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SELECTED ENVIRONMENTAL FACTORS INFLUENCING
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GRADE STUDENTS.

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THE UNIVERSITY OF OKLAHOMA
GRADUATE COLLEGE

SELECTED ENVIRONMENTAL FACTORS INFLUENCING AUDITORY
DISCRIMINATION SKILLS OF FIRST GRADE STUDENTS

A DISSERTATION
SUBMITTED TO THE GRADUATE FACULTY
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BY
MOZELLE PHILLIPS LEACH

Norman, Oklahoma

1974

SELECTED ENVIRONMENTAL FACTORS INFLUENCING AUDITORY
DISCRIMINATION SKILLS OF FIRST GRADE STUDENTS

APPROVED BY

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DISSERTATION COMMITTEE

TO

All the members of my family, past and present,
who have provided help, encouragement,
and understanding needed for
completion of this study.

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SELECTED ENVIRONMENTAL FACTORS INFLUENCING AUDITORY
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CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

Introduction

The fact that many children have learned to read well in America's public schools is undeniable. The fact that many others have learned to read poorly, or not at all, is also undeniable. Why so many children have failed to learn to read well has been the subject of extensive research. Karlin reviewed research related to reading failure and stated:

Investigations have identified physical and perceptual, intellectual, emotional, language, and experiential factors as possible contributors to reading failure. But all these suggest weaknesses within children and tend to shift some responsibility away from the schools. There is an accumulating body of evidence which shows that the schools have not been doing as well as they might in teaching reading.¹

The lack of adequate programs for the assessment and development of auditory discrimination skills has been an

¹Robert Karlin, Teaching Elementary Reading: Principles and Strategies (New York: Harcourt Brace Jovanovich, Inc., 1971), p. 1.

example of failure on the part of the schools to meet the needs of the children. Essential to the development of such programs is the identification of factors influencing auditory discrimination. Some of these factors are related to characteristics of family patterns. This study investigated the relationships of the occupational level of the head of the household, the length of time the mother has worked outside the home, the level of formal education of each of the parents, the number of children in the family, and the ordinal position of the child in the family to auditory discrimination.

Review of Literature

Pertinent professional literature was reviewed. The three categories of literature reviewed were the extent of unsatisfactory reading achievement, the role of auditory discrimination, and the role of socio-economic and family factors.

Unsatisfactory Reading Achievement

The maximum development of reading potential has been of major concern to American educators. The concern has been well founded, for reliable sources have reported that large numbers of children in every section of the nation have failed to learn to read adequately. Karlin stated:

There are no firm figures on the extent to which reading is a problem, but it is estimated that as many as one third of our school children do not read well

enough to meet the requirements of school and society. In some states and communities where data are available the proportion is even higher.¹

Emery cited a poll indicating that eighteen million adults were unable to understand the questions on such standard forms as applications for a driver's license or for a personal bank loan and concluded:

Reading continues to be the key for learning. Without the basic skill of reading, one is severely limited in his access to society. When too many are limited, society itself has a problem.

Millions in our country are severely handicapped because they read poorly or not at all. The same handicap prevents them from making their proper contribution to society.

At least one child in five is not making satisfactory progress in school because of his reading problem. Two out of five in the major cities are reading well below reading achievement levels expected of their grade and age.²

Summarizing a large number of research projects done to estimate the number of students deficient in reading, Bond and Tinker reported percentages of those considered seriously retarded in reading ranging from ten to twenty-five percent of the children in many schools. Bond and Tinker stressed the importance of proficient reading when its role in various aspects of a person's life is considered:

The ability to read well constitutes one of the most valuable skills a person can acquire. Our world is a

¹Ibid.

²Donald G. Emery, "A Nation's Problems," in Papers on Educational Reform, Vol. II, ed. Jacques Barzun, et al, (LaSalle, Ill.: Open Court Publishing Company, 1971), pp. 45-48.

reading world. It is difficult to discover any activity, whether in school or in the home, in business, in the professions, and even in recreational pursuits that does not demand some, and often considerable reading. In many situations, reading constitutes the indispensable channel of communication with an ever widening world.¹

In an address given to the 1969 Annual Convention of the National Associations of State Boards of Education, U.S. Commissioner of Education James E. Allen, Jr., stated that for more than a quarter of our population education had been a failure. Those individuals had been denied a right--a right as fundamental as the right to life, liberty, and the pursuit of happiness--the right to read. Allen asked for a total national commitment to and involvement in the achievement of the "right to read" and concluded:

Remarkable success has been achieved by our educational system, but so long as there is one boy or girl who leaves school unable to read to the full extent of his capacity, we cannot escape the charge of failure in carrying out the responsibility entrusted to us.²

Extensive research has been done to identify factors which contribute to reading success or failure. Karlin reviewed and summarized more than two hundred such studies. Although the results of the studies were not consistent, there was a measure of agreement among those who interpreted the findings that:

¹Guy L. Bond and Miles A. Tinker, Reading Difficulties: Their Diagnosis and Correction (New York: Appleton Century Crofts, 1967), p. 4.

²James E. Allen, Jr., "The Right to Read--Target for the '70's" in Remedial Reading: Classroom and Clinic, 2nd ed., ed. Leo Schell and Paul Burns (Boston: Allyn and Bacon, 1972), pp. 3-9.

1. There appears to be a small but significant relationship between physical development and success in beginning reading. Girls seem more physically mature than boys, and have a smaller rate of failure in first grade reading.
2. Hearing and visual impairments, poor health and general physical condition can be detrimental in beginning reading achievement.
3. Intelligence is a major factor in learning to read, but possession of high intelligence is no guarantee of reading success. Neither is there one mental age which assures success in reading.
4. Socially and emotionally immature children are less likely to respond satisfactorily to difficult learning tasks than children who have feelings of self-confidence and security.
5. Children with rich language and experiential backgrounds seem to do much better than children with meager ones. Children who participate in activities that are associated with beginning reading seem much better prepared for this learning task than children who have not engaged in them.¹

Auditory Discrimination

One of the factors which has been studied is the child's ability to understand and use the speech symbols which are associated with printed symbols. If there is a lack of understanding of speech symbols, reading may also be adversely affected. As early as 1932 Monroe stated that one of the specific constitutional factors affecting speech was the ability to discriminate the sound of words:

Inaccurate articulation and reading disability may come from a common cause, the inability to discriminate successfully the sound of words. The child models his

¹Karlin, Teaching Elementary Reading: Principles and Strategies, pp. 76-77.

articulation to match the auditory pattern of the word as presented by another. When he can give himself the same auditory stimulus which is given by another person the word will appear to himself to be correctly articulated. If his auditory discrimination is poor, he may confuse similar words in both speech and reading without recognizing the error.¹

In searching for reasons for reading difficulties Monroe² conducted a study of auditory discrimination. In order to determine the influence of poor auditory discrimination upon reading defects, a group of non-readers (N=32) was compared with a group of unselected children (N=32). The reading defect cases, although more mature in both chronological and mental age than the controls, made more errors in auditory word discrimination and had fewer successes in the visual-auditory learning which involved auditory impressions. Monroe found that a poor score on the auditory word discrimination test did not necessarily indicate lack of auditory acuity as measured by tests given during the physical examinations for this study.

Cohen³ stated that the ability to discriminate separate sounds in spoken words were auditory discrimination skills necessary for success in beginning reading. A child's ability to mimic words spoken by a teacher is no indication of

¹Marion Monroe, Children Who Cannot Read (Chicago: The University of Chicago Press, 1932), p. 93.

²Ibid., pp. 93-95.

³Alan M. Cohen, Teach Them All to Read (New York: Random House, 1969), p. 166.

his ability to hear separate sounds in words. He further stated that auditory discrimination, which is not sharpness of hearing and cannot be measured by an audiometer, is adequate for beginning reading when a child can recognize spoken words at the beginning, middle, and end as being the same or different. "If a child knows his letters and can associate a letter with a sound, he is more than halfway to the crucial goal of auditory discrimination."¹

Clark and Richards² cited research which rated weaknesses in auditory discrimination of speech sounds as one of the most important and most frequently occurring factors in poor reading. This research indicated that in most cases of retarded readers with deficiencies in speech, the difficulty was due to lowered powers of auditory discrimination rather than to organic conditions.

Deutsch³ studied the high incidence of reading and other learning disabilities in children from lower socioeconomic circumstances. Such children experience more failure, frustrations, develop more negative attitudes, and

¹Ibid., p. 167.

²Ann E. Clark and Charlotte J. Richards, "Auditory Discrimination Among Economically Disadvantaged and Nondisadvantaged Preschool Children," Exceptional Children 33 (December 1966): 259-262.

³Cynthia P. Deutsch, The Development of Auditory Discrimination: Relationships to Reading Proficiency and to Social Class, Final Report (Office of Ed. [DHEW] Washington, D.C.: ERIC Document Reproduction Service, ED 064 697, June, 1972), pp. 5-7.

have a higher dropout rate than children from higher socioeconomic groups. The task of determining the mediating factors between social conditions and learning performance is primarily an educational problem, and since studies show striking differences in auditory functioning of lower class children between good and poor readers, it is possible that a portion of reading retardation is attributable to auditory problems. Thus development of auditory discrimination may be one of the mediating factors.

Strag and Richmond¹ summarized recent studies on auditory discrimination. Their summary reaffirmed earlier statements that many studies have clearly found a high coefficient of correlation between auditory discrimination and poor reading, that problems associated with auditory dysfunction are not related to anatomy and that the evidence of the studies reviewed indicated overwhelmingly that audition, reading achievement, and socioeconomic status are related. As an extension of the research reviewed, Strag and Richmond studied deprived children and reported that their research agreed with findings of past experiments on the poor ability of deprived children to discriminate between speech sounds but stated that no comparison was made with advantaged peers.

¹Gerald A. Strag and Bert O. Richmond, "Auditory Discrimination Techniques for Young Children," The Elementary School Journal 73 (May 1973): 447-454.

