

PSYCHOLINGUISTIC ABILITY
IN THREE- TO FIVE-YEAR-OLDS

by

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ABSTRACT

The purpose of the study was to explore the development of psycholinguistic ability in three- to five-year-old children, where psycholinguistic ability is defined in terms of seven tests of auditory word segmentation and auditory-visual integration of the symbols of literacy.

The study was designed to explore three implicit questions:

(a) developmental trends in the abilities of three- to five-year-olds on tasks of letter knowledge (identifying, naming and writing), hearing letter name sounds in spoken words, and hearing phonemes in spoken words; (b) the appropriateness of the tests for the age groups tested; and (c) the relative difficulty of the tests as a basis for suggesting an hierarchical order.

A total of 75 preschoolers, including 11 three-year-olds, 33 four-year-olds, and 31 five-year-olds, were tested on the following tasks: (1) identifying letters named; (2) naming letters; (3) writing letters from dictation; (4) hearing letter name sounds in spoken words (oral and marking responses); and, (5) hearing phonemes in words (oral and marking responses).

The data were analyzed in terms of the three implicit questions. When scores were analyzed for developmental trends through t-tests, statistically significant differences were found between four- and five-year-olds on all of the tests. Similar comparisons between three- and four-year-olds were not made because of the difficulty of the tests for three-year-olds.

When the appropriateness of the tests was explored, only the test of identifying letter names was considered appropriate for the three-year-olds.

Although even this test was considered somewhat difficult, results of the testing provided evidence that this psycholinguistic ability was beginning to emerge. For four-year-olds, the test of letter identification was considered appropriate. While the letter naming test did reveal some differentiation in performance for this age group, and so was considered marginally appropriate, the other tests were judged too difficult. All of the tests were considered appropriate for five-year-olds, although the two phonemes tests were clearly difficult.

An informal inspection of the data resulted in the following hierarchy for difficulty of the tests, listed from easiest to most difficult: (1) identifying letters named; (2) letter name sounds in spoken words (oral); (3) naming letters; (4) hearing letter name sounds in spoken words (marking); (5) writing letters from dictation; (6) hearing phonemes in words (marking); and (7) hearing phonemes in words (oral). The two last named seemed almost equal in difficulty.

The following observations were made through an analysis of the data:

1. Most of the children from age 5 years 7 months and up were able to identify most of the letters.
2. The ability to write most of the letters appeared to occur quite consistently from age 5 years 9 months.
3. Also from age 5 years 9 months, most children were able to identify letter name sounds in spoken words and to relate these to the printed symbols.
4. The tasks involving auditory word segmentation were the most difficult for all age levels. However, performance in this area appeared to show some stability from age 5 years 9 months.

It was concluded that specific kinds of testing can provide considerable information about preschool children's knowledge in the area of psycholinguistic ability.

Some implications and suggestions for further research were stated.

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CHAPTER I

THE PROBLEM

The purpose of the study was to explore factors in the psycholinguistic development of three- to five-year-old children, where psycholinguistic ability is defined in terms of (a) two tests of auditory word segmentation and (b) five tests of auditory-visual integration of the symbols of literacy.

Specifically, an answer was sought to these questions:

1. What evidence is there of developmental trends in the abilities of three- to five-year-old children on tasks of (a) letter name knowledge (identifying, naming, and writing); (b) hearing letter name sounds in spoken words (oral and marking responses); and, (c) hearing phonemes in spoken words (oral and marking responses)?
2. Which tests appeared to be appropriate or inappropriate to the age groups tested?
3. If the tests were arranged in a hierarchy of difficulty, what would the hierarchy be?

BACKGROUND OF THE PROBLEM

For many years, researchers have been occupied with the investigation of readiness for reading and, more specifically, with the question, "What is the best predictor of reading achievement in Grade One?" An initial approach to the

literature on reading readiness reveals that the number of variables studied is very large. Recently, however, there has been increasing enthusiasm for the idea that the child's status in psycholinguistic development has implications for his eventual reading achievement.

The field of developmental psycholinguistics is, however, quite new. In fact, the first studies of child language that could claim even reasonable scientific rigour were done at Harvard University as recently as the 1960's. These studies have given impetus to others and the literature on developmental psycholinguistics in the early years has expanded a great deal, although it remains sparse.

Logically, the field of developmental psycholinguistics should include information both about a child's oral language production and his oral language reception; and some studies of each category can be found. However, the time appears to be appropriate for studies in which somewhat less global and more refined concepts of psycholinguistic abilities are investigated.

Thus far, for example, most studies on oral language reception define the reception ability as the ability to interpret the global meaning of a speaker's utterances. Not much attention has been paid to oral language reception, in developmental terms, of a child's ability to identify and respond to sounds within words and relate them to the symbols of literacy.

That children's ability to "hear sounds in words" (called variously auditory discrimination, phoneme perception, or word segmentation) and relate them to a letter or groups of letters is related to reading ability has been documented on school age children for many years (Murphy & Durrell, 1963). Some researchers

also believe that the ability to hear sounds in words or segment words presented aurally, without necessarily relating these sounds to the symbols of literacy, is also an important predictor of reading readiness. Durrell and Murphy, for example, in their Murphy-Durrell Reading Readiness Analysis (1964) use a subtest called Phonemes Test in which the child is asked to match the beginning sound of a "key" picture to other pictures. Success in this task is considered evidence of the ability to discriminate the beginning sounds of whole words and also evidence of readiness for beginning reading.

Detractors of the ~~notion~~ that phoneme discrimination is an identifiable factor in reading readiness suggest that the test is simply a measure of intelligence applied in a specific way.

Whatever the correct interpretation of the phenomenon, there is continuing interest in investigating its development over the two or three years prior to formal instruction in reading. A number of approaches have been used, with some researchers involving themselves in in-depth study of the manifestations of auditory discrimination/word segmentation at the aural level, and others attempting to relate the word segmentation factor to the ability to match the sound heard with its representation in the symbols of literacy.

Murphy and Durrell, in the tests developed for their Sound Start (1976) programme, seem to have gone farthest towards measures that provide possibilities for comparing word segmentation abilities at the aural level, word segmentation abilities at the auditory-visual integration level, and various abilities in auditory-visual integration of the symbols of literacy. They have prepared tests to accompany the Sound Start programme that would normally be given as readiness measures to

children who are approximately age 5 years 6 months to age 6 years 6 months. The authors are well known in the reading field and their intuition and judgment give considerable weight to any materials they develop. However, statistical evidence about the tests is limited mainly to what the authors have gathered from children within a rather narrow age band. It would seem advisable for independent researchers to use the tests in a variety of ways and at a variety of age levels. Their administration to children between the ages of three and five years might yield some insights into the gradual development of the various abilities measured and provide, as well, some information about both the value of the tests for such investigations and into any needed adjustments.

SIGNIFICANCE OF THE STUDY

The literature on developmental reading is voluminous. It is probably the largest literature of any in the field of educational theory and practice. Until recently, however, that literature has concentrated mainly on the study of children's reading from kindergarten upward, and given much less attention to the preschool years.

Given the recent interest in early child language as a significant factor in a child's potential school achievement in reading, the time seems to be appropriate to attempt some exploration of links between early specific language abilities at the pre-kindergarten and kindergarten ages and later reading achievement. A large-scale investigation would require the examination of children on selected tests of psycholinguistic abilities at early ages (say, age three) and later

use of the results obtained to study their relationship to school reading achievement once instruction has begun.

At present, little is known about tests of psycholinguistic abilities that could appropriately be used in any large scale studies encompassing a range of the preschool years. Only a few attempts, for example, have been made to examine the specific developmental sequences related to the acquisition of knowledge about letters in the preschool child. Little, in fact, has been done to explore the emergence of this phenomenon in three- to five-year-old children.

The Gibson (1962) developmental study of letter-like forms, although related, focuses only on the visual aspect of letter discrimination. Because the letter-naming task includes an auditory component as well, an investigation should study the emergence of letter knowledge in terms of both the auditory and visual modes.

This study will provide information about children's responses to tests designed to investigate the emergence of letter knowledge at a variety of levels. That information should make it possible not only to draw some conclusions about children's abilities between the ages of three and five, but also to provide a basis for judging the usefulness of the specific tests.

DEFINITIONS

For the purpose of the study, some terms are defined.

Psycholinguistic ability is defined in terms of two tests of auditory word segmentation and five tests of auditory-visual integration of the literacy symbols.

Auditory word segmentation is defined as (a) the ability to echo letter name sounds in words pronounced, and (b) the ability to echo phonemes in words pronounced.

Auditory-visual integration ability is defined in terms of the ability to name letters, identify letter names, write letters to dictation, identify the letter that represents a letter name heard in a word, and identify the letter that represents a phoneme heard in a word.

POPULATION

Subjects for the study were drawn from middle-class environments of the Surrey and White Rock areas of British Columbia. A total of 75 children were tested in the spring of 1977. Only children whose first language was English were tested.

