td>.009</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Concept Assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kit - Conservation</td>
<td>.712</td>
<td>.694</td>
<td>.666</td>
<td>.507</td>
<td>.035</td>
<td>.454</td>
<td>.434</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Inventory of Literary</td>
<td>.729</td>
<td>.706</td>
<td>.672</td>
<td>.531</td>
<td>.024</td>
<td>-.187*</td>
<td>-.249</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Background</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sex</td>
<td>.739</td>
<td>.711</td>
<td>.670</td>
<td>.546</td>
<td>.015</td>
<td>.245</td>
<td>2.701</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Father's Education</td>
<td>.746</td>
<td>.712</td>
<td>.664</td>
<td>.557</td>
<td>.011</td>
<td>.267</td>
<td>.618</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Mother's Education</td>
<td>.755</td>
<td>.716</td>
<td>.661</td>
<td>.570</td>
<td>.013</td>
<td>-.241</td>
<td>-.676</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Attempts to Write Words</td>
<td>.764</td>
<td>.720</td>
<td>.658</td>
<td>.584</td>
<td>.014</td>
<td>.176</td>
<td>3.884</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Asks Help in Spelling</td>
<td>.779</td>
<td>.733</td>
<td>.665</td>
<td>.607</td>
<td>.023</td>
<td>-.181*</td>
<td>-.4561</td>
<td></td>
</tr>
</tbody>
</table>

*Suppressor Variable

A Weight -2.994
increased to 51.6 percent. Only one suppressor may be noted in the table (Literary Background) which also was a suppressor in the previous equation for Words Read.

A comparison of Words with Sentences reveals almost identical initial entries, five of the six entries listed for Sentences appear in the same order of entry for Words. The sixth, Time Mother Reads to Child is seen to enter only this equation. It adds no predictive efficiency to any other criterion.

Prediction of Total Correct

Table 4.13 presents the best predictors for the criterion Total Number Correct. Concepts About Print enters first, as it has with each previous regression equation, accounting for 46% of the criterion's variance. With the addition of seven more predictors, efficiency is increased to 62.9%. Only one suppressor is found in this equation, Inventory of Children's Literary Background, which also operated as a suppressor in the two previous regression equations (Words Read and Sentences Read).
Table 4.12 Multiple Regression Selection of Variables for Prediction of Criterion Sentences Read

<table>
<thead>
<tr>
<th>Step</th>
<th>Predictor</th>
<th>Multi R</th>
<th>Shrunken R</th>
<th>Variance Accounted For Increase</th>
<th>Weights Standard Score</th>
<th>Weights Raw Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Population</td>
<td>Cross Validation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Concepts About Print</td>
<td>.583</td>
<td>.574</td>
<td>.553</td>
<td>.340</td>
<td>.433</td>
</tr>
<tr>
<td>2</td>
<td>Time Looks at Books</td>
<td>.660</td>
<td>.645</td>
<td>.620</td>
<td>.436</td>
<td>.096</td>
</tr>
<tr>
<td>3</td>
<td>Concept Assessment Kit-Conservation</td>
<td>.674</td>
<td>.652</td>
<td>.619</td>
<td>.454</td>
<td>.018</td>
</tr>
<tr>
<td>4</td>
<td>Inventory of Children's Literary Background</td>
<td>.694</td>
<td>.666</td>
<td>.626</td>
<td>.482</td>
<td>.028</td>
</tr>
<tr>
<td>5</td>
<td>Sex</td>
<td>.706</td>
<td>.673</td>
<td>.625</td>
<td>.498</td>
<td>.016</td>
</tr>
<tr>
<td>6</td>
<td>Time Mother Reads To Child</td>
<td>.718</td>
<td>.679</td>
<td>.623</td>
<td>.516</td>
<td>.018</td>
</tr>
</tbody>
</table>

*Suppressor Variable

A Weight -3.644
A comparison of this equation with that for Words and Sentences reveals their similarity. The first six predictors are identical with the exception of Age which enters the Total Correct equation.

Discussion of Multiple Regression

Concepts About Print was seen to enter every equation first, from Letter Matching to Total Correct, accounting for 21 to 46% of the variance of the criterion being regressed. This indicates the power of this one instrument, a simple 24 question procedure which is utilized while the examiner reads to the subject for approximately 10 minutes interjecting the questions within the natural context of a story being read.