Durrell and Murphy¹ stated that most children who were referred for clinical help in reading because they had not achieved beyond a first grade reading level were unable to discriminate between speech sounds in words. They believed such children could be helped by ear training. In a reported study children having difficulty with reading were given ten minutes of ear training daily for six weeks. At the end of that period their learning gain was almost three times as great as that of a control group matched for intelligence but not given the ear training.

Wepman conducted a number of studies on auditory discrimination and made the following statement:

The ability to discriminate sounds develops rapidly in some children and more slowly in others. A few individuals never develop the capacity to any great degree. Fortunately, in all but the rare child, the skill is developed roughly by the eighth birthday, or the end of the third grade . . .

Essential to the development of auditory discrimination is the ability to retain individual sounds in mind to serve as models for later speech and as part of the phonic act necessary for reading. Both discrimination and retention must reach a satisfactory level of development before the child can use them for accuracy in speaking or for word attack in reading. Fortunately, the two capacities, discrimination and retention, tend to develop simultaneously.²

¹Donald D. Durrell and Helen A. Murphy, "The Auditory Discrimination Factor in Reading Readiness and Reading Disability," Education 73 (June 1955): 556-560.

²Joseph M. Wepman, "Auditory Discrimination, Speech, and Reading," The Elementary School Journal 60 (March 1960): 325-333.

In the same article Wepman pointed out the common misconception about the ability to hear being wholly functional and ready to work as soon as it appears. He stated that this misconception had influenced evaluations of children's readiness for the phonics of reading at a specified time. Wepman also contended that children should be studied as they reach school age to determine whether their auditory discrimination abilities have reached such a level of maturation that they could benefit from phonic instruction or auditory training and that poor auditory discriminators should not be given the same instruction as good discriminators.

Wepman¹ stated that auditory perception involved acuity, understanding, and retention and that while it appeared that each of these elements was relatively independent of the others, that high performance on one did not insure equal performance on another. Based on this study of second grade students, Wepman reported those with adequate articulation and discrimination had a higher mean reading grade equivalent than those with adequate articulation and inadequate discrimination.

Linder and Fillmer² stated that modality preference seems to be affected by maturation, and that young elementary

¹Ibid., p. 327.

²Ronald Linder and Henry Fillmer, Research Generalizations on Receptive Skills (Office of Ed. [DHEW], Washington, D.C.: ERIC Document Reproduction Service, ED 055 751, 1972), p. 7.

children are usually auditory learners. The majority of children who are poor auditory discriminators are experiencing reading difficulties. The view was expressed that auditory discrimination ability may be a more reliable prognostic indicator of success in reading during early school years than reading readiness tests. Readiness tests measure visual acuity and discrimination rather than auditory abilities when the latter is the maturational level at which most children are performing:

Low socioeconomic children have a deficit in all forms of language development. This deficit leads to reading disability. Teachers should remember that a general language problem is involved and not treat the problem as a specific reading disability. Language disabled pupils need wide experience with all types of language. . . . and visual and auditory discrimination. As general language proficiency increases their reading ability will increase proportionally.¹

Durrell and Murphy also stressed the importance of auditory discrimination:

Although there are many factors which combine to determine the child's success in learning to read, it is apparent that his ability to notice the separate sounds in spoken words is a highly important one. Observations in our reading clinic bear out the above findings in intensified form. Almost every child who comes to the clinic with a reading achievement below first grade has a marked inability to discriminate sounds in words. Children who are severely handicapped in this ability seldom achieve primer level in reading. Some are so deficient in auditory analysis that the usual ear training exercises are useless. . . . It is difficult to understand how children with excellent speaking vocabularies, clear enunciation, high intelligence, and training in phonics fail to acquire the ability.²

¹Ibid., p. 8.

²Donald S. Durrell and Helen A. Murphy, "The Auditory Discrimination Factor in Speech and Reading," pp. 556-560.

Role of Socioeconomic Factors

Since 1950 research studies have been less concerned with intelligence and personality and more concerned with abilities associated with reading and environmental conditions which seem to affect children's responses to school learning.¹ Karlin cited studies on the inadequacy of language backgrounds as a factor which contributed to reading failure and related this inadequacy to being socially disadvantaged:

There doesn't seem to be much doubt that the language patterns of children from low socioeconomic groups vary significantly from those of children who come from higher income families. It is possible that for the former group oral language plays a greater role in causing difficulty in reading. Some feel that these children cannot cope with language patterns found in readers, as well as in spoken language used in school, and as a result their reading achievement is adversely affected.²

Heilman stated that as a language function, reading is the manipulation of symbolic materials and is influenced by early language experiences:

Psychologists and other observers of human behavior tell us that the symbolic process is sensitive to pressures of any kind. Language is the most sensitive indicator of personal or emotional maladjustment. Yet in no area of learning in our schools is greater pressure brought to bear on the pupil than in the area of reading. This is partly due to the high value which our society places on education and to the recognition that education is based on reading skill. . . .

Reading is a language process. The child being taught to read must understand the relationship between

¹Karlin, Teaching Elementary Reading, p. 79.

²Ibid., p. 83.

reading and his language. Much has been written about "what the child brings to school" and that the school must build on the skills children have acquired. In the final analysis, the only thing the child brings to school that can transfer to learning to read is the language he uses.¹

Heilman further stated that failure in reading has been the major educational problem of children termed "culturally different," and in this group he included the socially and economically deprived as well as "the leftouts, the alienated ones, the underachievers, children from depressed areas, and the children of the poor."² This discussion continued:

As a potential reader, the culturally different learner will come to school speaking his natural language which is not the language upon which the curriculum was constructed. He may not have the auditory discrimination for some "standard" English phonemes, and he will be much more limited than most middle-class children in his development of readiness-for-reading skills.³

Spache and Spache reported hundreds of federal and local projects which had shown concern for education of children who are culturally or language deprived. Early attempts to stimulate language development through extending school services into preschool years showed some value in stimulating language development and increasing experiential backgrounds:

¹Arthur W. Heilman, Principles and Practices of Teaching Reading (Columbus, Ohio: Charles E. Merrill Publishing Company, 1972), p. 5.

²Ibid., p. 57.

³Ibid., p. 58.

Children who enter school with what is basically an underdevelopment of language ability probably need a somewhat different program than middle- and upper-class children. They need a slower introduction to reading, an extended readiness program. . . . Intensified training in visual discrimination and auditory discrimination prior to, and during early reading has also demonstrated marked values for these children.¹

Goldberg² believed that the expressive style of the lower-class child was often motoric, concrete, "thing oriented" and nonverbal, while the middle class child was more often conceptual, abstract-symbolic, "idea-oriented," and verbal in his style of expression. Deutsch added support to this assumption in declaring that it is the active verbal engagement of people who surround him which is the operative influence in the child's language development:

The structuring of these verbal engagements in terms of the families' conditions and style of life, and the further relationship between styles of life and social class membership leads to the analysis of children's language skills and verbal behavior in terms of their families' socio-economic status.³

Deutsch stated that it is possible to have adequate hearing and still be unable to discriminate differences in

¹George D. Spache and Evelyn Spache, Reading in the Elementary Schools, 3rd ed. (Boston: Allyn and Bacon, 1973), pp. 27-28.

²Miriam L. Goldberg, "Factors Affecting Educational Attainment in Depressed Urban Areas," in Education of the Disadvantaged, ed. A. Harry Passow, Miriam L. Goldberg, and Abraham J. Tannenbaum (New York: Holt, Rinehart and Winston, Inc., 1967), pp. 31-61.

³Martin Deutsch, "The Role of Social Class in Language Development and Cognition," in Education of the Disadvantaged, ed. A. Harry Passow, Miriam L. Goldberg, and Abraham J. Tannenbaum (New York: Holt, Rinehart and Winston, Inc., 1967), p. 215.

stimuli, especially when experience has been limited and language used in the most restricted and concrete sense. Within a deprived home there may often be much noise but relatively little interaction and directed and sustained speech. Much communication is nonverbal; and verbal communication itself is likely to be terse, grammatically incorrect, and monotonous in structure and vocabulary:

Thus, attentiveness to discriminatory cues is less likely to develop, and the economically disadvantaged child may enter school ill-prepared to face auditory demands of the classroom, especially the unfamiliar speech of the teachers and the need for attention to prolonged speech sequences.¹

Clark and Richards² conducted a research study investigating the differences in auditory discrimination abilities of economically disadvantaged and nondisadvantaged preschool children attending a Headstart Program. The disadvantaged (N=29) were children with families in the lowest mean family income level and the lowest mean educational level in the city where the study was done who could not pay the stated enrollment tuition for the program. The nondisadvantaged (N=29) were children whose parents enrolled them in the Headstart Program without solicitation, paid the tuition, and supplied daily transportation. Subjects were tested, using

¹Martin Deutsch, "The Disadvantaged Child and the Learning Process," in Education in Depressed Areas, ed. A. Harry Passow (New York: Teachers College, Columbia University, 1963), p. 180.

²Clark and Richards, "Auditory Discrimination Among Economically Disadvantaged and Nondisadvantaged Preschool Children," pp. 259-260.

the Wepman Auditory Discrimination Test. Based on the findings of the study, conclusions were drawn that preschool economically disadvantaged children exhibit deficiencies in auditory discrimination when compared to a nondisadvantaged group.

Chandler¹ cited studies done with reading success and occupational level of parents. One study showed that 90 percent of the upper-occupational level children were successful in reading while one-third of the children of semi-skilled or unskilled manual laborers were reading below the grade level expected of them. Another study compared reading achievers with underachievers in sixty-nine Denver schools showed that the underachievers were from homes of lower socioeconomic status where parents had had fewer educational advantages.

The above mentioned studies indicated that poor reading achievement and poor auditory discrimination may have common causes in socioeconomic backgrounds and parental educational levels. Another study which further emphasized these findings was done by Harris, using one hundred boys classified as learners and one hundred boys classified as non-learners:

¹Theodore A. Chandler, "Reading Disability and Socio-economic Status" in Remedial Reading: Classroom and Clinic, ed. Leo M. Schell and Paul C. Burns (Boston: Allyn and Bacon, Inc., 1972), pp. 47-65.