Intact populations were tested at the following daycare and nursery school centres:

Alexandra Children's Centre in Crescent Beach

Christopher Robin Day Care Centre in Surrey

Star of the Sea Preschool in White Rock

Tall Trees Kindergarten in White Rock

Because there were very few five-year-olds attending these schools, most of the five-year-old population was taken from kindergarten classes at the following schools:

White Rock Elementary School in White Rock

Peace Arch Elementary School in White Rock

H. T. Thrift Elementary School in White Rock

All five-year-olds present on the days of the researcher's visit were tested.

LIMITATIONS OF THE STUDY

There were certain limitations to the study. They were:

1. The size of the sample, especially in the three-year-old age band, was small.
2. All students who were present on the specific testing days were tested, but no attempt was made to follow up students who were absent.
3. A small number of the five-year-olds were tested in March and the remainder tested in early June when it was considered necessary to increase the population of that age group.

ORGANIZATION OF THE REPORT

The first chapter includes a general description of the problem, the specific questions to be answered by the study, the background of the problem, a statement about the significance of the study, definitions of terms used, description of the population, statements about the limitations of the study, and an outline of the organization of the study. Chapter Two consists of a review of

the related literature. The third chapter provides a description of the general design of the study. Chapter Four presents the results of the study and an analysis of the data. The fifth and final chapter is a summary of the findings. Some conclusions and implications are also provided in that chapter.

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of literature is presented under the following headings:

(a) Auditory Word Segmentation/Auditory Discrimination; (b) Auditory-Visual Integration in Preschool Children; and, (c) Word Segmentation, Auditory-Visual Integration, and Beginning Reading.

AUDITORY WORD SEGMENTATION/AUDITORY DISCRIMINATION

Some researchers and test developers have used the term "auditory discrimination" to designate the ability to "hear" separate sounds in spoken words and make a connection between them and the printed symbols (either a letter or group of letters), and others have used it to designate the ability to "hear" separate sounds in spoken words without connecting those sounds to specific symbols.

Murphy and Durrell (1963), at Boston University, have investigated the implications of both definitions for reading readiness and reading achievement in the elementary school and they report significant correlations between the auditory discrimination ability and reading.

The Murphy-Durrell line of thinking is supported by some, but not all, reading specialists. In fact, some have argued that the factor Murphy and Durrell have called the "auditory discrimination" skill - especially the "aural" type of skill - is heavily saturated with a general intelligence factor and that

the label is not appropriate. Dykstra (1966), in fact, has argued that many common tests labelled as "auditory discrimination" tests do not test what they purport to test and he is skeptical of their validity.

The argument is by no means resolved and goes on with some shift in labels. One finds, in fact, that since 1970 a number of researchers have focused their attention on the "pure" auditory discrimination skill (calling it "word segmentation" or "phoneme perception"), in an attempt to examine the child's ability to analyze words into phonemes or syllables in an aural task, eliminating the matching of sound to symbol.

Savin (1972), attempting to make a case for syllable instruction for reading, suggested that a pig Latin task was appropriate for determining a child's ability to manipulate phonemes within syllables and would constitute evidence of the child's awareness of phonemes in words. He suggested further that a child's inability to learn the pig Latin task would constitute evidence of the likelihood of reading failure. He did not, however, provide any evidence to support his view.

McNinch (1975) has reported that Liberman et al. (1972) were able to conclude from an analytic experiment that awareness of linguistic and language structures at the phoneme level was in fact difficult to attain. McNinch has also reported that Allen, Rozin, and Gleitman (1972) were also able to conclude that kindergarten children were more responsive to syllable blending than to phoneme blending, evidence that the phoneme blending task was the harder of the two.

Liberman (1973) expressed her conviction about awareness of sound structures when she said that a much more explicit awareness of the sound structure of the language is needed for reading than for listening and she provided some evidence

that children do not in fact have readily available knowledge of this structure. She discussed this problem and made some interesting comments on the importance of the size of segments into which a child can divide a word. Liberman thought that while a child may be able to perceive the phonemic segments in speaking, he may have difficulty relating this phonemic structure to sounds in print. She cited an example of the child's attempting to decode bat, when he has knowledge of both the separate letter names and their corresponding sounds. The difficulty encountered here, she thought, was reflected in abilities required in trying to combine the separate sounds to produce the word bat. Orally, the child will be able to provide each sound (adding the schwa to both consonants). But, in decoding, he is likely to produce five phonemic segments (buh a tuh) to correspond with "the three phonemic segments of the spoken word" (the schwa constituting an extra phoneme). Liberman suggested that it might be the lack of direct correspondence of segmentation at the phonemic level with that at the acoustic level that makes difficult the awareness of word segmentation at the phonemic level. She believed that syllable segmentation might be a more natural task in reading, and that it probably developed earlier.

Liberman et al. (1974) provided evidence to support the hypothesis about the relative difficulty of phoneme and syllable perception.

To test the hypothesis, Liberman and her colleagues conducted an experiment using 135 children: 46 preschoolers, 49 kindergartners, and 40 first graders. A tapping task was designed that required the child to repeat words articulated by the examiner and then to tap out the number of segments in each.

Results showed that the test items were more easily segmented into syllables than into phonemes. While errors on both tasks decreased with successive grade levels, segmentation into phonemes was clearly the more difficult task at each level. The data showed that the phoneme level task was significantly more difficult and that this analysis into phonemes developed later. Both abilities, however, improved sharply during the first grade year.

It was not possible to determine from this experiment to what extent maturation and instruction contributed separately to the changes in these abilities. The findings appeared to indicate, however, that greater intellectual maturity is necessary for phoneme segmentation than for syllable segmentation. Liberman noted also that the ability to do explicit segmentation is necessary for reading, but not for speaking, and that the lack of this ability may account, in some measure, for the difficulty that some children have in early reading tasks. Eventually, the child must be able to make the correspondence between the segments in the spoken form with those in the printed form.

In a follow-up study involving 42 school-age children (21 pairs of twins), Fischer (1975) reported results which clearly demonstrated the importance of Liberman's conclusions. Her data indicated that school-age reading skills are correlated with, and predictable from, preschool language skills. The study was concerned with "the predictability of school abilities" and was part of a longitudinal investigation that examined psycholinguistic skills of white, middle-class children whose language skills had been assessed at age 3. Reading, listening, and speaking skills were tested at the beginning and end of Grade One. These skills were subsequently related to the linguistic skills examined at age 3.

The data were analyzed to determine the major independent predictors for the children at age 6, and to discover if school-age reading skills were related to preschool psycholinguistic abilities.

Results indicated that: (a) phoneme discrimination skill at age 3 was a reliable predictor of vocabulary score at age 6; (b) skill in school-age sentence repetition also was predictable from preschool language skills; (c) listening skills at age 6 were highly related to preschool language scores at age 3. An important finding, in relation to phoneme perception, was that phoneme discrimination showed a highly significant correlation with alphabet recognition ($r = .69$). Phoneme discrimination at age 3 was found to be the best predictor of reading readiness for the child entering Grade One.

Fischer's longitudinal research had been initiated as a study of the "heritability of language" without consideration at the time about further longitudinal investigation. As a consequence, certain variables which might have been pertinent to the follow-up study were not studied initially. Another limitation is that the children studied did not comprise a representative sample. Nevertheless, however tentative some of the conclusions might be, some important results regarding psycholinguistic skills were drawn.

Among the significant conclusions was that "phoneme discrimination" (or word segmentation) correlated significantly with reading readiness and with later reading achievement. The indication is strong that results from school-age reading tests correlate significantly with those from preschool psycholinguistic tests of word segmentation and, further, that school-age reading and language skills are related to abilities in all components of early language. Fischer suggested,

in summary, that reliable testing of preschool language skills can have significant potential as an instrument of diagnosis and prediction for school-age language abilities.

AUDITORY-VISUAL INTEGRATION IN PRESCHOOL CHILDREN

As has been noted, the ability to segment words into their phonemes and syllables from an aural presentation has interested both writers of readiness tests and psychologists interested in the development of children's word segmentation abilities over the years.

Other researchers have focused their attention on the level in which aural word segmentation and "phonics" ability come together in a level called here "auditory-visual integration of the symbols of literacy."

Letter and phoneme perception was studied by Calfee, Chapman and Venezky (1972). Interested in the findings about letter knowledge as the best predictor of reading readiness "re-discovered" in the U.S.O.E. Studies (Bond & Dykstra, 1967), their research was conducted on the assumption that there is a collection of cognitive abilities essential to reading acquisition. They referred to cognition not in terms of theory, but as being similar to the approach known as human Information processing. A first grade reader, for example, must, they thought, have a variety of prerequisite cognitive skills if he is to translate abstract visual symbols into written language.