As pictured in Table 4.14, eight other predictors operate differentially when comparing Letter Matching/Alphabet (Pre-reading) with Words/Sentences (Reading). Affording a positive contribution to both equations for Pre-reading but not for Reading are the predictors Reading Children's Magazines, Books from the Library, Electric Company, and Age. On the other hand, positive contributions toward Reading, but not for Pre-reading
Table 4.13  Multiple Regression Selection of Variables for Prediction of Criterion Total Correct

<table>
<thead>
<tr>
<th>Step</th>
<th>Predictor</th>
<th>Multi R</th>
<th>Shrunken R Population</th>
<th>Shrunken R Cross Validation</th>
<th>Variance Accounted For Total</th>
<th>Variance Accounted For Increase</th>
<th>Weights Standard Score</th>
<th>Weights Raw Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concepts About Print</td>
<td>.681</td>
<td>.674</td>
<td>.660</td>
<td>.464</td>
<td></td>
<td>.454</td>
<td>1.153</td>
</tr>
<tr>
<td>2</td>
<td>Time Looks at Books</td>
<td>.747</td>
<td>.736</td>
<td>.719</td>
<td>.558</td>
<td>.094</td>
<td>.361</td>
<td>.021</td>
</tr>
<tr>
<td>3</td>
<td>Inventory of Children's Literary Background</td>
<td>.754</td>
<td>.738</td>
<td>.715</td>
<td>.569</td>
<td>.011</td>
<td>- .178*</td>
<td>- .441</td>
</tr>
<tr>
<td>4</td>
<td>Age</td>
<td>.763</td>
<td>.743</td>
<td>.715</td>
<td>.582</td>
<td>.013</td>
<td>.105</td>
<td>.242</td>
</tr>
<tr>
<td>6</td>
<td>Sex</td>
<td>.779</td>
<td>.750</td>
<td>.710</td>
<td>.607</td>
<td>.013</td>
<td>.140</td>
<td>2.873</td>
</tr>
<tr>
<td>7</td>
<td>Attempts to Write Words</td>
<td>.788</td>
<td>.755</td>
<td>.710</td>
<td>.621</td>
<td>.014</td>
<td>.138</td>
<td>5.644</td>
</tr>
<tr>
<td>8</td>
<td>Time Watching TV</td>
<td>.793</td>
<td>.756</td>
<td>.703</td>
<td>.629</td>
<td>.008</td>
<td>.094</td>
<td>.127</td>
</tr>
</tbody>
</table>

*Suppressor Variable

A Weight -21.714
is afforded by two of the variables: Time Looks at Books, and Sex. Concept Assessment Kit - Conservation plays a duel role operating as a suppressor on the lower (Pre-reading) level and as a contributor for the higher (Reading) level while Inventory of Literary Background is a suppressor for Reading but a contributor in one of the Pre-reading equations. The remaining variables (Attempts to Spell, Asks Help in Spelling, Attempts to Write Words, TV, Father's Education, Mother's Education, Father Reads to Child, Mother Reads to Child, Magazines in Home, Books in Home) enter one or more equations but are not consistent across the dichotomy Pre-reading/Reading.

It should be noted that Verbal IQ, Watching Sesame Street, and Father's Occupation entered none of the regression equations and that both Mother's and Father's Education contributed minimally. The little to no contribution of the three SES variables may be understood in light of the lack of variability of these predictors. But, the lack of any predictive efficiency being afforded
by WPPSI Verbal IQ, while conservation explains a sizeable amount of variance, raises a question concerning the usefulness of verbal IQ as an indicator of the reading achievement of preschool children.

Discussion of Clustering

The multiple correlation matrix pointed to two separate stages in the mastery of the reading process. While the relationship between Letter Matching and Alphabet is .65, significant at the .001 level, there appeared a weaker relationship to reading words orally or reading sentences silently. In like manner, it was seen that reading sentences and words correlated strongly (.86 p<.001). When such happens, there appears evidence for common factor variance, indicating a measurement of something in common. The factor analysis upheld this hypothesis, producing a Factor A and a Factor B which appeared as distinct entities, one appearing to blend into the next in a sequential manner.