Differences in social class proved to be one of the few general factors distinguishing the entire learner group from the entire non-learner group. Taking occupation and education of the father as the prime indicator of social class, we found among the 100 learners a much greater proportion of boys whose fathers had "professional" occupations, or who had some college education. In contrast, among the 100 nonlearners, there was a greater frequency of boys whose fathers had occupations which could be categorized as "semiskilled" or who had not finished highschool. The percentage of fathers who were skilled craftsmen or had a high school education were about the same for both the learners and the nonlearners.¹

Studies related to the educational level of mothers and its impact on the education of the children were scarce. Edwards made the following general statement, which did not differentiate in the education of either parent:

A child who grows up in a severely depressed environment with poorly educated parents and peers is not likely to receive the kind of stimulation to think which would encourage him to flex his cognitive muscles. In a "rich" environment there is frequent dialogue, and language is thus used as the instrument for getting into the thinking processes of the child and stirring them up.²

One study did include comparisons of educational levels of the father and of the mother on educational aspirations of students. In reporting this study Wilson made the following statement:

Looking closely at the effect of the interaction between the education of the two parents, it can be

¹Irving D. Harris, Emotional Blocks to Learning (New York: The Free Press, 1961), p. 13.

²Thomas J. Edwards, "Language-Experience Attack on Cultural Deprivation" in Remedial Reading: Classroom and Clinic, ed. Leo M. Schell and Paul C. Burns (Boston: Allyn and Bacon, Inc., 1972), pp. 410-419.

seen that each makes an independent and cumulative impact of about the same degree.¹

One of the additional factors related to socioeconomic class which showed the same effect on the learning process as the occupational and educational level of the father was whether the mother was employed outside the home. In discussing the effect of working mothers, Harris stated that whether mothers worked to supplement the family income or to improve standards of living, the effects were similar for both the learner and the non-learner:

Low average intelligence test scores were more frequently found for boys whose mothers worked than for those whose mothers did not work. One possible reason for this effect was mentioned previously; namely, the absence of the mother from the home lessens the child-adult communication and that this, in turn, lessens the stimulation of the child's intellect. Furthermore, the child who is thrown on his own uses his learning energy for practical survival purposes rather than for abstract education which may or may not pay off in the dim future.²

When mothers work because of economic necessity, the fact that they work may not represent family conflict. In such cases the child's motivation to learn may be affected. Harris³ stated that mothers sometimes work outside the home for psychological reasons which indicate family conflict and

¹Alan B. Wilson, "Residential Segregation of Social Classes and Aspirations" in Education of the Disadvantaged. ed. A. Harry Passow, Miriam L. Goldberg, and Abraham J. Tannenbaum (New York: Holt, Rinehart and Winston, Inc., 1967), pp. 268-283.

²Harris, Emotional Blocks to Learning, pp. 21-22.

³Ibid., pp. 26-28.

that the absence of the mother may help to produce marked learning problems for children.

In a study of 209 children Johansson¹ found that the percentage of mothers working outside the home did not differ significantly with social class but that there were significant differences in the performance variables, including general school readiness, reading readiness, obedience to school rules and stability, for children of employed and non-employed mothers.

Another factor of importance to the learning process in the Harris² study was the number of children in the family, a factor that has partial socioeconomic determinants since there are more large families in the lower class than in the middle class. His study indicated high intelligence scores were most frequently found for children without siblings or with one or two siblings.

In an explanation for the relation of family size to intelligence, Harris theorized:

Just as the absence from the home of a mother who works may diminish the quantity of intellectually stimulating adult-child communication, so may the distribution of the mother's energies among many children cut down on the amount any one child receives.³

¹Bror A. Johansson, Criteria of School Readiness (Stockholm, Sweden: Almqvist & Wiksell, 1965), pp. 182-186.

²Harris, Emotional Blocks to Learning, p. 22.

³Ibid., p. 24.

Nisbit¹ stated that in any representative sample of the population there existed a negative correlation between the intelligence test scores of children and the size of the family to which they belonged. The only child enjoyed much greater opportunities of contact with adults and of acquiring adult vocabulary. Belonging to a large family implied restricted contact with adults and was a disadvantage which entered into intelligence test performances of children from such families. In large families the first, and perhaps the last, have some advantage over their siblings.

Monroe included ordinal position of the child among siblings of the family as one of the environmental factors which influences reading:

The influence of ordinal position may be an environmental factor in that the only or oldest children probably receive a greater amount of stimulation and extra help from their parents during their first years at school than do the later born children, or there may exist not environmental but biologic factors which affect the later born children with regard to certain types of organic deviation.²

Robinson³ also reported a study on ordinal position which agreed with Monroe's findings. Among her subjects there were fewer only or oldest children with learning problems

¹John Nisbet, "Family Environment and Intelligence," in Education, Economy, and Society, ed. A. H. Halsey, Jean Floud, and C. Arnold Anderson (New York: The Free Press of Glencoe, 1961), pp. 273-287.

²Harris, Emotional Blocks to Learning, p. 22.

³Ibid., p. 24.

than children who were intermediate or youngest.

In studying sibling pairs, Koch¹ found the elder to exhibit better articulation, but to be less social than the last born. Koch attributed this to the premise that parents are less restrictive with the second child.

In discussing the effect of the order of birth in socialization, Rosen² stated that parent interaction with the first born child is likely to be more continuous and intense than with latter born children. Rosen agreed with Monroe that parents are generally more available to the early born child because of fewer competing demands for time and attention:

The first born child tends to be trained early in mastering his environment. In part, this is because he is the sole object of parental attention and expectations; . . . Of course, the youngest child may also receive considerable training in independent mastery, for with approaching freedom from child care the mother tends to accelerate the youngest child to the level of mastery attained by his elder siblings. But the effects of this training may be vitiated by the excessive indulgence which youngest children tend to receive. . . .

Little is known about the socialization of the intermediate child. Perhaps this is because the intermediate child is not so much a fixed position in the birth order as a residual category. The intermediate child could be any one of several children in the ordinal distribution.

¹Helen L. Koch, "Some Personality Correlates of Sex, Sibling Position and Sex of Siblings Among Five- and Six-Year-Old Children," Genetic Psychology Monographs LII (1955): 3-50.

²Bernard C. Rosen, "Family Structure and Value Transmission," in Society and Education, ed. Robert J. Havighurst, Bernice L. Neugarten, and Jacqueline M. Falk (Boston: Allyn and Bacon, Inc., 1967), pp. 86-95.

Despite this ambiguity, there has been some speculation that there is less pressure on the intermediate child to conform to levels of mastery attained by his siblings, and less anxiety about his development.¹

These findings did not deal directly with relationships of socioeconomic factors to auditory discrimination. However, they were reported because it was the purpose of this study to view auditory discrimination in the light of the stated environmental factors.

¹Ibid., pp. 86-95.

CHAPTER II

THE STUDY

Statement of the Problem

The problem dealt with the question of whether or not auditory discrimination of children was related to the occupational level of the father or head of the family, the length of time that the mother has worked outside the home, the educational level of each of the parents, the number of siblings, and the order of birth.

The specific questions studied were:

1. Are there significant differences in auditory discrimination, as measured by the Wepman Auditory Discrimination Test, related to the occupations of heads of families, as classified by the "Census Classification of Occupations" developed by Eells and others?
2. Are there significant differences in auditory discrimination related to the length of time the mother has worked outside the home?
3. Are there significant differences in auditory discrimination related to the number of years the father has attended school?

4. Are there significant differences in auditory discrimination related to the number of years the mother has attended school?

5. Are there significant differences in auditory discrimination related to the number of children in the family?

6. Are there significant differences in auditory discrimination related to the order of birth in families with more than one child?

Limitations of the Study

This study was limited to first grade students with hearing in the normal range as determined by audiometric evaluations given under the supervision of a pediatric nurse through the Tulsa County (Oklahoma) Early Childhood Education Program, a Title III ESEA Program, during the school year of 1971-72. It was limited to Caucasian children who attended first grade in the same school where they had been screened during their kindergarten year. No child lived in a home where a language in addition to English was spoken. The children had not attended a preschool as operationally defined. The parents had to complete the questionnaire which was sent to them. A copy of the questionnaire is in Appendix A.

Definition of Terms

The following terms were used in accord with the definitions stated here:

1. Auditory acuity was the ability to hear sounds of varying pitch and loudness, according to the definition of Spache and Spache.¹

2. Auditory discrimination was the ability to recognize the likenesses and differences that exist in the phonemes of English speech. Auditory discrimination was measured by the Wepman Auditory Discrimination Tests² (Appendix B).

3. Adequate auditory discrimination was the ability to score fewer than the number of errors stated for each chronological age developmental level of the Wepman Auditory Discrimination Test.

4. Inadequate auditory development was the scoring of more than the number of errors stated for each chronological age developmental level on the Wepman Auditory Discrimination Test.

5. Occupational Levels were as identified by the classification of occupations as given in the "Census

¹Spache and Spache, Reading in the Elementary School, p. 69.

²Joseph M. Wepman, Auditory Discrimination Test, Manual of Directions (Chicago: University of Chicago Press, 1958).

Classification of Occupations," by Eells, et al.¹ (Appendix C).

6. Siblings were considered as the children forming a single family unit, regardless of blood relationship.

7. Pre-schools, or nursery schools, were defined as programs which were primarily designed to meet educational needs, as contrasted with programs which were designed primarily as child care, such as baby sitting services or child care centers.

8. Educational level of parents was considered as the number of years the parents had attended school. Special training was included, but short term or apprentice training was not.

Statement of Hypotheses

With the acceptance of the basic assumptions that the Wepman Auditory Discrimination Test has been sufficiently tested to demonstrate its worth in measuring auditory discrimination and that the "Census Classification of Occupations" by Eells and others had established its value as a worthwhile instrument for the categorization of occupational levels, the following hypotheses were formulated:

¹Kenneth Eells, Allison Davis, Robert Havighurst, Virgil Herrick, and Ralph Tyler, Intelligence and Cultural Differences (Chicago: The University of Chicago Press, 1951), p. 95.

1. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the occupational levels of the heads of the families, as categorized by the "Census Classification of Occupations."

2. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the length of time the mother has worked outside the home.

3. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of years the father has attended school.

4. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of years the mother has attended school.

5. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of siblings in a family.

6. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the ordinal position of the child in the family.

Selection of Subjects

Permission was requested and secured from the Tulsa County Early Childhood Education Program, A Title III ESEA Project, to examine and use the results of the auditory acuity tests given to the kindergarten children of Tulsa County Schools during the school year of 1971-72. The tests were given under the supervision of a pediatric nurse and a trained audiologist. The children were given both a pure tone audiometric evaluation and a Verbal Auditory Screening for Children (VASC).¹ This test was developed in 1959 by the Minnesota Medical Association's Committees on Ophthalmology and Conservation of Hearing to circumvent the use of abstract sound of the pure tone audiometer with children who either lack motivation or ability with pure tone. Results for these two tests were available for approximately 750 children. Lists of the test results were compiled according to the schools which had been attended by the children. In order to facilitate the testing of the children, it was arbitrarily decided that children would have to be attending the schools in which they had been tested.

The screening tests had been offered by the Tulsa County Early Childhood Education Program to the sixteen county schools served by the Project. One of the schools had

¹Terry S. Griffing, Kinsey M. Simonton, and Leroy D. Hedgecock, "Verbal Auditory Screening for Children," Minnesota Medicine 45 (January 1962): 34-36.

declined the services offered because it had a school health program which provided most of the services. One school did not wish to be served by a federal project, one had only four children in its kindergarten, and one was a parochial school. An arbitrary decision was made to eliminate the last two from further consideration in the study. The decision was made because it was known that two of the children in the smallest school had planned to move at the end of the kindergarten year, and it was decided to restrict the study to the public school systems. A list of the remaining twelve schools cooperating in the study is to be found in Appendix D.

Lists of students in the twelve schools were examined to remove the names of children with hearing considered to be outside the normal range as determined by either of the auditory acuity tests. The names of all children who had not been present for both the pure tone audiometric evaluation and the VASC were also deleted. The remaining names were then assigned a code letter for the school and a number.

To assure that each child tested had an equal chance to be chosen as a subject, the coded numbers were placed in a receptacle and two hundred fifty of the approximately six hundred names were randomly selected. Lists of the children drawn were compiled by the schools attended.

Superintendents, principals, and teachers of each of the schools involved were contacted personally, and the study explained. Cooperation on all levels was pledged. In schools

which required official permission from the school board to conduct such a study, arrangements were made by the administrator to ask for permission.

A questionnaire to be sent home with the children and filled out by the parents was developed. An attempt was made to keep the form as uncomplicated and as concise as possible and yet obtain the information needed for the study. The questionnaire can be found in Appendix A.

As soon as permission at all necessary levels had been obtained, the questionnaires were placed in envelopes addressed to the parents of the children selected. Envelopes were included with the questionnaires to facilitate their return. These envelopes were delivered to the schools and plans were made for the testing of the children for whom the questionnaires would be returned.

Within a week after the envelopes containing the questionnaires were delivered to the schools, the returned forms were collected. A visit was made to each cooperating classroom to meet the children. Some time was taken to assure the subjects that there would be something for them to do that each of them would like. Inquiries and a precursory view of the school plant were made to determine the locale for testing.

Approximately seventy-five of the two hundred fifty children who had been randomly selected were not in first grade rooms in the schools participating. Some of the

children had been transferred from the district where the testing had been done the previous year, some had been retained in kindergarten, and some had been transferred to special education programs. This left approximately one hundred seventy-five of the addressed envelopes to be sent home with the children.

Of the one hundred seventy-five questionnaires sent home, one hundred twenty-one (69 percent) were collected. Eight of these were deleted from the study because the children had attended a pre-school which was primarily educational in purpose; two children were from bilingual homes; one child was living with grandparents for whom no occupation was given; and no occupational statement was given on one questionnaire.

Selection of Instruments

It was necessary to select instruments to measure auditory discrimination and to classify occupations of parents. The instruments selected were the Wepman Auditory Discrimination Test¹ and the "Census Classification of Occupations" by Eells² and others.

Auditory Discrimination Test

The Wepman Auditory Discrimination Test, Form I, was given to all subjects. This test had forty items or pairs

¹Wepman, Auditory Discrimination Test.

²Eells, et al., Intelligence and Cultural Differences, p. 95.

of words, a larger number than was contained in any of the other tests of discrimination examined. The test did not require visual or reading ability. A copy of the test is in Appendix B.

The items, with words selected from The Teacher's Wordbook of 30,000 Words,¹ had met three criteria. (1) Each word of a pairing had to appear with the same frequency as the other word in the language of the children. (2) Pairing was made within phonetic categories to avoid discrimination based on differences in articulatory position rather than on auditory basis being tested. (3) Word pairs had to be equated for length to avoid the possibility of discrimination being based on span rather than audition.

The Wepman Auditory Discrimination Test was considered reliable, as the test-retest administration showed a reliability of .91 (N=109). The difficulty of each phoneme on the two forms showed a rank-order correlation of .67 (n=214).² Validity of the test was established by five studies, four of which related to reading.³ Relationship between test results and intelligence ($r=.32$), articulatory

¹Edward L. Thorndike and Irving Lorge, The Teacher's Wordbook of 30,000 Words (New York: Bureau of Publications, Teachers College, Columbia University, 1944).

²Oscar K. Buros, ed., The Sixth Mental Measurements Yearbook (Highland Park, N.J.: Gryphon, 1965), pp. 1203-04.

³Wepman, Auditory Discrimination Manual of Directions, p. 2.

disorders, and reading disability was accepted as indicators of validity.¹ Neither administration nor scoring of the test was difficult.

For purposes of this study, useful interpretations of scores were possible. X scores on the test were determined by the number of errors made on the thirty pairs of words that are different. Y scores, or errors on the ten pairs of words that are alike, were used to judge the validity of the test. Because the factor of discrimination is developmental, error scores mean different things for different ages. Cut-off points, determined by testing first, second, and third grade urban and non-urban children were developed for the test:

- For five year olds: - X scores greater than six.
- For six year olds: - X scores greater than five.
- For seven year olds: - X scores greater than four.
- For eight year olds: - X scores greater than three.

Scores greater than the cut-off score given for each age indicated inadequate or immature development. If a child made an X score greater than fifteen, or a Y score greater than three, the test was considered invalid and was put aside, according to the instructions stated in the Manual of Directions.

As final preparation for the testing, the examiner met with a Title III staff member who had worked for seven

¹Buros, Mental Measurements Yearbook, pp. 1203-04.

years in programs designed primarily to test children with reading or learning disabilities and reviewed the administration of the Wepman Auditory Discrimination Test. The examiner worked at reading the word pairs with no special emphasis, or unnecessary loudness, as specified in the directions for administering the test. There was also timing to see that the pauses between the two words of a pair were neither more nor less than the one second interval specified in the testing manual. When this had been done in a manner that satisfied the Title III staff member who had administered large numbers of these tests during her seven years with testing programs, preparations for the testing were considered complete.

Classification of Occupations

An instrument was needed to determine the socioeconomic levels of families represented. The first instrument considered was the "Index of Status Characteristics" by Warner, Meeker, and Eells.¹ This instrument took into consideration characteristics other than occupation, but the authors made this statement:

Class varies from community to community. The new city is less likely than an old one to have a well-organized class order; this is also true for cities

¹W. Lloyd Warner, Marcia Meeker, and Kenneth Eells, Social Class in America: Manual of Procedure for the Measurement of Social Status (New York: Harper and Brothers, Publishers, 1960), pp. 140-141.

whose growth has been rapid as compared with those which have not been disturbed by high increases in population.¹

Growth had been rapid in most of the Tulsa County School Districts. Many of the districts served families who lived in tract houses which were built about the same time, many of them by the same contractor, with lot sizes and price ranges equated. When house type and dwelling area, two of the characteristics which were a part of the "Index of Status Characteristics," were so equated, it did not seem feasible to add these two characteristics to the study of status. Since all communities were considered "bedroom" communities, the majority of employed parents commuted daily to work outside the city of Tulsa, another source of income, was so nearly equated, its inclusion in the study would have had little effect.

With the characteristics of the "Index of Status Characteristics" so nearly equated, the reading on the remaining determinant of status produced the following statements by Edwards:

The most nearly dominant single influence in a man's life is probably his occupation. More than anything else, a man's occupation determines his course and his contribution in life. There is no other single characteristic that tells so much about a man

¹Ibid., p. 23.

and his status--social, intellectual, economic,--as does his occupation.¹

After the decision was made to base the study on occupational level the "Index of Status Characteristics" could not be used. To maintain its validity, source of income, size of dwelling, and area of dwelling must be included. Eells had produced the "Census Classification of Occupations," which is found in Intelligence and Cultural Differences. This instrument could be used. A copy of the letter requesting permission to use the rating scale and a copy of the letter from the University of Chicago Press granting permission from the authors for the use of the scale are in Appendix C.

The "Census Classification of Occupations," to be found in Appendix C, categorizes occupations of parents or heads of households into seven occupational levels:

1. Professional, Managerial (very large businesses)
2. Semi-professional, Managerial (large businesses), high status white collar workers
3. Managerial (medium size businesses), medium status white collar workers
4. Managerial (small businesses), low status white collar workers
5. Managerial (very small businesses), apprentices

¹Alba Edwards, Comparative Occupation Statistics for the United States, Sixteenth Census of the United States (Washington, D.C.: U.S. Government Printing Office, 1943), p. xi.

6. Semi-skilled workers

7. Unskilled workers

When the questionnaires from the parents were returned, information was categorized according to the Eells instrument. In all cases where both parents worked, the occupation given for Head of the Household was used. When a question of proper classification of an occupation arose, the opinion of an individual who had had extensive experience with job classification in the personnel office of a large institution was requested.