The principal assumption, then, on which the research was based was that "separable and independent performance skills" exist which are prerequisite to reading acquisition. The focus of the experiment was on the decoding process,-- that is, on translation from the printed to the spoken form. An attempt was made to identify the fundamental processes involved in each of the skills tested at the early developmental stages of the reading process. Primarily, the experiment was an indepth study aimed at uncovering the psychological processes involved in a "limited set of cognitive skills." Another goal was the development of better teaching procedures based on the knowledge gained about the reading process. Prediction in terms of later reading achievement was only a secondary aim of the research.

The researchers examined the performance of children at the readiness and initial stages of reading. Skill areas were delimited; then subtests were designed which could sample each skill in various contexts. Single-letter matching tests, for example, were administered in both simultaneous and successive modes. Testing procedures were kept as simple as possible, and a basal level of performance was established.

The following areas of cognitive functioning were examined: matching of visual forms, auditory-phonetic identification, letter-sound association, vocabulary knowledge, and general achievement. A group of 21 kindergarten children were tested at one-month intervals between November, 1968, and January, 1969. In March, 1969, a second group, consisting of 22 kindergartners, was tested to replicate the study on the basis of the findings which were more noteworthy in

the first group. The data of specific interest here are those related to auditory phonetic identification and letter-sound association.

To make use of letter-sound correspondences, the authors assumed, a child must be able to identify and analyze strings of letters and their phonetic equivalents. Generally, children were unable to deal with phonetic segments. The reasons for this difficulty were not apparent to the researchers. A relationship between segmentation tasks and alphabet-production tasks appeared to exist, indicating, the researchers said, that both were "tapping the same set of acoustic-phonetic skills." Evidence of the importance of the acoustic-phonetic skills for later reading achievement seemed to be provided, in some measure, by the discovery of this relationship.

The researchers believed that problems in this area are more likely to be cognitive than perceptual and that the characteristic difficulty here is cognitive confusion and the resultant lack of a system. This difficulty, they felt, was largely a failure in the ability to analyze, abstract, and generalize. They also concluded that results of the alphabet-learning tests provided evidence that children who cannot identify alphabet letters, and who cannot make the proper letter-sound correspondences, are unprepared for later paired-associate tasks in beginning reading.

On the whole, it was found that skills in segmentation, sound-matching, and sound-symbol association are not well developed in most kindergartners and that children do not tend naturally to segment words into phonic elements. The authors conceded, however, that their testing procedures may have been at fault.

Correlational data on the relationships between the skills tested and later reading achievement were not available at the completion of this experiment.

Another study that provides insight into auditory-visual integration was done by Read (1971). He suggested that some preschool children have "an unconscious knowledge of aspects of the sound system of English" and that they are able to "organize phonetic segments into categories defined by articulatory features." He stated that in learning a language, children eventually master the regular processes of the sound system. This mastery, he thought, enables the child to pronounce a new and unfamiliar word which fits into the general phonological patterns governing the language. How this unconscious mastery is acquired is not clearly understood.

A child's spelling, according to Read, represents knowledge of an organized phonological system. Evidence of this was drawn from the invented spellings of preschool children, from age three-and-one-half. First, the children learned the alphabet letter names, and then began to spell, using blocks. It was found that children were able to organize certain phonetic contrasts and similarities and that they possessed a system of phonetic relationships that had not been taught to them, but from which they could abstract to invent spelling.

Read hypothesized that a child gradually masters spelling representations that are systematically related to phonology. He then attempted to provide an explanation, derived from analyses of the invented spellings, to demonstrate the children's understanding of sound-structure.

An analysis of children's representations of vowels showed that they were able to organize vowels by analyzing their phonetic features. Read suggested that such knowledge is probably more important, initially, than the establishment of various spelling habits learned through practice.

Other conclusions drawn from Read's descriptive analysis of invented spellings were:

1. Children were able to provide consistent spellings for segments that could be represented by various vowel combinations (ovin/oven, cerit/carrot).
2. Invented spellings showed systematic categorization of vowels according to properties of articulation.
3. Spelling is a "rule-governed" behavior, which implies that it is the principle--not individual spellings--which must be learned.
4. Children were able to abstract relevant principles through their perception of phonetic contrasts.
5. Children were able to distinguish letter names from the sounds represented by the letters.
6. Where children had limited phonetic perceptions, they were still able to abstract from these in a systematic way.
7. Although children did not know phonological rules of standard spelling, they did have tacit knowledge of a system of phonetic relationships that had not been specifically taught to them.

In summary, Read concluded that learning to spell is not solely a process of acquiring certain spelling habits. Furthermore, the child who enters school already has unconscious knowledge of phonological principles and relationships. Eventually, however, the child learns that the standard spelling system is different from his own. At this stage, he becomes aware that a spelling principle may conform to an abstract form, rather than directly to what he hears.

Read's final conclusion was that "learning to read and write are matters of knowledge rather than habit."

Chomsky (1974) provided evidence similar to Read's about children's ability to organize knowledge of phonology in a systematic way. In order to examine the invented spellings of young children, she collected stories, letters, and other samples of their spontaneous writing. Data were reported descriptively, without being subjected to statistical analysis. From the spelling these children provided, it was possible to gain considerable knowledge about how children process language. She concluded that samples of children's writing provided reliable insight into the systematic ways in which children categorize their knowledge of the sound structure. Such samples have supplied evidence that children can perform sophisticated linguistic tasks. The samples also provided important knowledge about children's phonological development. Chomsky felt that reading could effectively be introduced through a writing method. Some supportive empirical data on extensions of this kind of work by Chomsky could have considerable significance for understanding language acquisition and its relationship to reading.

Knowledge of preschool children's ability with regard to phoneme-grapheme correspondences was also studied by Lamb (1976). Children from a campus nursery school were given tasks designed to assess their ability to represent consonants in initial and final positions, and certain vowel sounds in medial positions. The selection of words for these spelling tasks was made according to evidence provided by Read and Chomsky.

Sixty-eight children, from three-, four-, and five-year-old classes, participated. Because they were selected from a campus nursery school, they were not considered a representative sample. Materials were plastic letters and a magnetic board. Each child was required to arrange, in correct sequence, the letters of his first name; provide the first letter of his last name; and, arrange the letters in alphabetical order. Those children who performed adequately or better were given the sounds test.

Some specific results were:

1. Of 28 three-year-olds, two boys and two girls could spell their first names correctly. One boy and three girls were able to identify the first letter of their last names. Eight boys and five girls knew all the letters.
2. In the four-year-old group, nine boys and nine girls (in a group of 21 children) were able to spell their first names and provide the first initial for their last names. Ten girls and 10 boys knew all the alphabet letters.

3. Of the 19 five-year-olds, 14 boys and five girls could spell their first names; three girls and 10 boys could spell their last names; and, 13 boys and five girls knew most or all of the alphabet letters.

This indicated that it is possible to gather considerable information on the knowledge that preschool children possess regarding phoneme-grapheme correspondences. Results of phoneme-grapheme knowledge were tabulated according to age and sex, both factors which were found to be less significant than had previously been thought with respect to certain areas of language development.

WORD SEGMENTATION, AUDITORY-VISUAL INTEGRATION, AND BEGINNING READING

Since 1964, Durrell and Murphy have embarked on a programme of research and writing designed to refine and capitalize on their earlier work on reading readiness and the relationship of "hearing sounds in words" to beginning reading levels. Products have been Speech to Print Phonics (1964) and Sound Start (1976).

The latter programme is of specific interest here since it includes a number of tests designed to determine a child's level of achievement on tasks that this review has designated as "auditory word segmentation" and "auditory-visual integration", divided in this way:

Auditory Word Segmentation

1. Ability to hear letter name sounds in words
2. Ability to hear phonemes in words

Auditory-Visual Integration

1. Ability to identify letters named
2. Ability to name letters
3. Ability to write letters
4. Ability to identify letter names heard in spoken words
5. Ability to identify the letter that represents a phoneme heard in a spoken word

Durrell and Murphy (1974, 1975, 1976) have obtained evidence about these tests on several populations of first grade children just prior to their beginning the use of the Sound Start programme. Data are available, then, on children from about the age of five years and up. If these tests were administered to children from age 3 to 6, some evidence would be available about the relative difficulty of the tests and about developmental sequences in children's abilities to perform the tasks. Longitudinal studies could provide evidence about the power of the tests in predicting reading ability.

CHAPTER III

MATERIALS AND PROCEDURES

In this chapter, information is presented on materials, the pilot study, procedures used; and, scoring and projected analysis of the data.

MATERIALS

Materials for this study consisted of seven tests for each child, instructions for the examiner, and several large wax crayons to be used by the children.

The Tests

The major parts of the 1975 unpublished edition of the Sound Start Prereading Phonics Inventory (Murphy & Durrell, 1976), with a letter naming test, and a phoneme test (Murphy & Durrell, 1970), were selected as being the most suitable for the purposes of the study. The tests were:

1. Identifying Letters Named
2. Naming Letters (all lower and upper case letters)
3. Writing Letters from Dictation
4. Letter Name Sounds in Spoken Words - oral response
5. Letter Name Sounds in Spoken Words - marking response
6. Hearing Phonemes in Words - oral response
7. Hearing Phonemes in Words - marking response

Sample tests with instructions for their administration and sample answer sheets are provided in Appendices A and B.