This identification of two clusters is upheld when the stepwise multiple regression is employed. Regression analysis indicated differential
Table 4.14 Increase of Predictive Efficiency for Each Criterion Afforded by Individual Predictors in the Multiple Regression Equation

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Letter Mat.</th>
<th>Alpha. Named</th>
<th>Words Read</th>
<th>Sent.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal IQ (WPPSI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concept Assessment Kit-Conservation</td>
<td>8.7%*</td>
<td>4.7%*</td>
<td>3.5%</td>
<td>1.8%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Inventory of Children's Literary Background</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concepts About Print</td>
<td>4.3%</td>
<td>2.4%*</td>
<td>2.8%*</td>
<td>1.1%*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>37.0%</td>
<td>20.8%</td>
<td>36.1%</td>
<td>34.0%</td>
<td>46.4%</td>
</tr>
<tr>
<td>Attempts to Spell</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asks Help in Spelling</td>
<td>.7%</td>
<td>2.4%*</td>
<td>2.3%*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attempts to Write Words</td>
<td>2.6%</td>
<td>1.9%</td>
<td>1.4%</td>
<td></td>
<td>1.4%</td>
</tr>
<tr>
<td>Reads Children's Mag.</td>
<td>4.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Looks at Books</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books from Library</td>
<td>1.8%</td>
<td>1.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Watching TV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.8%</td>
</tr>
<tr>
<td>Watching Sesame Street</td>
<td>2.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watching Electric Co.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father's Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.1%</td>
</tr>
<tr>
<td>Father's Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.3%</td>
</tr>
<tr>
<td>Mother's Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father Reads to Child</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Reads to Child</td>
<td>1.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magazines in Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books in Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>3.4%</td>
<td>1.7%</td>
<td></td>
<td></td>
<td>1.3%</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td>1.5%*</td>
<td>1.5%</td>
<td>1.6%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Total Variance Acc. for:</td>
<td>72.6%</td>
<td>55.4%</td>
<td>60.7%</td>
<td>51.6%</td>
<td>62.9%</td>
</tr>
</tbody>
</table>

*Suppressor Variable
contributions of variables to the dichotomy Pre-
reading/Reading for eight of the predictors. The
factor analysis has also shown evidence for these
two separate clusters. Therefore, it appears that
there are two separate stages toward reading
maturity for unschooled children and that stage two
follows stage one.

Addressing the Null Hypotheses

1. Hypothesis 1 stated that the measures of
cognitive maturity and attainment were not signifi-
cantly related to the total reading score or to the
part scores. Since all cognitive maturity and
attainment measures were significantly related to
either the part or the total scores, Hypothesis 1 is
rejected. However, it must be noted that Verbal IQ
reached significance only in the correlation of
Words and Total, thus entering Factor B in the
factor analysis and not entering the multiple
regression at all.

2. Hypothesis 2 stated that the measures of
child initiative as reported by the parent were not
significantly related to the total reading score or to
the part scores. Three of the measures of initiative were found to be significantly correlated to either total reading or the part scores and each of the six were found to enter the multiple regression of at least one criteria. Therefore the null hypothesis is rejected for these measures of initiative.

3. Hypothesis 3 stated that the measures of television viewing were not significantly related to the total reading score or to the part scores. Two of the measures (TV and Electric Company) were significantly correlated to the Pre-reading Cluster and were found entering the multiple regression as positive predictors of one or both of the components of Pre-reading. The third, Sesame Street was the only variable of the 27 in this study to be completely absent. Therefore, the null hypothesis is accepted for Sesame Street in total and for TV as it relates to Cluster II (Reading) but is rejected for TV Watching and Electric Company in part, as they were found to relate to the lower Cluster I (Pre-reading).

4. Hypothesis 4 stated that the measures of socioeconomic variables used in the research were
not significantly related to the total reading score or to the part scores. None of the socioeconomic variables reached the .05 level of significance when correlated with the criteria. However, six were found to enter one or another of the multiple regression equations but the beta weights were as often negative as positive. Therefore, the null hypothesis cannot be rejected.

5. Hypothesis 5 stated that the personal variables are not significantly related to the total reading score or to the part scores. Both Sex and Age were found to reach significance with all part scores and the total. Each contributed to at least three of the five criteria in the multiple regression. It is to be noted that age is differential in its prediction, entering the Pre-reading Cluster but not the Reading Cluster, except for Total, which has become affected by the lower entry. Therefore, Hypothesis 5 is rejected.
CHAPTER V

SUMMARY, INTERPRETATIONS, CONCLUSIONS, AND RECOMMENDATIONS
FOR FURTHER RESEARCH

Summary

Purpose of the Study

The purpose of this study was to examine the relationship of cognitive, environmental and personal factors to the acquisition of reading skills in preschool children who had not received formal training. It provided a look at what was going on within the environment and within the child who had developed, on his own, to the various stages on the reading continuum leading toward reading maturity.

Measures of the environmental input were achieved through a questionnaire completed by each child's parent indicating the quality of the home surroundings and quality of the personal interactions.
Measures within the child of functioning and initiative were achieved through tests of intellectual performance and achievement. Intellectual functioning was assessed using both Wechsler's and Piaget's theoretical frameworks. Intellectual achievement was assessed using measures of the assimilation of concepts about reading and facts remembered about children's literature.