Conditions and Locales for Testing

The participating schools provided a range of testing situations. Rooms designed for speech classes, principals' offices, and classrooms not being used by students provided testing locales. Each of the testing situations was evaluated as being quiet enough for the test results to be considered valid. Each situation provided a comfortable chair where the child being tested could sit facing away from the examiner and a chair for the examiner.

With the child facing the examiner, instructions for the test were read according to the direction given in the testing manual. If the child did not seem at ease, or did not seem to understand the directions, the directions were repeated or rephrased as suggested in the testing manual. When the child exhibited an understanding of what he was to do, he was asked to turn his back to the examiner so that

neither the lip movement of the examiner nor the word pairs could be seen. Since this was explained as being part of the "game," the children were happy to comply with this request.

One hundred nine children were tested. One test, with an X score of 18, was considered invalid and put aside according to the directions given in the manual which states that all X scores above 15 shall be considered invalid. Test scores for one hundred eight children were recorded immediately following the test. The scores were evenly divided between boys and girls.

After all test scores and all data collected on the family variables were recorded for the subjects, data for analysis were considered complete. All raw data is tabulated in Appendix E.

Treatment of Hypotheses

When all data had been collected they were statistically treated by the stepwise discriminant analysis as explained by Weiner, et al.¹ This statistical process first treated each function separately. It then determined the interrelationships between different functions, and took those interrelationships into account when it assessed their predictive power for a single variate. The criterion variate

¹John M. Weiner, M. Allen, and J. Marmorston, Manual of Computer Programs for Preliminary and Multivariate Analysis (Los Angeles: University of Southern California School of Medicine, 1965), pp. 214, a to l.

or dependent variable for this study was auditory discrimination. The predictive or independent variables were occupational levels, working mothers, education of parents, number of children, and order of birth.

CHAPTER III

ANALYSIS AND INTERPRETATION OF DATA

Statistical Analysis

A multiple regression analysis was chosen for treatment of the data collected. That decision was based on the fact that multiple regression seeks to identify and quantify the magnitude and statistical significance of the variance of a dependent variable that is shared with several independent variables. Since the study involved the correct classification of individuals into two groups on the basis of test scores a regression equation with a discriminant function was needed. Using several measures for each individual in the sample discriminant analysis maximally discriminated the individuals into group membership, according to Kerlinger and Pedhazur.¹

The specific statistical program selected was the stepwise discriminant analysis, as developed by the Health

¹Fred N. Kerlinger and Elazar J. Pedhazur, Multiple Regression in Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1973), pp. 336-7.

Science Computing Facility of the University of California.¹ In stepwise discriminant analysis a new variable which is a linear combination of the measurement of the variables being studied is introduced.

At each step in the program one variable was entered into the set of discriminating variables. The variable entered was selected by the following criteria:

1. The variable with the largest F value.
2. The variable which when previously entered variables are partialled out has the highest multiple correlation with the criterion variable.
3. The variable which gives the greatest decrease in the ratio of within to generalized variances.

The criterion variate selected for the study was the inclusion of each child tested in groups rated either as Adequate or Inadequate on the Wepman Auditory Discrimination Test.² The predictive variables, using each as a single predictor, or taking their interrelationships into account when assessing predictive power, were:

1. Occupational level of Head of the Household
2. Number of years that the mother has worked outside the home

¹J. M. Weiner, M. Allen and J. Marmorston, Manual of Computer Programs for Preliminary and Multivariate Analysis (Los Angeles: University of Southern California School of Medicine, 1965), pp. 214, a to l.

²Wepman, Auditory Discrimination Test, Manual of Directions, p. 2.

3. Educational level of the father
4. Educational level of the mother
5. Number of siblings
6. Order of birth

Age was also included with the variables since age determines whether a score on the Wepman Auditory Discrimination Test is considered adequate or inadequate. Age itself was not a predictive variable studied.

Table 1 shows group means for Adequate/Inadequate membership. Grand means over the groups and standard deviations are shown.

TABLE 1

GROUP MEANS FOR ADEQUATE/INADEQUATE MEMBERSHIP,
GRAND MEANS, AND STANDARD DEVIATIONS
FOR ALL GROUPS

Var.	Item Mean Scores				Standard Deviations	
	Ade- quate	Inade- quate	Dif- ference	Grand Means	Ade- quate	Inade- quate
Age	1.51948	1.45161	.06787	1.5000	0.50292	0.50588
1	4.22078	3.90322	.31756	4.12963	1.61101	1.42255
2	0.88312	0.77410	.10893	0.85185	1.45071	1.38346
3	12.63636	12.48387	.15249	12.59259	2.50214	2.60603
4	11.70130	12.06452	-.36322	11.80556	1.87128	1.59029
5	2.94805	2.70968	.28370	2.87963	1.20193	1.65719
6	2.28571	2.09677	.18894	2.23148	1.29632	1.68037
n=77		n=31				
N = 108						

At the beginning of the study the F level for inclusion of the variables into the study was set at the 0.01 level and the F level for deletion was 0.005. F levels for all variables were high enough to be included. They are shown in Table 2.

TABLE 2

F RATIOS FOR EACH VARIABLE

Variable	Age	1	2	3	4	5	6
<u>F</u> ratio	0.4011	0.9158	0.1279	0.0801	0.9037	0.6927	0.3937

With 1 and 106 degrees of freedom, the critical value of F required to show significance at the .05 level of confidence was 3.93 for N=108. Since this value was not approached by any of the variables, or any combination of the variables, each of the hypotheses stated for this study was rejected.

Table 3 shows models and symbols for stepwise discriminant analysis. Table 4 shows a summary of the regression series.

Table 5 shows the number of subjects considered correctly classified into Adequate/Inadequate group membership at three levels in the regression series. Using occupational level of the head of the household as the criterion of judgment for auditory discrimination of first grade students, classification into the Inadequate group membership is considered more correct than classification in the Adequate

TABLE 3

MODELS AND SYMBOLS FOR STEPWISE DISCRIMINANT ANALYSIS
IN PREDICTING ADEQUATE-INADEQUATE GROUP MEMBER-
SHIP IN AUDITORY DISCRIMINATION ABILITIES
AMONG FIRST GRADE STUDENTS

Y = Mediated Group Membership (1 = Adequate Group membership)
(0 = Inadequate membership)

Variables:

= Age (weighted to enter as last variable)

X_1 = Occupational Level of parents

X_2 = Number of years Mother has worked outside home

X_3 = Educational Level of Father

X_4 = Educational Level of Mother

X_5 = Number of Siblings

X_6 = Order of Birth

Weights: $X_1 \dots X_6 = 1$; $X_7 = 2$

a_0 = Regression Constant

Full Model Equation:

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \dots + a_nX_n$$

TABLE 4

PREDICTION MODELS FOR PREDICTING MEMBERSHIP IN ADEQUATE-INADEQUATE AUDITORY
DISCRIMINATION GROUPS USING SELECTED ENVIRONMENTAL FACTORS AS DETERMINANTS

Step	Variable	Variable Entered	Equation ($Y = a_0 + a_1X_1 + a_2X_2 + \dots + a_nX_n$)	U- Sta- tistic	Degrees of Freedom	Equiv- alent <u>F</u> ratio*
1	1	Occupational Level of Parents	$Y = a_0 + a_1X_1$	.99143	1, 106	0.9158
2	3	Educational Level of Father	$Y = a_0 + a_1X_1 + a_3X_3$	.97842	1, 105	1.3966
3	4	Educational Level of Mother	$Y = a_0 + a_1X_1 + a_3X_3 + a_4X_4$	.96940	1, 104	0.9674
4	5	Number of Siblings	$Y = a_0 + a_1X_1 + a_3X_3 + a_4X_4 + a_5X_5$	.96379	1, 103	0.6000
5	2	Years Mother Has Worked Outside Home	$Y = a_0 + a_1X_1 + a_3X_3 + a_4X_4 + a_5X_5 + a_2X_2$	.96058	1, 102	.3410
6	6	Order of Birth	$Y = a_0 + a_1X_1 + a_3X_3 + a_4X_4 + a_5X_5 + a_2X_2 + a_6X_6$	.96058	1, 101	0.8285
7		Age	$Y = a_0 + a_1X_1 + a_3X_3 + a_4X_4 + a_5X_5 + a_2X_2 + a_6X_6 + a_7X_7$	.95666	1, 100	0.4087

*Variance Contributed by last variable added.

group membership. The use of Variables 1, 3, and 4 equate the correct classification for both groups. With the addition of the effects of the educational levels of both parents, classification becomes more correct for the Adequate group and less correct for the Inadequate group than at the first step. Using all variables past these three changes the correct classification for the Adequate group one percent, and does not alter classification for the Inadequate group.

TABLE 5

NUMBER OF SUBJECTS CORRECTLY CLASSIFIED INTO
RESPECTIVE AUDITORY DISCRIMINATION GROUPS
ON THE BASIS OF CRITERIA STUDIED

Using Variable 1:

	Success	Nonsuccess
Group Success	34	43
Nonsuccess	9	22

Correct Classification: Success - 44%
Nonsuccess - 71%

Using Variables 1, 3, and 4:

	Success	Nonsuccess
Group Success	47	30
Nonsuccess	11	20

Correct Classification: Success - 61%
Nonsuccess - 64%

Using all Variables:

	Success	Nonsuccess
Group Success	46	31
Nonsuccess	15	16

Correct Classification: Success - 60%
Nonsuccess - 64%

Interpretation of Data

Hypothesis 1. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the occupational levels of the heads of the families as categorized by the "Census Classification of Occupations."

This hypothesis was rejected. Table 6 shows the percentages of adequate scores in each of the occupational categories to be unrelated to the occupational levels of the parents. Figure 1 presents this information graphically with maxima at both ends of the distribution.