Format of the Tests

The format of each test sheet and answer sheet is described in the following section.

Identifying letters named. This test was a xeroxed copy of the original by Murphy and Durrell. It consisted of a display of 26 rows of lower case letters, each row displaying five letters preceded by a small picture to identify the row. All 26 letters were used. The student recorded his responses on the test sheet. In each case, a response required circling a letter.

Naming letters. This test consisted of two parts. The first part was a display of all 26 lower case letters spaced on an $8\frac{1}{2}$ x 11 inch sheet of manilla tag; the second part was a display of all 26 upper case letters printed on the other side of the sheet. The letters were hand-printed with a black felt pen and were approximately half an inch high, with a 1-inch space between each. Student responses were recorded by the examiner on a separate $8\frac{1}{2}$ x 11-inch mimeographed answer sheet providing space for responses, the student's name, and the name of the school.

Writing letters from dictation. This test was a mimeographed copy of the original by Murphy and Durrell. The test consisted of 26 rectangular blocks on

an $8\frac{1}{2}$ x 11-inch sheet. Each block was approximately $3 \times 3\frac{1}{2}$ inches in size and contained a small drawing, representing the beginning sound of the letter dictated (except for x), on the left-hand side. Four of the vowels represented were long sounds; one was short. The student printed each letter, as dictated, in the appropriate space beside the picture which signified the letter.

Letter name sounds in spoken words (oral response). Since this test required an oral response by the child to a word spoken by the teacher, only an answer sheet was needed to record the student's responses. The answer sheet was an $8\frac{1}{2}$ x 11-inch mimeographed sheet providing space for the student's name, his school name, and two numbered columns for recording the student's responses.

Letter name sounds in spoken words (marking response). This test consisted of 22 rows of letters, each row displaying five letters preceded by a picture to assist the student in identifying the row. The student recorded his response on this test sheet. In each case, a response required circling a letter.

Hearing phonemes in words (oral response). This test required an answer sheet similar in format to the oral section of the letter name sounds test. It consisted of an $8\frac{1}{2}$ x 11-inch mimeographed sheet providing space for the student's name, his school name, and two numbered columns for recording the student's oral responses. The test was derived from the unpublished Murphy-Durrell test, Identifying Phonemes in Words (1970).

Hearing phonemes in words (marking response). This test was a mimeographed modification of the unpublished phonemes test by Murphy and Durrell (1970). It consisted of a display of 24 rows of letters, each row displaying three letters. The rows were separated into two columns (thirteen in one; eleven in the other) distributed on an $8\frac{1}{2} \times 11$ -inch sheet. The student's task was to circle the letter that represented the phoneme pronounced by the examiner.

Content and Purpose of the Tests

Identifying letters named. The purpose of this test was to discover whether a student could identify the letters named. A sample direction was: "Put your finger on the fish. Look at the letters in this row and find O. Draw a circle around O."

Naming letters. The purpose of this test was to discover which lower and/or upper case letters a student could name. The student's first task was to point to a lower case letter and say its name. If the student succeeded in correctly naming 12 or more lower case letters, the upper case letters were not tested, since evidence has shown that this constitutes an easier test. If fewer than 12 lower case letters were correctly identified, the second section, containing the same letters in upper case form, was administered. Directions for the second part were the same as for the first.

Writing letters from dictation. This was a test to determine which letters a student could write correctly from dictation. A sample direction was: "Put your

finger on the star. Write S beside it. If you can't make an S, make an O." Letters written backwards were scored as correct, and a tally was kept of these.

Letter name sounds in spoken words (oral response). This was a test to determine if the child can isolate and identify the letter name sound in a spoken word. A sample instruction was: "This is a big elephant. Say elephant. What letter do you hear in elephant?" (Correct answer: L) The student's oral response was recorded by the examiner on an answer sheet. The letters q, h, y, and w were omitted from this test since no appropriate sample word could be selected.

Letter name sounds in spoken words (marking response). This tested the ability of a student to match the letter name sound he heard in a spoken word with the printed form of that sound. The same letters were tested, in the same order, as were used in the oral section of the test of letter name sounds in spoken words. The student's task was to circle, from a choice of five samples, the letter name sound heard in a word pronounced by the examiner. A sample instruction was: "Put your finger on the pin. Do you have an EXTRA pin? Say EXTRA. Draw a circle around the letter name you hear in EXTRA." (correct answer: X).

Hearing phonemes in words (oral response). This tested the student's ability to isolate and identify the beginning sound of a word. Twenty-four phonemes were used in this test, which was based on the 1970 Murphy-Durrell edition containing 26 phonemes. The letters x and q were not tested here; all vowel sounds were short. Since instructions for the original test were not available, the examiner devised a set of instructions and an answer key to fit the test. Four samples were

done to acquaint the student with the task. A sample instruction was: "What is the first sound you hear in gate? Gate." The student's response was recorded by the examiner on an answer sheet. Either the phoneme, or the name of the letter representing the phoneme, was considered acceptable, and the examiner noted which response was given.

Hearing phonemes in words (marking response). This was a test of a student's ability to match the phoneme heard with the corresponding printed letter. Directions were the same as for the previous test. The student's task was to circle, from a choice of five samples, the phoneme heard in a word pronounced by the examiner. Responses were recorded on a mimeographed sheet by the pupil. Instructions for the first item were: "Mark the first sound you hear in soap. Soap. Draw a ring around soap."

PILOT STUDY

A pilot study was undertaken for two reasons: (a) to provide an informal assessment of the reliability of the tests; and (b) to provide an opportunity for revision of the instructions and an estimate of the time required for their administration.

Six five-year-old students were selected from the kindergarten class at White Rock Elementary School by the kindergarten teacher, who was asked to choose students who would provide a reasonably broad range of abilities. These children were excluded from the final study.

The students were tested during the first week of March, 1977, and again during the second week of March, 1977. Although this was too small a sample size to provide data for a statistical analysis of reliability, it was felt that the results were consistent enough to indicate that reasonable reliability could be expected from the tests used.

The pilot study was useful as well in adjusting test procedures. It was decided, after the pilot testing, that the test, Naming Letters, which had been administered first, would be placed second; and the easier test, Identifying Letters Named, placed first. Scores for both testing sessions are shown in Table 1. The tests are listed in the following order:

- Test No. 1: Identifying Letters Named
- Test No. 2: Naming Letters
- Test No. 3: Writing Letters from Dictation
- Test No. 4: Letter Name Sounds in Spoken Words (oral)
- Test No. 5: Letter Name Sounds in Spoken Words (marking)
- Test No. 6: Hearing Phonemes in Words (oral)
- Test No. 7: Hearing Phonemes in Words (marking)

TABLE I
SCORES OF THE PILOT TESTING

Student	Test Number						
	1	2	3	4	5	6	7
1	26	26	26	22	21	23	24
	226	26	26	22	22	23	24
2	26	22	25	22	22	20	22
	26	23	26	22	22	22	23
3	26	26	25	21	22	23	23
	26	26	26	20	22	24	23
4	26	19	24	19	21	13	17
	26	19	26	22	22	16	21
5	18	7,11	5	22	14	2	5
	21	8,10	5	22	16	2	4
6	14	4,14	8	21	13	9	14
	17	9,12	5	21	10	8	11

Scores in the upper left-hand corner are from the first testing. Scores in the lower right-hand corner are from the second testing. Where two scores are shown in the second column for Test 2, the first refers to lower case letters; the second, to upper case letters.

PROCEDURES

Procedures are explained under two headings: (a) Administration of the Tests, and (b) Schedule of Testing.

Administration of the Tests

The tests were administered individually by the researcher.

Locating of the testing in each school was a separate room or a quiet space set apart. Furniture consisted of a table or desk and two chairs. The student sat on the right of the examiner.

For the oral tests, the examiner recorded the student's responses on an answer sheet. For each test requiring a marking response, the student recorded his response on the test sheet or answer sheet provided. At the end of each testing session, all response sheets were stapled together, identified, and dated.

The students were tested in short sessions lasting about twenty minutes for each student. For some of the younger children, a longer time was needed and, in some cases, a short break was required. No attempt was made to hurry the student. The tests were administered in the same order for each student.

Schedule of Testing

The locations and dates of the testing sessions are shown in Table II.