The investigation focused on the following null hypotheses:

1. The measures of cognitive maturity (verbal IQ and conservation) and knowledge both of children's literature and of basic reading concepts (Taking Inventory of Children's Literary Background, Concepts About Print) are not significantly related to the total reading score or to the part scores.

2. The measures reported by the parent of the child's initiative in reading and writing (Attempts to Spell Asks Help in Spelling, Attempts to Write Words, Number of Hours Spent Reading Children's Magazines, Amount of Time the Child Looks at Books, Number of Books Checked out of the
Library by/for the Child) are not significantly related to the total reading score or to the part scores.

3. The measures of television viewing (Time Spent Watching TV, Time Spent Watching Sesame Street, Time Spent Watching Electric Company) are not significantly related to the total reading score or to the part scores.

4. The socioeconomic variables (Father's Education, Father's Occupation, Mother's Education, Time Spent by Father Reading to the Child, Time Spent by Mother Reading to Child, Number of Magazines in the Home, Number of Books in the Home) are not significantly related to the total reading score or to the part scores.

5. The personal variables (Sex and Age) are not significantly related to the total reading score or to the part scores.

**Procedures and Methods**

The sample. Sixty preschool children from Columbus, Ohio day care centers were selected on the basis of age, lack of formal schooling, and
willingness of the parent to both sign a permission form for testing and complete a questionnaire.

The children, 28 boys and 32 girls, ranged in age from 5 years to 6 years 7 months with the average being 5 years 8 months. Verbal IQ ranged from 84 to 135 with a mean of 111. The father's of these children were well educated, averaging 14.75 years of schooling. This may reflect the fact that Columbus is the home of The Ohio State University and/or the willingness and interest of university students to allow their offspring to be given a series of tests. It is not surprising with this high level of education that the father's occupation averaged 2 on a scale of 1 to 9.

The instrumentation. To measure reading achievement (the criteria) two subtests (Reading Recognition and Reading Comprehension) of the Peabody Individual Achievement Test (PIAT) were administered. The Reading Recognition subtest is an oral measure in which the child matches letters, names alphabet letters, and reads words in isolation. The Reading Comprehension subtest is a silent sentence task. The Recognition subtest was
analyzed as if it were three separate tests: letter matching, alphabet naming, and word reading. The criteria thus became five measures: letter matching, alphabet naming, word reading, sentence reading, and total correct. Raw scores were used for all criteria.

The predictors. Five types of predictors were analyzed in the research. They were measures of (1) cognitive maturity and attainment (2) child initiative (3) television viewing (4) socioeconomic status and (5) certain personal variables. These five classifications of the variables provided the basis for the five null hypotheses.

(1) Cognitive maturity and Attainment. Both a traditional psychometric instrument and a recently developed measure of conservation attainment were utilized to establish cognitive maturity levels. The verbal subtest (only) of the WPPSI provided a traditional IQ score. The Concept Assessment Kit - Conservation provided a measure of the level of cognitive attainment from a Piagetian viewpoint.

Two other instruments were utilized to assess knowledge of the reading process and memory of
children's literature. Concepts About Print examined the child's assimilation of the underlying concepts considered essential to reading while Taking Inventory of Children's Literary Background sampled the child's retention of information gleaned from children's literature.

(2) Child initiative. Measures of the subject's initiative in the areas of reading and writing were collected through a written questionnaire. The parents were asked if their child attempted to spell, asked for help in spelling or attempted to write words. They were asked to report the amount of time the child spent each week looking at books by himself, the hours per month spent reading children's magazines, and the number of books checked out of the library for/by the child each month.

(3) Television viewing. The written questionnaire also contained queries pertaining to TV viewing. The parents were asked to state the number of total hours the child spent watching TV, and the amount of time spent watching both The Electric Company and Sesame Street.
(4) **Socioeconomic status.** The richness of the social and economic environment was ascertained by a questionnaire. The number of years of school completed by both parents, the father's occupation, the time spent by each parent reading aloud to the child, and the number of magazines and books in the home were determined.

(5) **Personal variables.** Two personal differences were obtained from day care directors: the child's sex and age in months.