When the scores for subjects were tabulated and ranked in Adequate/Inadequate groups, using Occupational Levels of head of the household as criteria for group membership, the highest percentage of adequate auditory discrimination scores was Occupational Level 1, which represented doctors, lawyers, ministers, and proprietors of very large businesses. Ranking only three percentage points below Level 1 were the two lowest levels: Level 6, representing semi-skilled workers, and Level 7, representing domestic and unskilled workers. The lowest performance level was Level 3, representing parents who are grade school teachers, draftsmen, laboratory technicians, proprietors of medium size businesses, etc. Level 2, representing high-school teachers, editors, nurses, auditors, real estate and insurance agents, proprietors of small businesses, etc., had the same percentage of

TABLE 6

ADEQUATE/INADEQUATE AUDITORY DISCRIMINATION SKILLS
BY OCCUPATIONAL LEVELS OF PARENTS

Level	Subjects		Scores		Percent of Score in Adequate Rank
	No.	% of Total	No. Adequate	No. Inadequate	
1	6	.055	5	1	.833
2	12	.111	8	4	.666
3	17	.157	10	7	.588
4	30	.276	20	10	.666
5	18	.167	14	4	.777
6	20	.185	16	4	.800
7	5	.046	4	1	.800

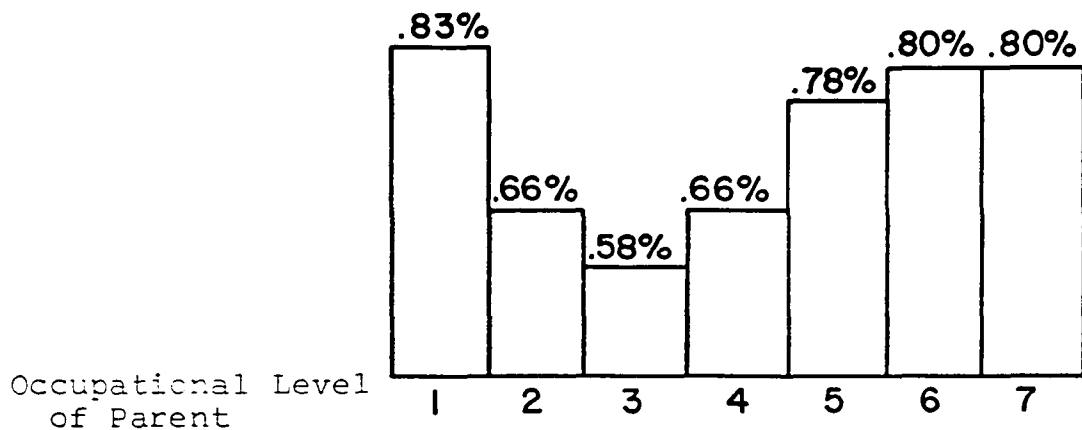


Fig. 1.--Percentage of scores in adequate rank by occupational level.

children in the Adequate rank as Level 4, which represented proprietors of small businesses, retail salesmen, store clerks, bookkeepers, craftsmen, firemen, policemen, etc.

When the scores for the three occupational ranks above the median were combined, the percentage of children in the Adequate auditory discrimination rank, at 65 percent was smaller than the 79 percent obtained in that rank when the three occupational ranks below the median were combined. This would give a negative correlation of auditory discrimination and occupational levels of parents.

Hypothesis 2. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the length of time the mother has worked outside the home.

This hypothesis was rejected. There were no significant relationships between auditory discrimination of children and the number of years the mother had worked outside the home. Table 7 shows the percentages of adequate scores in each of the categories for the number of years the mother had worked outside the home. Figure 2 shows a bimodal distribution with the highest peak over the category for mothers who had worked outside the home four years. If the categories for mothers who had worked one year or less were combined, and the categories for mothers who had worked three years or more were combined, the graph would then become U-shaped with peaks for these two categories.

TABLE 7

ADEQUATE/INADEQUATE AUDITORY DISCRIMINATION SKILLS
BY NUMBER OF YEARS MOTHER HAD WORKED
OUTSIDE OF THE HOME

Years Mother Had Worked Outside Home	Subjects		Scores		Percent of Scores in Adequate Range
	No.	% of Total	Adequate	Inadequate	
0	66	.611	46	20	.70
1	22	.203	17	5	.77
2	6	.055	3	3	.50
3	4	.037	3	1	.75
4	4	.037	4	0	1.00
5	6	.055	4	2	.66

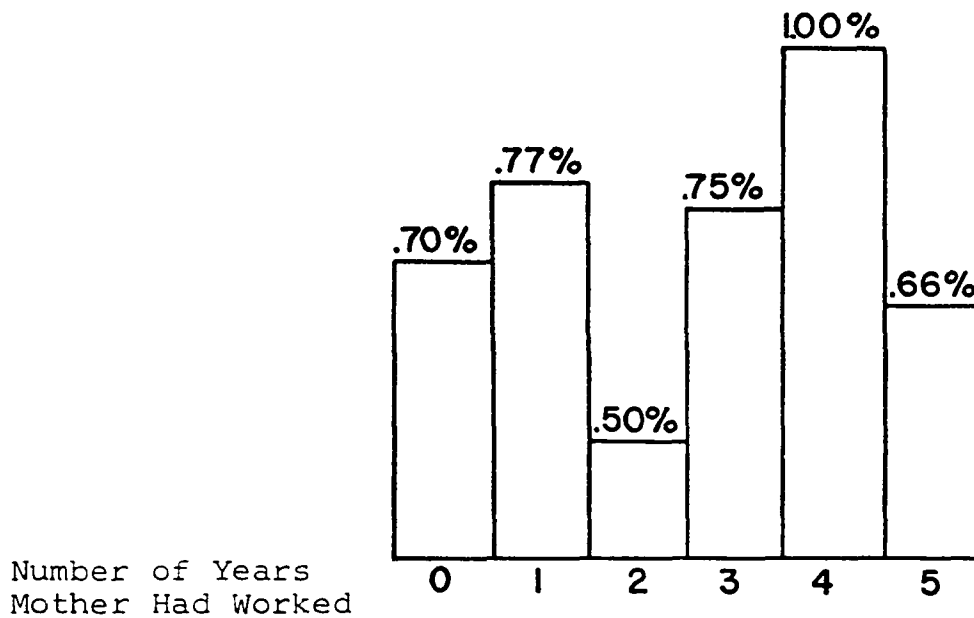


Fig. 2.--Percentage of scores in adequate rank by years mother had worked.

Hypothesis 3. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of years the father has attended school.

This hypothesis was rejected. There were no significant relationships of auditory discrimination of children and the educational levels of the fathers. Table 8 shows the percentages of children with adequate auditory discrimination in relation to the number of years the father had attended school. Figure 3 reveals a slightly multimodal distribution with three peaks being for categories 1, 4, and 6. The only category with scores that were outside an 11 percentage point range was the category for children whose father's had one year of college education.

Tabulation of the data on the Educational Level of the Father showed the highest percentage of children with adequate auditory discrimination skills to be those whose fathers had two years of higher education, and the lowest level was children representing fathers who had one year of higher education. When the categories for fathers who had formal education beyond high-school were combined, and the categories representing fathers who had high-school or less than high-school education were combined, children representing the lower educational category had more adequate auditory discriminators than the children representing the higher educational level.

TABLE 8

ADEQUATE/INADEQUATE AUDITORY DISCRIMINATION SKILLS
BY EDUCATIONAL LEVEL OF FATHER

Father's Educational Level	Subjects		Scores		Percent of Scores in Adequate Range
	No.	% of Total	Ade-quate	Inade-quate	
More than 4 years of higher education	1 4	.037	3	1	.75
4 years of higher education	2 12	.111	8	4	.66
3 years of higher education	3 8	.074	6	2	.75
2 years of higher education	4 13	.120	10	3	.77
1 year of higher education	5 7	.064	3	4	.44
High school education	6 42	.388	32	10	.76
Less than high school education	7 22	.203	15	7	.68

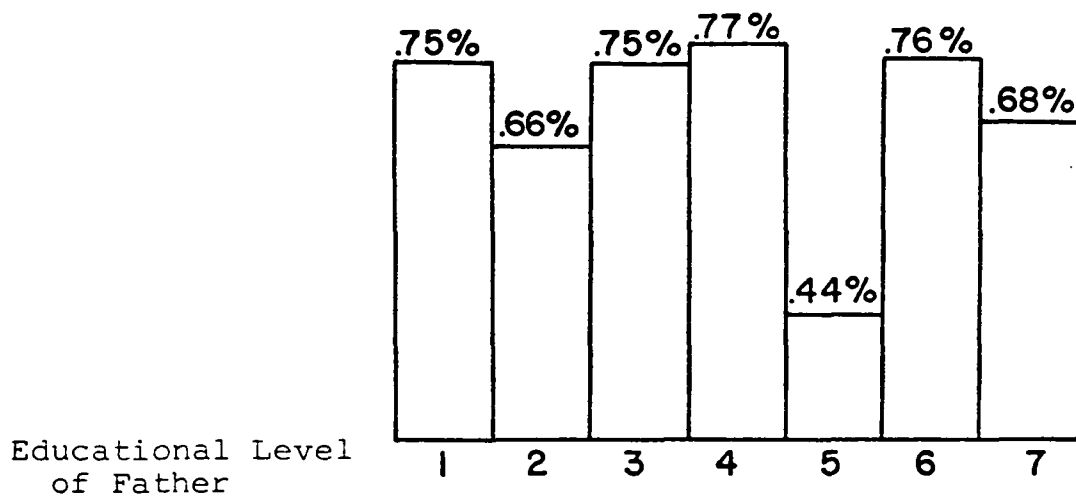


Fig. 3.--Percentages of scores in adequate rank by father's educational level.

Hypothesis 4. There are statistically significant differences in the auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of years the mother had attended school.

This hypothesis was rejected. There were no significant relationships in auditory discrimination of children and the number of years the mother has attended school. Table 9 shows the percentage of adequate auditory discrimination scores in relation to the number of years the mother had attended school. The category with the lowest percentage of adequate auditory discrimination scores was that for the children whose mothers had the most education. Figure 4 presents this information graphically.

Final compilation of the data concerning Educational Level of the Mother showed that fifty-nine of the mothers had completed high-school while twenty-three had less than high-school education. Twenty-six had completed one to four years of formal higher education. Children representing the highest level of education for the mother had the smallest percentage of adequate auditory discriminators. When all categories representing mothers who had completed formal education beyond high-school were combined, and categories representing mothers who had high-school education or less were combined, the lower educational level had a higher percentage of children with adequate auditory discrimination.