TABLE II
LOCATIONS AND DATES OF
TESTING

Testing Date	School
Thurs., Mar. 17, a.m.	Christopher Robin
Mon., Mar. 21, a.m.	Christopher Robin
Mon., Mar. 21, p.m.	Alexandra Daycare
Tues., Mar. 22, a.m.	Tall Trees
Tues., Mar. 22, p.m.	Alexandra Daycare
Wed., Mar. 23, a.m.	Tall Trees
Wed., Mar. 23, p.m.	Star of the Sea
Thur., Mar. 24, a.m.	Tall Trees
	Star of the Sea
Thur., Mar. 24, p.m.	Star of the Sea
Mon., June 6, a.m.	White Rock Elementary
Mon., June 6, p.m.	Peach Arch Elementary
Tues., June 7, a.m.	White Rock Elementary
Tues., June 7, p.m.	Peach Arch Elementary
Wed., June 8, a.m.	Thrift Elementary

SCORING AND PROJECTED ANALYSIS OF DATA

All tests were hand-scored by the researcher. Raw scores were tabulated for each test in each age band.

The plan for analysis of data involved calculating means and standard deviations for each test in each age group. Critical ratios were to be computed for the mean scores of each test for four-year-olds and five-year-olds. Informal comparisons were also to be made, within each age group, to answer the questions of the study about the relative difficulty of the tests and their appropriateness to the age groups tested.

CHAPTER IV

ANALYSIS OF DATA

The data were analyzed to answer the basic questions of the study. It was decided, however, that it was inappropriate to utilize the data obtained from the three-year-old children in any but informal analyses.

QUESTION ONE:

EVIDENCE OF DEVELOPMENTAL TRENDS

What is the evidence of developmental trends in the abilities of children on the seven tasks of the study? To obtain the answer to this question, data were analyzed to determine whether or not statistically significant differences existed between scores of four-year-olds and five-year-olds for each of the seven tests.

Results of the analysis for identifying letters are shown in Table III.

TABLE III
COMPARISON OF MEAN SCORES OF FOUR-
AND FIVE-YEAR-OLDS ON IDENTIFYING LETTERS

Group	<u>n</u>	Mean	S.d.	S.e.	t-value
Four-Year-Olds	33	15.51	7.37	1.28	4.6*
Five-Year-Olds	31	22.54	5.26	0.94	

Note. Maximum score = 26

*significant at .01 level

Results showed that there were statistically significant differences between four- and five-year-olds on the test of identifying letters. Apparently the ability grows significantly in children between the ages of four and five years.

An analysis of the scores for naming letters is shown in Table IV.

TABLE IV
COMPARISON OF MEAN SCORES OF FOUR-
AND FIVE-YEAR-OLDS ON NAMING LETTERS

Group	<u>n</u>	Mean	S.d.	S.e.	t-value
Four-Year-Olds	33	10.06	7.04	1.22	3.6*
Five-Year-Olds	31	16.90	7.88	1.41	

Note. Maximum score = 26

*significant at .01 level

Results showed that there were statistically significant differences between four- and five-year-olds on the test of letter naming. Apparently this ability grows significantly between the ages of four and five years.

Table V shows the results of the analysis for writing letters.

TABLE V
COMPARISON OF MEAN SCORES OF FOUR-
AND FIVE-YEAR-OLDS ON WRITING LETTERS

Group	<u>n</u>	Mean	S.d.	S.e.	t-value
Four-Year-Olds	33	6.75	6.55	1.14	5.6*
Five-Year-Olds	31	16.87	8.12	1.46	

Note. Maximum score = 26

*significant at .01 level

These results showed a highly significant difference between four- and five-year-olds on the test of writing letters. This ability appears to grow significantly between the ages of four and five years.

Table VI shows results of the analysis for hearing letter name sounds in spoken words (oral response).

TABLE VI
COMPARISON OF MEAN SCORES OF FOUR-
AND FIVE-YEAR-OLDS ON LETTER NAME SOUNDS
(ORAL)

Group	<u>n</u>	Mean	S.d.	S.e.	t-value
Four-Year-Olds	33	10.12	9.62	1.67	4.7*
Five-Year-Olds	31	19.00	5.29	0.95	

Note. Maximum score = 22

*significant at .01 level

These results showed a highly significant difference between four- and five-year-olds on the test of hearing letter name sounds in spoken words (oral response).

Table VII shows results of the analysis for hearing letter name sounds in spoken words (marking response).

TABLE VII
COMPARISON OF MEAN SCORES OF FOUR- AND
FIVE-YEAR-OLDS ON LETTER NAME SOUNDS (MARKING)

Group	<u>n</u>	Mean	S.d.	S.e.	t-value
Four-Year-Olds	33	8.60	7.26	1.26	4.5*
Five-Year-Olds	31	16.16	6.16	1.10	

Note. Maximum score = 22

*significant at .01 level

These results showed a highly significant difference between four- and five-year-olds on the test of hearing letter name sounds in spoken words (marking response). Apparently this ability grows significantly between the ages of four and five years.

The results of the analysis for hearing phonemes (oral response) are shown in Table VIII.

TABLE VIII

COMPARISON OF MEAN SCORES OF FOUR-
AND FIVE-YEAR-OLDS ON HEARING PHONEMES
(ORAL)

Group	<u>n</u>	Mean	S.d.	S.e.	t-value
Four-Year-Olds	33	4.81	7.25	1.26	4.0*
Five-Year-Olds	31	12.45	8.22	1.47	

Note. Maximum score = 24

*significant at .01 level

Results of this analysis showed a statistically significant difference between four- and five-year-olds on hearing phonemes (oral). Again, the ability appears to develop significantly between the ages of four and five years.

The results of the analysis for hearing phonemes (marking response) are shown in Table IX.

TABLE IX

COMPARISON OF MEAN SCORES OF FOUR-
AND FIVE-YEAR-OLDS ON HEARING PHONEMES
(MARKING)

Group	<u>n</u>	Mean	S.d.	S.e.	t-value
Four-Year-Olds	33	6.21	5.44	0.94	4.5*
Five-Year-Olds	31	13.35	6.64	1.19	

Note. Maximum score = 24

*significant at .01 level

Again, results showed statistically significant differences between four- and five-year-olds on the test of hearing phonemes (marking response).

For all seven tests, there were statistically significant differences between four- and five-year-old children. All of the tests were statistically significant at the .01 level. Apparently the abilities tested develop quantitatively between the ages of four and five years.

QUESTION TWO:

APPROPRIATENESS OF THE TESTS

Which tests appeared to be appropriate or inappropriate to the age groups tested? The data were scrutinized in an informal analysis to obtain an answer to the question of whether or not the tests were appropriate to the age groups measured.

The question was answered partly in terms of the subjective judgment of the examiner and partly in terms of the scores obtained.

Appropriateness of Tests for Three-Year-Olds

The data for three-year-olds were examined in terms of the question of appropriateness of the tests. Table X shows mean scores and standard deviations for three-year-olds for all seven tests.

TABLE X
MEAN SCORES FOR THREE-YEAR-OLDS ON ALL TESTS GIVEN
($\underline{n} = 11$)

Test	Maximum Raw Score	Mean	S.d.
Identifying Letters Named	26	7.72	7.32
Naming Letters	26	3.18	5.60
Writing Letters	26	1.09	1.44
Letter Name Sounds (oral)	22	0.00	0.00
Letter Name Sounds (marking)	22	0.00	0.00
Hearing Phonemes (oral)	24	0.09	0.08
Hearing Phonemes (marking)	24	0.09	0.08

It was concluded from these results that only the test of identifying letters named was appropriate. Even here, with the standard deviation almost equal to the mean, the test was judged too difficult for the age group. However, some children did know some letters names, evidence that this psycholinguistic ability is beginning to appear.

Appropriateness of Tests for Four-Year-Olds

Table XI shows mean and standard deviations for all tests given to the four-year-old children.

TABLE XI
MEAN SCORES FOR FOUR-YEAR-OLDS ON ALL TESTS GIVEN
($n = 33$)

Test	Maximum Raw Score	Mean	S.d.
Identifying Letters Named	26	15.51	7.37
Naming Letters	26	10.06	7.04
Writing Letters	26	6.75	6.55
Letter Name Sounds (oral)	22	10.12	9.62
Letter Name Sounds (marking)	22	8.60	7.26
Hearing Phonemes (oral)	24	4.81	7.25
Hearing Phonemes (marking)	24	6.21	5.44

The conclusion was drawn that the test of letter identification was appropriate, while the test of letter naming differentiated to some extent amongst the children. However, the remaining tests appeared to be too difficult.

It was noted that in the phonemes test originally assumed to be the more difficult (i.e., marking phonemes heard), children obtained a slightly higher score, on the average, than on the oral phonemes test which had initially been placed lower in the hierarchy. Although the pattern of scores made their reliability suspect, this was considered to be an interesting result.

Appropriateness of Tests for Five-Year-Olds

Mean scores and standard deviations for five-year-olds are shown in Table XII.