**Analysis of the data.** All data analyzed, except IQ, were the obtained raw scores from the instruments. The tests used were first subjected to reliability determination. The data then were submitted to correlational analysis, factor analysis, and multiple linear regression analysis by means of The Wherry Multivariate Analyses Program Package of The Ohio State University. It was advisable to establish and to maximize the reliability of the instruments for this specific sample because reliability coefficients were either nonexistent or were inappropriate.
Findings

The findings of this study related to the null hypotheses considered were as follows:

1. The measures of cognitive maturity and attainment were found to operate in a bifurcated manner in relationship to the criteria. Letter Matching and Alphabet Naming were found to form a cluster separate from Words Read and Sentences. Factor analysis indicated that the first two criteria involving letters loaded heavily on Factor A while the second two involving reading saturated Factor B. In the multiple regression, Conservation and Literary Background were seen to load differentially. Conservation acted as a suppressor for the two letter criteria and as a contributor to the two criteria Words/Sentences while Literary Background was found to be a suppressor for Reading but a contributor to one of the Letter cluster criteria.

While it was found that each cognitive measure shared a significant amount of common variance with at least two of the criteria, IQ and Literary Background were noticeably weak, reaching
significance only at the .05 level while conservation hovered at or beyond the .001 for Words/Sentences/Total and Concepts About Print exceeded p. 001 with every criteria.

It would appear that the attainment of conservation is positively related to the higher level reading abilities, its lack of predictability for the lower (Cluster I) skills appears puzzling. Yet, consider that the cognitive attainment of conservation may be more attuned to the meaning emphasis of words and sentence reading than of Letter Matching (which is a visual discrimination task) and Alphabet Naming (which may be a memory task).

It certainly appears that IQ, at least as tapped in this study using WPPSI verbal, is a far less able predictor of reading attainment than any of the three other cognitive measures used. Thus, Livo's (1970) conclusion that the WPPSI was helpful in predicting success in beginning reading but is "not the most effective and efficient test to use" for predictive purposes is upheld. It must be pointed out that this sample consisted of preschoolers with
no formal training in reading. The results might prove different had equal instructional opportunities been provided.

2. Three measures of initiative were found to reach a significant level in the correlative analysis while all six entered at least one multiple regression equation.

The three initiative predictors which significantly correlated with the criteria were Attempts to Write Words, Looks at Books, and Books from the Library. While Writes Words and Books from Library both reached the .01 level with Letter Matching, Time Child Looks at Books attained a p.001 significance with all three Reading criteria: Words/Sentences/Total. Books from the Library varied from .320 (p.05) to .427 (p.001) with the same three reading criteria.

For Cluster I (Letters) each of the initiative predictors was found to enter as a predictor on the multiple regression of one or both except Time Child Looks at Books. Only two (Attempts to Write Words and Time Child Looks at Books enter positively the equations of the Words/Sentences (Reading Cluster).
It would appear that a child's personal initiative to write words may indicate that he is becoming sensitive to the distinctive differences in letters and that this cognizance of higher order structuring may transfer to groups of letters (words) and sentences. Lavine argues that children develop considerable sensitivity to differences in graphic displays by age five simply by having such displays available for their inspection. Thus, the child who can read (Words/Sentences/Total) is spending more time looking at books and checking books out of the library. The high correlation between Books from the Library and Letter Matching and the entry of this predictor on both of Cluster I's multiple regression analysis may indicate the younger group of children for whom an adult (presumably Mother) checks out many picture books. There appears to be no ready explanation for why Reading Children's Magazines only enters the regression equations of the lower level reading skill.

Both spelling predictors enter the regression equations of the lower (letter) cluster. The variable, Attempting to Spell, predicted Alphabet
Naming and the variable Asking Help in Spelling predicted Letter Matching. Consequently, it appears that if a child asks for help in spelling he may be asking the parent "What is this letter, and this one, and this one..." thus attempting to visually classify those features which make this grapheme different from others. On the other hand if the child is attempting to spell, his understanding of the higher order structure of letters is approaching mastery as he attaches a name, from memory, to the grapheme. Results from several studies suggest that children develop a set to search for invariant patterns during which time hints or prompts of a general nature from adults facilitate the discovery of such structure by the learner which in turn, as shown by Lowenstein (1969 as reported in Gibson and Levin) has great transfer power to new problems.

3. Of the three TV viewing predictors, only two were found to be of significance: Total Time Watching TV and Time Watching Electric Company. Both of these correlated highly with the lower cluster (Letters) and were found to enter on one or both of the criteria in the multiple regression,
though Total TV Watching was also found to enter the regression equation for Total Reading. Comparing the correlation of Total TV with Sesame Street, a significance was noted at the .01 level. This information perhaps clarifies why Total TV entered the regression equation of Total Reading. It appears that children at the lower level of reading attainment are watching TV more and do appear to be specifically "tuned in" to the Electric Company. Since the format for this particular program is one which stresses letter naming and spelling, it may fit their interests. It is possible that the more able readers still enjoy Electric Company (Electric Company and Sesame Street were found to be significantly related) but are requesting to watch other programs as well.