TABLE 9

ADEQUATE/INADEQUATE AUDITORY DISCRIMINATION SKILLS
BY EDUCATIONAL LEVEL OF MOTHER

Mother's Educational Level		Subjects		Scores		Percent of Scores in Adequate Range
		No.	% of Total	Ade-quate	Inade-quate	
4 years of higher education	1	4	.037	2	2	.50
3 years of higher education	2	3	.027	3	0	1.00
2 years of higher education	3	6	.055	5	1	.83
1 year of higher education	4	13	.123	9	4	.77
High school education	5	59	.546	39	13	.66
Less than high school education	6	21	.194	17	4	.81
Did not finish grade school	7	2	.018	2	0	1.00

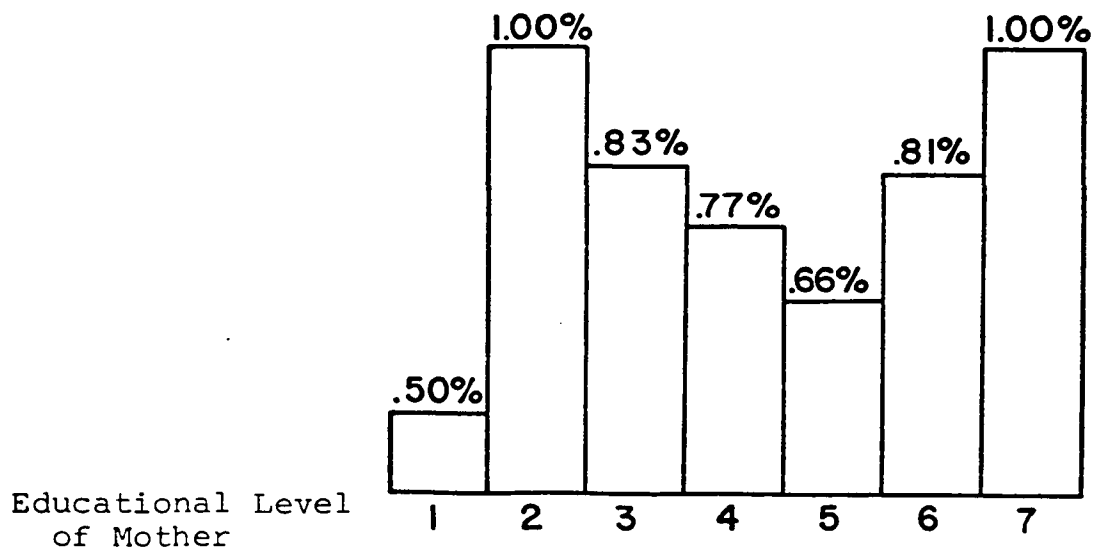


Fig. 4.--Percentage of scores in adequate rank by mother's educational level.

Hypothesis 5. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of children in the family.

This hypothesis was rejected. There were no significant differences in auditory discrimination of children related to the number of children in the family. Table 10 shows the percentage of adequate scores in relation to the number of children in the family. Only children, and children with one sibling had the lowest percentages of adequate scores except for the one child from a family of nine. Figure 5 graphically presents this information.

Compilation of all the data regarding the Number of Children in the Family showed that children from families with one or two children have smaller percentages of adequate auditory discriminators than children from families with three to seven children. The extremes of this scale showed five only children and one child from a family of nine children.

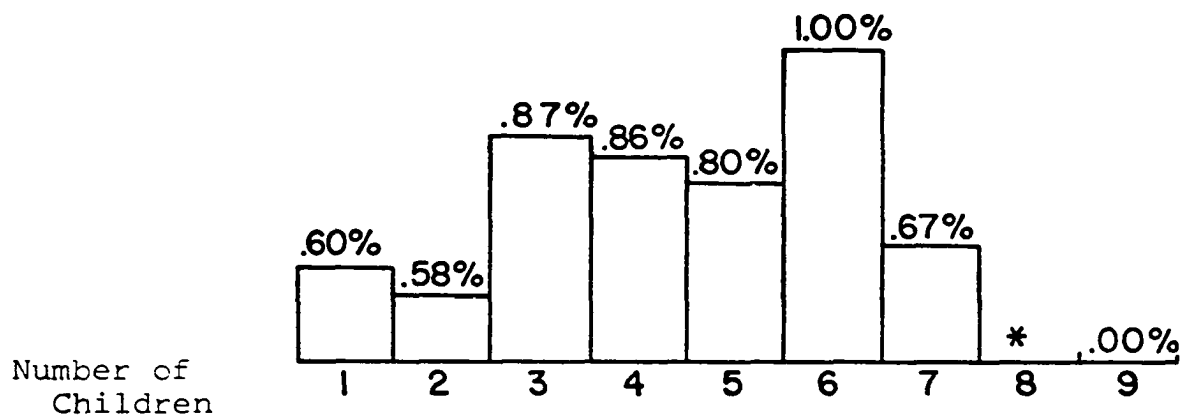
Hypothesis 6. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the order of birth in the family.

This hypothesis, as stated for this study, was rejected. Table 11 shows the percentages of adequate auditory discrimination scores in relation to the order of

TABLE 10

ADEQUATE/INADEQUATE AUDITORY DISCRIMINATION SKILLS
BY NUMBER OF CHILDREN IN THE FAMILY

No. of Children in Family	Subjects		Scores		Percent of Scores in Adequate Range
	No.	% of Total	Adequate	Inadequate	
1	5	.046	3	2	.60
2	48	.444	28	20	.58
3	30	.278	25	5	.87
4	14	.129	12	2	.86
5	5	.046	4	1	.80
6	2	.018	2	0	1.00
7	3	.027	2	1	.67
8	0	. .	. .	. .	. .
9	1	.009	0	1	.00



* None in category.

Fig. 5.--Percentage of scores in adequate rank by number of children.

TABLE 11

ADEQUATE/INADEQUATE AUDITORY DISCRIMINATION SKILLS
BY ORDER OF BIRTH IN FAMILY

Ordinal Position	Subjects		Scores		Percent of Scores in Adequate Range
	No.	% of Total	Adequate	Inadequate	
only child	5	.046	3	2	.60
with siblings					
1	31	.287	20	11	.65
2	42	.388	30	12	.71
3	15	.138	12	3	.80
4	6	.055	6	0	1.00
5	4	.037	3	1	.75
6	3	.027	3	0	1.00
7	1	.009	0	1	.00
8	1	.009	0	1	.00

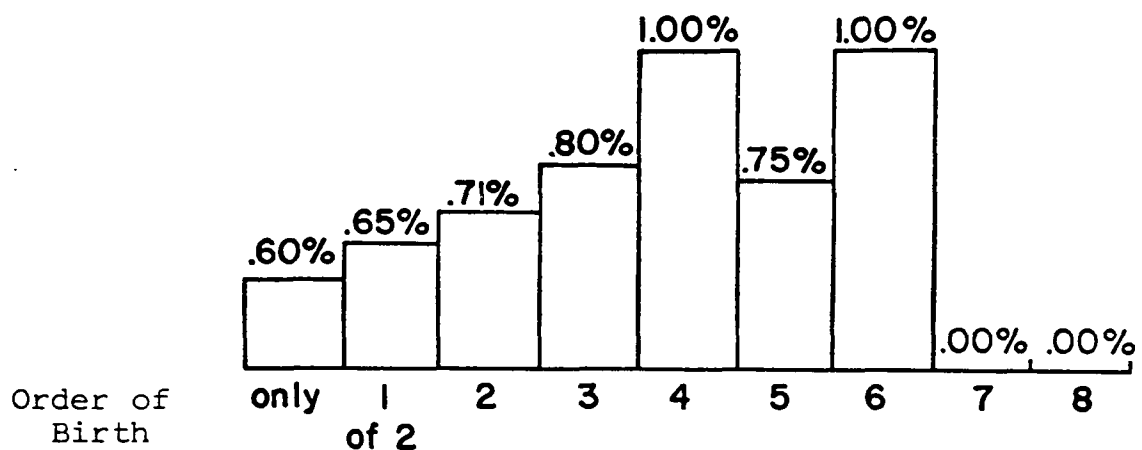


Fig. 6.--Percentage of scores in adequate rank by order of birth.

birth. The percentage of adequate auditory discrimination scores for the only or first born child was lower than for any category up to and including sixth. There were as many children who were sixth, seventh, and eighth as there were only children, and if these categories were combined, the percentage of adequate scores would be the same as for the category with only children. With the combining of these scores, the distribution shown in Figure 6 would become symmetrical.

Results of the tabulation of the last variable, Order of Birth, shows that auditory discrimination skills increase as does the ordinal position in the family, up to and including being the fourth child. Children with no siblings had the smallest percentage of adequate discriminators, except for the one child who was eighth in a family of nine, of any category in the study.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The problem was to investigate the relationship of selected socioeconomic factors, predictive variables, to the auditory discrimination of first grade children, criterion variable. The predictive variables selected were the occupational level of the head of the family, the number of years the mother had worked outside the home, the educational level of each of the parents, the number of children in the family, and the order of birth.

Twelve Tulsa County (Oklahoma) School Districts were involved in the study. All children attending kindergarten in these schools during the 1971-72 school year had been given physical screenings under the direction of a pediatric nurse and a trained audiologist. These services had been made available to the schools through the Tulsa County Early Childhood Education Program, a Title III ESEA program. Results of the screenings were examined for 750 students. Two hundred fifty names of children with hearing in the normal range, as determined by both a pure tone audiometric evaluation and a Verbal Auditory Screening for Children, were

randomly selected. One hundred seventy five of these children were attending first grade in schools where they had been screened.

A questionnaire was sent to the parents of these children to obtain information related to the occupational level, number of years that the mother had worked, educational level of the parents, number of children, and the order of birth. One hundred nine usable questionnaires were returned for Caucasian children from homes where no language other than English was spoken. Information from these questionnaires was tabulated.