TABLE XII
MEAN SCORES FOR FIVE-YEAR-OLDS ON ALL TESTS GIVEN
($\bar{n} = 31$)

Test	Maximum Raw Score	Mean	S.d.
Identifying Letters Named	26	22.54	5.26
Naming Letters	26	16.90	7.88
Writing Letters	26	16.87	8.12
Letter Name Sounds (oral)	22	19.00	5.29
Letter Name Sounds (marking)	22	16.16	6.16
Hearing Phonemes (oral)	24	12.45	8.22
Hearing Phonemes (marking)	24	13.35	6.64

Results showed that all of the tests were appropriate for five-year-olds, although the last two tests (hearing phonemes: oral, and hearing phonemes: marking) were clearly difficult.

QUESTION THREE:

HIERARCHY OF DIFFICULTY OF THE TESTS

If the tests were arranged in a hierarchy of difficulty, what would the hierarchy be? The decision about the relative difficulty of the tests was made by informal inspection of the data. Table XIII shows the means and standard deviations for all groups.

On the basis of inspection, the conclusion was reached that the following represented a hierarchy from the easiest to the most difficult test.

TABLE XIII
MEANS AND STANDARD DEVIATIONS FOR THREE-, FOUR-, AND FIVE-YEAR-OLDS
ON ALL TESTS

Test	Maximum Score	Age Group					
		3-Year-Olds ^a		4-Year-Olds ^b		5-Year-Olds ^c	
		Mean	S.d.	Mean	S.d.	Mean	S.d.
Identifying Letters Named	26	7.72	7.32	15.51	7.37	22.54	5.26
Naming Letters	26	3.18	5.60	10.06	7.04	16.90	7.88
Writing Letters	26	1.09	1.44	6.75	6.55	16.87	8.12
Letter Name Sounds (oral)	22	0.00	0.00	10.12	9.62	19.00	5.29
Letter Name Sounds (marking)	22	0.00	0.00	8.60	7.26	16.16	6.16
Hearing Phonemes (oral)	24	0.09	0.08	4.81	7.25	12.45	8.22
Hearing Phonemes (marking)	24	0.09	0.08	6.21	5.44	13.35	6.64

^a_n = 11

^b_n = 33

^c_n = 31

1. Identifying Letters Named
2. Letter Name Sounds in Spoken Words (oral)
3. Naming Letters
4. Letter Name Sounds in Spoken Words (marking)
5. Writing Letters from Dictation
6. Hearing Phonemes in Words (marking)
7. Hearing Phonemes in Words (oral)

Although this pattern was not entirely true for the three-year-olds, it was fairly representative of the overall performance for both four- and five-year-olds. It may be true that Tests 6 and 7 were about equal in difficulty. However, only a collection of data on larger numbers of children could make that conclusion firm.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of the study was to explore psycholinguistic development in three- to five-year-old children and, more specifically, to seek evidence of developmental trends in the abilities of these children on tasks of auditory word segmentation and auditory-visual integration of the symbols of literacy.

SUMMARY OF FINDINGS

The summary is presented in terms of the questions asked.

Question One: Evidence of Developmental Trends

With data from three-year-olds excluded because of low scores, significant differences were found between four- and five-year-old children on each of the seven tests when scores were analyzed through t-tests.

Question Two: Appropriateness of the Tests to the Age Groups

When means and standard deviations were examined, it seemed that only the test of identifying letter names could be considered appropriate for three-year-olds (ages 3.0 to 3.10).

For four-year-olds (ages 4.0 to 4.10), the test of letter identification seemed appropriate. Although the letter naming test did yield some very low scores and so was not entirely appropriate, it did to some extent differentiate

amongst the children. The remaining tests appeared to be too difficult for the majority of this age group.

All seven tests were considered appropriate for five-year-olds.

Question Three: Hierarchy of Difficulty for the Tests

In a hierarchy of the relative difficulty of the seven tests, the order appeared to be:

1. Identifying Letters Named
2. Letter Name Sounds in Spoken Words (oral)
3. Naming Letters in Spoken Words (oral)
4. Letter Name Sounds in Spoken Words (marking)
5. Writing Letters from Dictation
6. Hearing Phonemes in Words (marking)
7. Hearing Phonemes in Words (oral)

The last two tests may be equally difficult.

INFORMAL OBSERVATIONS

On the basis of an informal analysis of the data, a number of observations were made.

1. From about the age of 5 years 7 months, most children were able to identify and name most of the letters.
2. The ability to write most of the letters appeared to occur quite consistently from about age 5 years 9 months.

3. Also from age 5 years 9 months, most of the children were able to hear letter name sounds in words and relate these to the graphic forms.
4. Hearing phonemes was clearly the most difficult task at all age levels. However, mean scores had begun to rise, and standard deviations to fall, by age 5 years 9 months.

CONCLUSIONS

The findings in general appeared to suggest that some preschool children do in fact have considerable knowledge of letters and phonemes and that they are able to integrate this knowledge from the visual and auditory modes. A number of conclusions seem warranted:

1. A letter identification task may constitute the most useful index available of the growth in a child's auditory-visual integration of the symbols of literacy in the preschool years. This conclusion reflects the findings of many studies of reading readiness factors.
2. Clear gains are made in the abilities tested in the months represented by ages 3 years 0 months and 5 years 11 months.
3. Only the test of identifying letters was appropriate to the three-year-olds tested; writing letters, hearing letter name sounds (oral and marking responses), and hearing phonemes (oral and marking responses) were rather difficult for four-year-olds; but all tests seemed appropriate for five-year-olds. They were judged likely to be useful in identifying differences between children at school entrance age.

4. Of the seven abilities tested, those related to auditory word segmentation (hearing phonemes) were the most difficult.
5. Although all of the abilities tested seem to be related, the tests do appear to tap differing aspects of these abilities.

IMPLICATIONS OF THE STUDY

It seems to be possible to gather considerable information about pre-school children's abilities in auditory word segmentation and auditory-visual integration through specific testing. Such information may provide useful diagnostic information for beginning reading programmes.

It seems to be clear, also, that children from an early age in a literate society become steadily more aware of the symbols of literacy. No child who had reached the age of five years identified fewer than eight letters, and only one child of the 33 who had reached the age of four years knew no letters. The researcher considered, therefore, that the results obtained gave support to the idea that knowledge about letter names and letter sounds should be considered to constitute at least part of what is called psycholinguistic ability in young children.

SUGGESTIONS FOR FURTHER RESEARCH

The study suggests some possibilities for further research.

1. The collection should be made of a much larger body of data, on the same age groups, to provide specific information about the reliability of the tests.
2. Further testing, with larger samples, should be done to obtain more information about the same questions as those asked in this study.
3. Larger sampling might be useful in refining observations on the developmental trends noted from the results of the study.
4. A comparison should be made between the predictive value of the tests of the study, other tests of psycholinguistic ability, overall intelligence, and reading achievement in the primary grades.

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APPENDICES

APPENDIX A

TESTS USED IN THE STUDY

Identifying Letters Named

Murphy-Durrell

 v e t o g	 t k y f m
 t l s m q	 b l w m u
 a q n h t	 s g l w h
 e b a i r	 t r f c b
 m r p b h	 d m y h w
 e o a x q	 n g s x h
 c w r n f	 v n s r o
 o i n c s	 r b t w d
 b l s m k	 h r l x g
 i n z u m	 m k b l f
 n c r l h	 m r z o i
 l f p s u	 b r t j x
 f x w d s	 f r q t s

Naming Letters

part one

o x s c i p

t m k z e w

r j f n a h

v u b d l g

q y

Naming Letters

part two

O	X	A	B	T
---	---	---	---	---

C	L	R	I	S
---	---	---	---	---

P	N	F	E	H
---	---	---	---	---

D	M	K	Z	J
---	---	---	---	---

Y	W	G	Q	U
---	---	---	---	---

V

Naming Letters

name _____

school _____

identify lower case (to 12 ✓)

(if not 12 ✓ , then



identify upper case

(response sheet)

Writing Letters from Dictation

Murphy-Durrell

	
	
	
	
	
	
	
	
	
	
	
	
	

Letter Name Sounds in Spoken Words - Oral

name _____

school _____

- | | |
|-----|-----|
| 1. | 12. |
| 2. | 13. |
| 3. | 14. |
| 4. | 15. |
| 5. | 16. |
| 6. | 17. |
| 7. | 18. |
| 8. | 19. |
| 9. | 20. |
| 10. | 21. |
| 11. | 22. |

(response sheet)

Letter Name Sounds in Spoken Words - Marking

Murphy-Durrell

 c d a e o	 g p y j r
 a m o x z	 k t f l h
 o s y b m	 o a e g f
 f r k o c	 r a f m e
 t o p r i	 m b n u o
 h f l d k	 u p v w m
 k i r t y	 s u d w y
 m v u c h	 l t k b h
 r m n u o	 f p l h s
 m f s z r	
 o a e c g	
 w y v n u	
 k n x d b	

Hearing Phonemes in Words - Oral

name _____

school _____

- | | |
|-----|-----|
| 1. | 13. |
| 2. | 14. |
| 3. | 15. |
| 4. | 16. |
| 5. | 17. |
| 6. | 18. |
| 7. | 19. |
| 8. | 20. |
| 9. | 21. |
| 10. | 22. |
| 11. | 23. |
| 12. | 24. |