4. The socioeconomic variables proved less predictive in this study. While not one of the seven reached a significance level of p. 05, two entered positively in the multiple regression equations and three entered negatively. Father's education afforded the least increase (.007) of nine predictors for Words read and Time Mother
Reads to Child only .012 to the prediction of Sentences. Books in the Home, Time Father Reads to Child, and Mother's Education add negative Beta weights (with increases of -.085, -.011, and -.099 respectively). The first two (Books in Home and Time Father Reads) entered the Lower Cluster (Letters) while Mother's Education correlated negatively with the Words Read criterion.

It would appear that the SES variables as studied here, do not differentiate, for this sample, children with varying degrees of reading ability. In all probability, the lack of variability obtained in such measures as Mother's Education, Father's Education, and Father's Occupation account for this lack of explanatory power.

5. Age was found to be significantly correlated with every criterion and Sex (femaleness) with all but Alphabet. Comparing their entry into the multiple regression equations, one finds sex loading on the Reading Cluster and Age on the Letter Cluster and the Total Correct.

For girls to be better readers in the culture is not surprising given other extensive research
emphasizing this point. For the difference to be this great at this young an age points to the pervasiveness of the causal agents within this cultural environment.

Conclusions

The following conclusions were based upon those findings related to the null hypotheses considered in this study.

1. One cluster composed of Letter Matching/Alphabet, and another composed of Words/Sentences are functioning as a bifurcated dependent variable. The two clusters form two factors (A and B) which "trade off" predictors, sharing few.

The cognitive attainment measure of Concepts About Print is by far the most advantageous predictor of every reading criterion, whether part scores or total. But, Conservation attainment is almost equally predictive of actual reading ability. While Knowledge of Children's Literature correlates significantly with all except Letter Matching, when it enters the multiple regression equation following one or both of the major predictors (Print Concepts and Conservation) it enters negatively, increasing
the prediction of the preceding variables. IQ related significantly only to Words and Total Correct.

Distinctive features from the graphic display are learned during the first stage. As the child's economy of processing increases, a different cognitive relational stage of development is entered. These two stages appear to have both behavioral and environmental differences.

Stage I is distinguished by attention to individual letters: matching, recognizing, attempting to spell and write. The Stage I child watches Electric Company and is aided by magazines in the home.

On the other hand, general intellectual development, the amount and type of experience with print and books appear to contribute specifically to Stage II.

2. Initiative as indicated by the number of books the child gets from the library and the time he actually spends looking at books is an extremely strong correlate of actual reading. Books from the Library and Attempts to Write Words relate to a
significant degree of Letter Matching ability.

Durkin (1966b) had noted the availability of a blackboard in every prereader's home (Oakland, California study) and that reading appeared to begin with an interest in learning to print, then to spell, and only then to read.

Differences in exposure or nurture from adults does not account for these data. Implied is that manipulating and focusing on printed language comprises the substance from which the ability to read develops.

3. Children who scored higher on Cluster I (Letters) were tuned more often to Electric Company while TV viewing time, rather than being a hindrance to reading ability, tended to increase as the child's reading score on each criterion increased. However, TV viewing was less related to the actual reading (Cluster II) than to Pre-reading (Cluster I) and appears across the reading continuum to decrease proportionally as reading ability increases. These results appear to confirm both the Flood (1975 as reported by Rupley, 1977) and Ball and Bogatz (1965) findings that viewing educational television is
a perceptual and conceptual growth experience in which the skills best learned are the ones receiving the most time and attention on the programs.

4. While the SES variables are found in minute quantities as accounting for a minimal percent of the total variance of one or the other of the criteria, none reached a significance in the correlational comparisons. These data however, must be regarded with caution since the distribution was dominated by one level of socioeconomic class. This limitation precludes meaningful conclusions concerning SES as it may have operated in this research.

Elkind's (1974) finding that significantly more father's of early readers read more to their children was not upheld by this research.

5. Both age and femaleness relate positively to reading. For either to correlate with reading, in this culture, is not unexpected. The fact that girls in the U.S. read better than boys is well documented (Dykstra, 1966; Johnson, 1973; and Thorndike, 1973).

It is further apparent from the correlation matrix that mothers and fathers read more to boys
and moreover that girls are not only better readers but also spend more time looking at books. One parent's comment that, "As she learned to read, we stopped reading for her" may indicate a general feeling among parents. Since the girls were reading, the boys needed to be read to. Another explanation may lie within the framework of the culture: boys are expected to be active, girls passive. If this be the cultural cause, women's liberation with its emphasis on eliminating such stereotyping may soon alter research findings.

**Interpretations.**

Research on reading, according to MacGinitie (1969) has two purposes: 1) to understand better the nature of the process of learning to read, and 2) to learn how to make helpful predictions. The present research effort has spoken to both of these objectives.

**Understanding the Process**

Two distinct clusters became apparent in the correlation analysis and were more effectively described through the factor analysis. The two
clusters appear to be two separate stages toward reading attainment, each having separate behavioral and environmental components and each indicating the attainment of a unique higher order structuring system.

Stage I was found to be distinguished by attention to individual letters: a covert mastering of the rule system necessary for the establishment of the concept of invariance. Overtly it was found to be distinguished by activities involving letters: matching, naming, attempting to write and spell. Magazines in the home and, it was inferred, writing materials, along with the viewing of Electric Company, were concomitant with this learning.

Stage II was distinguished by a transfer of the rule-extracting behavior to the larger components of words and sentences. Overtly it was distinguished by a knowledge of children's literature, an interest in looking at books and checking them out of the library. This stage was found to occur in unschooled 5 and 6 year olds who had, for the most part, attained the cognitive stage of
conservation. The Reading Stage (Stage II) was found to be influenced by intelligence and by the presence of a highly educated father.

Thus was documented a two stage process toward learning to read: Stage I involving rule learning of the distinctive features of letters and Stage II focusing on the incorporation of the rule system for extracting meaning from both words and sentences.

Importance of Early Writing

This research provided evidence in support of the importance of the child's early writing and spelling attempts. Durkin (1966b) repeatedly found that early scribbling led to early reading. Gibson and Levin (1975) proposed that the act of trace marking helps the child discover rules for feature sets. Attempts to Spell, Attempts to Write, and Asks Help in Spelling all were found to saturate Factor A (Letter Achievement).

It would appear that more emphasis on the availability and direct encouragement of the use of writing tools at very early ages should be encouraged. A variety of such tracing tools should
be standard equipment for all preschool programs along with the encouragement of their free use.

**Testing for Reading Readiness**

It seems apparent from this research effort that the usual procedure of readiness testing using reading subskills may need to be revised. Highly effective methods are available with which to check growth toward reading maturity in a natural book-reading manner (Concepts About Print). The child is sheltered from a sense of failure if he cannot read and the process consumes no more than 10-15 minutes.

It also seems evident that a knowledge of each child's cognitive stage of development from a Piagetian framework would aid in the determination of which children might be successful with formal reading instruction. Eight children who were *conservers* (scoring 10 or more on the conservation test) read exceptionally well, one scoring at grade level 4.7 on the Reading Recognition subtest on the PIAT and 3.1 on the Reading Comprehension subtest. It must be noted, though, that at least one non-conserver (scoring 0 to 3 on the conservation test)
was able to read sentences silently and respond appropriately by pointing to correct pictures, and five other non-conservers were able to correctly respond to as many as four sight words. Nevertheless, it appears from this research, that those children who are conserving have reached a more mature cognitive level which should be an aid in the attainment of reading skill.

Recommendations for Further Research

To further research in this area, the following studies are recommended:

1. An investigation to refine the socioeconomic contributions to early reading using social process variables (parent aspirations, home verbal interactions, family activities, and home routines).

2. An investigation of the difference between the child's spelling attempts and writing attempts and the relationship each has to the child's budding awareness of the reading process. Each predictor's exclusive contribution needs to be further examined.

3. A study to elucidate the motivational aspects presented here. Are the books checked
out of the library an indication of parental desires for the child or is this an indication of desire on the part of the child to read.

4. A study of Charlotte Huck's Inventory of Children's Literary Background and its relationship to early reading. It would seem advisable to arrange the questions to eliminate a "set" for answering and to improve the instrument's reliability by sampling other comparable questions and through item analysis arriving at a more effective instrument.