(response sheet)

Hearing Phonemes in Words - Marking

Murphy-Durrell

1. s t f	14. g k h
2. z t g	15. c y u
3. l s a	16. x p w
4. r b f	17. c a g
5. p r e	18. i d m
6. i v w	19. e b o
7. s m c	20. t b l
8. u b t	21. l f e
9. r k b	22. o t m
10. l b m	23. r n b
11. n j u	24. p h m
12. j t e	
13. s i d	

APPENDIX B

INSTRUCTIONS FOR TESTS USED

DIRECTIONS: Identifying Letters Named

1. Put your finger on the fish. Look at the letters in this row and find O.
Draw a circle around O.
2. Put your finger on the apple. Find S and draw a circle around it. S.
3. Put your finger on the bike. Find T and draw a circle around it. T.
4. Put your finger on the broom. Find A and draw a circle around it. A.
5. Put your finger on the feather. Find R and draw a circle around it. R.
6. Put your finger on the leaf. Find E and draw a circle around it. E.
7. Put your finger on the tent. Find N and draw a circle around it. N.
8. Put your finger on the pencil. Find I and draw a circle around it. I.
9. Put your finger on the cane. Find L and draw a circle around it. L.
10. Put your finger on the key. Find U and draw a circle around it. U.
11. Put your finger on the mitten. Find C and draw a circle around it. C.
12. Put your finger on the ring. Find P and draw a circle around it. P.
13. Put your finger on the mouse. Find D and draw a circle around it. D.
Now come up to the top of the paper on this side.
14. Put your finger on the bell. Find M and draw a circle around it. M.
15. Put your finger on the wagon. Find B and draw a circle around it. B.
16. Put your finger on the cup. Find H and draw a circle around it. H.
17. Put your finger on the balloon. Find F and draw a circle around it. F.
18. Put your finger on the fork. Find Y and draw a circle around it. Y.
19. Put your finger on the elephant. Find G and draw a circle around it. G.

20. Put your finger on the pear. Find V and draw a circle around it. V.
21. Put your finger on the acorn. Find W and draw a circle around it. W.
22. Put your finger on the glass. Find X and draw a circle around it. X.
23. Put your finger on the button. Find K and draw a circle around it. K.
24. Put your finger on the toothbrush. Find Z and draw a circle around it. Z.
25. Put your finger on the knife. Find J and draw a circle around it. J.
26. Put your finger on the hammer. Find Q and draw a circle around it. Q.

DIRECTIONS: Naming Letters

Part One: Lower case letters

Look at the letters on this page. Point to the ones that you know, and say their names.

Part Two: Upper case letters

Now look at the letters on this page. Point to the ones that you know, and say their names

DIRECTIONS: Writing Letters from Dictation

Here are some little pictures with spaces beside them. I am going to ask you to write some letters in these spaces.

1. Put your finger on the picture of the owl. In this space, write O.
2. Put your finger on the star. Write S beside it. If you can't make an S, make an O.
3. Put your finger on the tire. Write T.
4. Put your finger on the acorn. Write A.
5. Put your finger on the ring. Write R.
6. Put your finger on the ear. Write E.
7. Put your finger on the nose. Write N.
8. Put your finger on the iron. Write I.
9. Put your finger on the leaf. Write L.
10. Put your finger on the uniform. Write U.
11. Put your finger on the cat. Write C.
12. Put your finger on the pig. Write P.
13. Put your finger on the dog. Write D.
14. Put your finger on the mouse. Write M.
15. Put your finger on the bird. Write B.
16. Put your finger on the horse. Write H.
17. Put your finger on the fish. Write F.
18. Put your finger on the yarn. Write Y.

19. Put your finger on the goat. Write G.
20. Put your finger on the vine. Write V.
21. Put your finger on the watch. Write W.
22. Put your finger on the box. Write X.
23. Put your finger on the kite. Write K.
24. Put your finger on the zebra. Write Z.
25. Put your finger on the jacket. Write J.
26. Put your finger on the queen. Write Q.

DIRECTIONS: Letter Name Sounds in Spoken Words - Oral

1. We are going to try to hear letter names in words. Say OLD. The chair is very OLD. Say OLD again. What letter name do you hear in OLD?
2. Do you have an EXTRA pin. Say EXTRA. What letter name do you hear in EXTRA?
3. I have a mouse called ESTHER. Say ESTHER. What letter name do you hear in ESTHER?
4. There is a fly on the CEILING. Say CEILING. What letter name do you hear in CEILING?
5. A hammer is made of IRON. Say IRON. What letter name do you hear in IRON?
6. Riding a bike takes EFFORT. Say EFFORT. What letter name do you hear in EFFORT?
7. This pencil belongs to the TEACHER. Say TEACHER. What letter name do you hear in TEACHER?
8. This ring has an EMERALD. Say EMERALD. What letter name do you hear in EMERALD?
9. A tent is sometimes used by the ARMY. Say ARMY. What letter name do you hear in ARMY?
10. We fed leaves to the ZEBRA. Say ZEBRA. What letter name do you hear in ZEBRA?

11. From an oak tree you get an ACORN. Say ACORN. What letter name do you hear in ACORN?
12. We need a fork to eat VEAL. Say VEAL. What letter name do you hear in VEAL?
13. You need a key to ENTER. Say ENTER. What letter name do you hear in ENTER?
14. The tree is near the JAIL. Say JAIL. What letter name do you hear in JAIL?
15. I know a girl called KATE. Say KATE. What letter name do you hear in KATE?
16. If you can fly a kite, you are a GENIUS. Say GENIUS. What letter name do you hear in GENIUS?
17. This feather is from an EAGLE. Say EAGLE. What letter name do you hear in EAGLE?
18. We saw a boat on the BEACH. Say BEACH. What letter name do you hear in BEACH?
19. There was a star on the UNIFORM. Say UNIFORM. What letter name do you hear in UNIFORM?
20. This fish swims very DEEP. Say DEEP. What letter name do you hear in DEEP?
21. This is a big ELEPHANT. Say ELEPHANT. What letter name do you hear in ELEPHANT?
22. This ice cream is PEACH. Say PEACH. What letter name do you hear in PEACH?

DIRECTIONS: Letter Name Sounds in Spoken Words - Marking

For this page, I will say a word and you will say the word after me. Then you will draw a circle around the letter name you hear in the word. If you don't know which letter to circle, just leave it and try the next one.

1. Put your finger on the picture of the chair. This chair is very OLD.
Say OLD. Draw a circle around the letter name you hear in OLD.
2. Put your finger on the pin. Do you have an EXTRA pin? Say EXTRA.
Draw a circle around the letter name you hear in EXTRA.
3. Put your finger on the mouse. The mouse's name is ESTHER. Say ESTHER. Draw a circle around the letter name you hear in ESTHER.
4. Put your finger on the balloon. There is a balloon on the CEILING.
Say CEILING. Draw a circle around the letter name you hear in CEILING.
5. Put your finger on the hammer. The hammer is made of IRON. Say IRON. Draw a circle around the letter name you hear in IRON.
6. Put your finger on the bike. Riding a bike takes EFFORT. Say EFFORT.
Put a circle around the letter name you hear in EFFORT.
7. Put your finger on the pencil. This pencil belongs to the TEACHER.
Say TEACHER. Draw a circle around the letter name you hear in TEACHER.
88. Put your finger on the ring. This ring has an EMERALD. Say EMERALD.
Draw a circle around the letter name you hear in EMERALD.

9. Put your finger on the tent. A tent is sometimes used by the ARMY.
Say ARMY. Draw a circle around the letter name you hear in ARMY.
10. Put your finger on the leaf. We fed leaves to the ZEBRA. Say ZEBRA.
Draw a circle around the letter name you hear in ZEBRA.
11. Put your finger on the acorn. From an oak tree you get an ACORN.
Say ACORN. Draw a circle around the letter name you hear in
ACORN.
12. Put your finger on the fork. We need a fork to eat VEAL. Say VEAL.
Draw a circle around the letter name you hear in VEAL.
13. Put your finger on the key. You need a key to ENTER. Say ENTER.
Draw a circle around the letter name you hear in ENTER.
14. Put your finger on the tree. The tree is near the JAIL. Say JAIL.
Draw a circle around the letter name you hear in JAIL.
15. Put your finger on the scissors. These scissors belong to a girl named
KATE. Say KATE. Draw a circle around the letter name you hear in
KATE.
16. Put your finger on the kite. If you can fly a kite, you are a GENIUS.
Say GENIUS. Put a circle around the letter name you hear in
GENIUS.
17. Put your finger on the feather. This feather is from an EAGLE. Say
EAGLE. Draw a circle around the letter name you hear in EAGLE.
18. Put your finger on the boat. We saw a boat on the BEACH. Say BEACH.
Draw a circle around the letter name you hear in BEACH.