5. An investigation to determine the processes in operation and the content being focused on in the intermediate growth stage between Factor A (Cluster I or Pre-reading) and Factor B (Cluster II or Reading). Such research may uncover the processes by which a child shifts from letter consciousness to word consciousness, from letter naming to the extraction of meaning from words/sentences.
APPENDIX A
PARENT QUESTIONNAIRE

1. How many years of school have been completed by the father of this child?______________

2. How many years of school have been completed by the mother of this child?______________

3. What is the father's occupation?______________________________

4. Does the father sit with the child and read aloud to him/her?______Approximately how much time per week?________

5. Does the mother read to the child?_________Approximately how much time per week?________

6. How much time does the child spend in one week looking at books by himself/herself?______________

7. How many hours per week are spent in watching TV?______________

8. Does the child watch Sesame Street?____How much time per week is spent watching Sesame Street?________

9. Does the child watch The Electric Company?____How much time per week is spent watching The Electric Company?________

10. How many books are checked out of the library either for the child or by the child each month?____

11. How many magazines are in the home?________

12. How many hours per month does the child spend reading children's magazines?________

13. Approximately how many books are in the home?________

14. Does your child attempt to spell words?____Does your child ask for help in spelling out words?____Does your child attempt to write words?________
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<td>Front of book</td>
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<tr>
<td>2</td>
<td>Finds print</td>
</tr>
<tr>
<td>3</td>
<td>Where to start reading</td>
</tr>
<tr>
<td>4</td>
<td>Which way to read</td>
</tr>
<tr>
<td>5</td>
<td>That one line follows another</td>
</tr>
<tr>
<td>6</td>
<td>Points to words</td>
</tr>
<tr>
<td>7</td>
<td>Knows first and last part of story</td>
</tr>
<tr>
<td>8</td>
<td>Shows bottom of picture</td>
</tr>
<tr>
<td>9</td>
<td>Shows direction for reading with print inverted</td>
</tr>
<tr>
<td>10</td>
<td>Knows if lines are sequenced correctly</td>
</tr>
<tr>
<td>11</td>
<td>Knows left page is first</td>
</tr>
<tr>
<td>12</td>
<td>Recognizes incorrect verbal sequence</td>
</tr>
<tr>
<td>13</td>
<td>Finds a word with incorrect letter sequence</td>
</tr>
<tr>
<td>14</td>
<td>Finds a word with incorrect letter sequence</td>
</tr>
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<td>15</td>
<td>Explains a question mark (name or function)</td>
</tr>
<tr>
<td>16</td>
<td>Knows the period (name or function)</td>
</tr>
<tr>
<td>17</td>
<td>Knows the comma (name or function)</td>
</tr>
<tr>
<td>18</td>
<td>Know quotation marks (name or function)</td>
</tr>
<tr>
<td>19</td>
<td>Points to two capital letters</td>
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<tr>
<td>20</td>
<td>Finds was and no</td>
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<td>21</td>
<td>Shows one letter</td>
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<tr>
<td>22</td>
<td>Shows one word</td>
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<td>Finds first and last letter</td>
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<td>Shows a capital letter</td>
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<td>Concepts About Print</td>
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<td>Time Watching Electric Co.</td>
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<td>Father's Education</td>
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<td>Father's Occupation</td>
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**TABLE A1 Variable Loadings**

* p < .05; **p < .01; ***p < .001
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LM = Letter Matching (PIAT)  
CAP = Concepts About Print  
CAK = Concept Assessment Kit - Conservation  
E1Co = Time Watching Electric Company  
CMag = Time Reading Children's Magazines  
WRWD = Attempts to Write Words  
MagH = Magazines in the Home  
FR = Time Father Reads to Child

*Suppressor Variable
## TABLE A4 ALPHABET NAMING (AN)

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AN = Alphabet Naming  
CAP = Concepts About Print  
BksH = Books in the Home  
CAK = Concept Assessment Kit - Conservation  
ILB = Inventory of Literary Background  
ElCo = Time Watching Electric Company  
TV = Time Watching TV  
AtSp = Attempts to Spell  
BL = Books from Library by/for Child  
RCI = Reading Children's Magazines  
AHS = Asks Help in Spelling  

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WR = Words Read  
CAP = Concepts About Print  
TCLB = Time Child Looks at Books  
CAK = Concept Assessment Kit - Conservation  
InLB = Inventory of Literary Background  
FEd = Father's Education  
MEd = Mother's Education  
AtWW = Attempts to Write Words  
AHS = Asks Help in Spelling  

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SR = Sentences Read  
CAP = Concepts About Print  
TLB = Time Looks at Books  
CAK = Concept Assessment Kit  
InLB = Inventory of Literary Background  

*Suppressor Variable
TABLE A7
TOTAL CORRECT

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TC = Total Correct (PIAT)
CAP = Concepts About Print
TLB = Time Looks at Books
InLB = Inventory of Literary Background

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