19. Put your finger on the star. There was a star on the UNIFORM. Say UNIFORM. Draw a circle around the letter name you hear in UNIFORM.
20. Put your finger on the fish. This fish swims very DEEP. Say DEEP. Put a circle around the letter name you hear in DEEP.
21. Put your finger on the elephant. This is a big ELEPHANT. Say ELEPHANT. Draw a circle around the letter name you hear in ELEPHANT.
22. Put your finger on the cone. This ice cream is PEACH. Say PEACH. Draw a circle around the letter name you hear in PEACH.

DIRECTIONS: Hearing Phonemes in Words - Oral

Now we are going to listen for the first sound in a word. Let's try a few examples. What is the first sound you hear in GATE? GATE. What is the first sound you hear in GO? GO. What is the first sound you hear in SOUP? SOUP. What is the first sound you hear in TOP? TOP.

1. What is the first sound you hear in SOAP? SOAP.
2. What is the first sound you hear in ZIPPER? ZIPPER.
3. What is the first sound you hear in APPLE? APPLE.
4. What is the first sound you hear in BOAT? BOAT.
5. What is the first sound you hear in PENCIL? PENCIL.
6. What is the first sound you hear in VALENTINE? VALENTINE.
7. What is the first sound you hear in CAKE? CAKE.
8. What is the first sound you hear in TABLE? TABLE.
9. What is the first sound you hear in RUBBER? RUBBER.
10. What is the first sound you hear in MOTHER? MOTHER.
11. What is the first sound you hear in UMBRELLA? UMBRELLA.
12. What is the first sound you hear in JUNK? JUNK.
13. What is the first sound you hear in DOOR? DOOR.
14. What is the first sound you hear in KITE? KITE.
15. What is the first sound you hear in YELLOW? YELLOW.
16. What is the first sound you hear in WINDOW? WINDOW.

17. What is the first sound you hear in GIRL? GIRL.
18. What is the first sound you hear in IT? IT.
19. What is the first sound you hear in EVER? EVER.
20. What is the first sound you hear in LITTLE? LITTLE.
21. What is the first sound you hear in FUN? FUN.
22. What is the first sound you hear in OTTER? OTTER.
23. What is the first sound you hear in NICE? NICE.
24. What is the first sound you hear in HOUSE? HOUSE.

DIRECTIONS: Hearing Phonemes in Words - Marking

On this paper, you will mark the first sound you hear in a word.

1. Mark the first sound you hear in SOAP. SOAP. Draw a ring around it.
2. Mark the first sound you hear in ZIPPER. ZIPPER.
3. Mark the first sound you hear in APPLE. APPLE.
4. Mark the first sound you hear in BOAT. BOAT.
5. Mark the first sound you hear in PENCIL. PENCIL.
6. Mark the first sound you hear in VALENTINE. VALENTINE.
7. Mark the first sound you hear in CAKE. CAKE.
8. Mark the first sound you hear in TABLE. TABLE.
9. Mark the first sound you hear in RUBBER. RUBBER.
10. Mark the first sound you hear in MOTHER. MOTHER.
11. Mark the first sound you hear in UMBRELLA. UMBRELLA.
12. Mark the first sound you hear in JUNK. JUNK.
13. Mark the first sound you hear in DOOR. DOOR.
14. Mark the first sound you hear in KITE. KITE.
15. Mark the first sound you hear in YELLOW. YELLOW.
16. Mark the first sound you hear in WINDOW. WINDOW.
17. Mark the first sound you hear in GIRL. GIRL.

18. Mark the first sound you hear in IT. IT.
19. Mark the first sound you hear in EVER. EVER.
20. Mark the first sound you hear in LITTLE. LITTLE.
21. Mark the first sound you hear in FUN. FUN.
22. Mark the first sound you hear in OTTER. OTTER.
23. Mark the first sound you hear in NICE. NICE.
24. Mark the first sound you hear in HOUSE. HOUSE.

APPENDIX C
RAW DATA FOR ALL TESTS

RAW DATA FOR THREE-, FOUR-, AND FIVE-YEAR-OLDS ON
SELECTED TESTS

Code for Selected Tests

1. Identifying Letters Named
2. Naming Letters
3. Writing Letters from Dictation
4. Letter Name Sounds in Spoken Words - oral response
5. Letter Name Sounds in Spoken Words - marking response
6. Hearing Phonemes in Words - oral response
7. Hearing Phonemes in Words - marking response

TABLE XIV
RAW SCORES FOR THREE-YEAR-OLDS ON SELECTED TESTS
($\underline{n} = 11$)

Age of Child	Test Number						
	1	2*	3	4	5	6	7
3.0	6	0	0	0	0	0	0
3.1	0	0	0	0	0	0	0
3.2	10	0	1	0	0	0	0
3.5	0	0	1	0	0	0	0
3.5	5	0	1	0	0	0	0
3.6	16	10,15	2	0	0	0	0
3.7	16	10,8	5	0	0	0	1
3.8	1	0	0	0	0	0	0
3.8	4	0	0	0	0	0	0
3.10	4	0	1	0	0	0	0
3.10	23	15	1	0	0	1	0
Maximum Score	26	26	26	22	22	24	24

*Where two scores are given, the first refers to lower case letters; the second, to upper case letters.

TABLE XV
RAW SCORES FOR FOUR-YEAR-OLDS ON SELECTED TESTS
($\underline{n} = 33$)

Age of Child	Test Number						
	1	2*	3	4	5	6	7
4.0	24	16	6	0	7	0	4
4.0	21	17	4	1	9	0	9
4.1	1	2,4	1	0	0	0	2
4.1	13	1,3	3	0	4	0	5
4.1	26	22	20	22	21	24	16
4.2	10	10,10	3	2	0	0	0
4.2	15	2,4	2	7	2	0	0
4.3	25	22	15	19	19	22	12
4.3	3	1,1	2	18	6	1	5
4.3	23	9,10	4	6	7	0	5
4.3	17	4,3	1	9	5	0	0
4.3	18	15	11	21	12	4	8
4.4	8	5,1	0	0	0	0	0
4.5	10	8,5	2	2	4	0	0
4.5	20	9,10	2	22	13	14	11
4.6	16	8,10	9	22	15	6	15
4.6	20	16,7	1	10	7	0	0
4.6	8	4,7	5	18	7	0	3
4.6	12	6,9	2	15	9	0	10
4.6	15	21	14	22	9	18	6
4.6	21	15	15	21	14	3	13
4.7	13	11,13	7	0	0	0	0
4.7	26	18	20	22	22	13	12
4.7	0	0	1	0	1	0	0
4.7	3	2,1	1	0	0	0	0
4.8	24	23	25	21	21	16	18
4.8	9	1,1	1	2	4	0	0
4.9	25	18	10	22	20	13	11
4.9	15	12	7	21	19	11	8
4.10	19	12	7	3	6	1	9
4.10	19	7,6	12	0	17	3	5
4.10	16	11,19	9	16	9	9	8
4.10	17	4,4	1	0	1	0	0
Maximum Score	26	26	26	22	22	24	24

*Where two scores are given, the first refers to lower case letters; the second, to upper case letters.

TABLE XVI
RAW SCORES FOR FIVE-YEAR-OLDS ON SELECTED TESTS
($n = 31$)

Age of Child	Test Number						
	1	2*	3	4	5	6	7
5.0	12	2,2	2	0	9	0	3
5.1	14	3,6	2	22	7	5	5
5.1	8	2,1	1	22	1	8	0
5.2	26	21	24	16	20	22	16
5.4	19	6,8	3	22	19	17	9
5.5	26	24	25	22	22	21	24
5.6	23	16	18	18	17	1	9
5.6	24	21	21	21	15	11	12
5.6	26	23	19	20	21	21	15
5.6	25	13	20	22	19	12	13
5.7	25	24	22	22	22	11	13
5.7	20	13	15	22	17	20	15
5.7	24	11,15	18	5	12	3	9
5.8	20	11,13	6	22	12	3	11
5.8	20	11,15	11	14	6	9	9
5.9	26	23	19	19	17	7	15
5.9	26	23	25	20	21	17	21
5.9	25	24	22	22	21	24	17
5.9	26	23	24	22	21	20	15
5.9	26	23	25	22	21	22	24
5.9	26	26	26	18	22	23	24
5.9	22	10,9	11	21	15	2	12
5.10	26	17	19	22	21	7	12
5.10	26	24	19	20	21	9	9
5.10	26	26	26	20	15	22	21
5.11	26	17	20	18	18	12	14
5.11	8	3,3	3	21	2	0	0
5.11	22	14	13	29	27	10	7
5.11	26	21	24	21	21	19	18
5.11	24	23	15	22	19	15	18
5.11	26	26	25	22	20	23	24
Maximum Score	26	26	26	22	22	24	24

*Where two scores are given, the first refers to lower case letters; the second, to upper case letters.