These children were given the Wepman Auditory Discrimination Test.¹ With test results invalid for one child, results for the 108 children who met all requirements for the study were recorded.

When all data had been collected it was statistically treated by the stepwise discriminant analysis explained by Weiner and others.² This statistical process first treated each variable separately. It then determined the interrelationships between different functions and took those interrelationships into account when it assessed their predictive power for a single variate, auditory discrimination.

Six hypotheses were stated and tested with the following results:

¹Wepman, Auditory Discrimination Test.

²Weiner, et al., Manual of Computer Programs.

Hypothesis 1. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the occupational levels of the heads of the families as categorized by the "Census Classification of Occupations."

This hypothesis was rejected. Results of the test showed that children in the middle occupational levels had poorer auditory discrimination than those at the extremes of the occupational scale.

Hypothesis 2. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the length of time the mother has worked outside the home.

This hypothesis was rejected. Children whose mothers had never worked had poorer auditory discrimination than children whose mothers had worked for one, three, or four years, and only four percentage points better than children whose mothers had worked five years.

Hypothesis 3. There are statistically significant differences in the auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of years the father attended school.

This hypothesis was rejected. There was little difference in the auditory discrimination of children at the extremes of the scale. Although the number of children whose fathers had one year of higher education was small, it

contained the lowest percentage of children with adequate auditory discrimination.

Hypothesis 4. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of years the mother attended school.

This hypothesis was rejected. Mothers with the most education had the smallest percentage of children with adequate auditory discrimination. From the children whose mothers had completed highschool to the children whose mothers were at the extremes of the educational categories, the percentage of adequate auditory discriminators increased in either direction, with the exceptions of the highest level.

Hypothesis 5. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the number of children in the family.

This hypothesis was rejected. Children from families with three to seven children had better auditory discrimination than only children, or children with one sibling.

Hypothesis 6. There are statistically significant differences in auditory discrimination of children, as measured by the Auditory Discrimination Test, related to the order of birth.

The hypothesis was rejected. Adequate auditory discrimination increased in relation to the order of birth

up to being the fourth child in the family.

After each variable had been treated by a simple correlational analysis, and rejected, the stepwise discriminant analysis constructed a new variable to determine if any combination of the independent variables would raise the predictive power for correctly classifying membership in Adequate or Inadequate groups. Classification was considered as correct using the factors of Occupation Level, Father's Educational Level, and Mother's Educational Level, as when all the variables were used.

Conclusions

While hypotheses stated for this study were rejected, the study was meaningful for it raised very important questions about recent research done with language abilities of the so-called disadvantaged or economically deprived child. Research reviewed for this study emphasized the relationship between low socioeconomic status, or employment of mothers and poor language skills, between education of parents and success in school, and between family size and poor language skills. This study raised questions as to the validity of such findings, at least for some groups.

Results of this investigation also showed that it is unwise for educators to assume that children do not develop some skills essential to learning to read because of the socioeconomic status or educational level of parents or

because the mother has worked outside the home for an extended period of time. Generalizations should not be made about large families or the older child having greater language skills. Furthermore, it should not be assumed that children who are socioeconomically privileged have developed adequate auditory discrimination.

Moreover the study indicated the responsibility of schools for providing adequate auditory discrimination programs. Instead of making any generalizations about the backgrounds from which a child comes, teachers should assume responsibility for testing and evaluating all language skills so that the individual child may be helped in the most effective way.

Recommendations

This study raised important unanswered questions. There is need for research to replicate, to extend, and to supplement this research.

Specific recommendations are:

1. Criteria for evaluating adequacy of auditory discrimination programs need to be developed. Identification of specific experiences to help children develop adequate auditory discrimination would be most helpful.

2. Additional research should be conducted with different populations. The factors of a second language spoken in the home and racial differences need to be researched.

3. A valuable contribution could be made by research analyzing variables of family interaction such as the amount of time spent reading to children, activities families engage in as a unit, or television viewing habits of the family.

4. It is recommended that longitudinal studies of the development of auditory discrimination be conducted.

5. The factors of intelligence and sex as predictive variables might justifiably to research such as this.

6. A comparison of children who have and those who have not attended nursery schools and/or kindergarten would be significant.

7. Although not a major concern of this research, there is an implied need for additional research to clarify the relationship of auditory discrimination to initial reading success. A question may be as to why selected socioeconomic variables which have been accepted as efficient predictors of success in beginning reading showed little predictive efficiency for auditory discrimination.

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APPENDIX A

QUESTIONNAIRE

To the Parents:

You gave written permission for physical screenings through the Tulsa County Early Childhood Education Program during your child's kindergarten year. The information on this form is needed for an extension of that study, and will be concerned with auditory discrimination of first grade children in Tulsa County Schools. Your cooperation in returning this form as soon as possible will be greatly appreciated.

Pupil's Name _____ Sex _____ Birthdate _____
(Month/Day/Year)

Address _____ School _____

Parents _____

A. If a language other than English spoken in the home? _____

B. How many children in the family are older than this child? _____
How many children in the family are younger than this child? _____

C. Has the mother worked outside the home since the child was born? _____
If she has, please give the total number of years she worked before this child started to kindergarten. _____

D. Did the child attend a Pre-school or Nursery School? Yes _____ : No _____ :
If he/she did, please give the length of time. _____. Do not report baby sitting services or child care centers; report only programs identified as primarily educational in purpose.

E. Please give the following information related to the occupation of the Head of Household. The Head of Household is:

(father, mother, guardian, other)

What kind of work does he/she do? _____

If he/she works in a factory, store, or office, tell what kinds of jobs he/she does there. _____

What other kind of work has he/she ever done? _____

How often is he/she paid? Check one: By the day _____ :

Every week _____ : Once every two weeks _____ : Once a month _____ :

In business for himself _____.

F. Education of Parents. Fill in applicable answers.

Did father: Finish ninth grade? Yes _____ : No _____ :

Finish High School? Yes _____ : No _____ :

Attend college? (Give number of years) _____

Attend trade or business school? (No. of years) _____

Did mother: Finish ninth grade? Yes _____ : No _____ :

Finish High School? Yes _____ : No _____ :

Attend college? (Give number of years) _____

Attend trade or business school? (No. of years) _____

APPENDIX B

AUDITORY DISCRIMINATION TEST

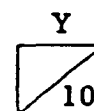
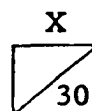
AUDITORY DISCRIMINATION TEST

FORM I

			X	Y
1.	tub	- tug		
2.	lack	- lack		
3.	web	- wed		
4.	leg	- led		
5.	chap	- chap		
6.	gum	- dumb		
7.	bale	- gale		
8.	sought	- fought		
9.	vow	- thou		
10.	shake	- shape		
11.	zest	- zest		
12.	wretch	- wretch		
13.	thread	- shred		
14.	jam	- jam		
15.	bass	- bath		
16.	tin	- pin		
17.	pat	- pack		
18.	dim	- din		
19.	coast	- toast		
20.	thimble	- symbol		

			X	Y
21.	cat	- cap		
22.	din	- bin		
23.	lath	- lash		
24.	bum	- bomb		
25.	clōthe	- clōve		
26.	moon	- noon		
27.	shack	- sack		
28.	sheaf	- sheath		
29.	king	- king		
30.	badge	- badge		
31.	pork	- cork		
32.	fie	- thigh		
33.	shoal	- shawl		
34.	tall	- tall		
35.	par	- par		
36.	pat	- pet		
37.	muff	- muss		
38.	pose	- pose		
39.	lease	- leash		
40.	pen	- pin		

Error Score



Copyright 1958, by Language Research Assoc., Inc., 175 E. Delaware Place, Chicago, Ill. 60611. Printed in U.S.A.
 This form is copyrighted. The reproduction of any part of it by mimeograph, hectograph, or in any other way, whether the reproductions are sold or are furnished free for use, is a violation of the copyright law.

Name of Child:

Date Tested:

Examiner's Name:

Age:

Date of Birth:

Grade:

Name of School:

Disabilities:

Hearing:

Reading:

Speaking:

Other:

I.Q.:

Test:

Error Score:

	X	Y
Form I	30	10
Form II	30	10

Additional Comments:

APPENDIX C

CENSUS CLASSIFICATION OF OCCUPATIONS

Rating of Occupations	Census Classification of Occupations						
	Profes- sional Persons	Proprietors, Managers, and Offi- cials (except Farmers)	Clerks and Kindred Workers	Skilled Workers and Foremen	Semi- skilled Workers	Servant Workers	Other Laborers (except Farm)
1	Doctor Dentist Lawyer Minister Engineer	Prop. or Mgr. of very large business (\$75,000 and over) State bank examiner					
2	High- school teacher Artist Editor Nurse	Prop. or Mgr. of large busi- ness (\$20,000- \$75,000) Stock broker Army col.	Auditor Insurance agent Real estate agent				
3	Grade- school teacher Draftsman and tool designer	Prop. or Mgr. of medium- size business (\$5,000- \$20,000) Contractor City official	Wholesale salesman Secretary Laboratory technician				

Rating of Occupations	Census Classification of Occupations						
	Profes- sional Persons	Proprietors, Managers, and Offi- cials (except Farmers)	Clerks and Kindred Workers	Skilled Workers and Foremen	Semi- skilled Workers	Servant Workers	Other Laborers (except Farm)
4		Prop. or Mgr. of small business (\$2,000- \$5,000)	Retail salesman Store clerk Bookkeeper Stenog- rapher Office clerk	Craftsman and any skilled worker (carpen- ter, mason, plumber, etc.) Foreman Policeman			
5		Prop. or Mgr. of very small business (\$500- \$2,000)	Telephone operator		Crafts- man's apprentice		
6		Prop. or Mgr. of business under \$500	Service- station attendant Freight checker		Semi- skilled worker (taxi- driver, knitter, grinder, machine operator, etc.)	Waitress Elevator operator Janitor	

Rating of Occupations	Census Classification of Occupations						
	Profes- sional Persons	Proprietors, Managers, and Offi- cials (except Farmers)	Clerks and Kindred Workers	Skilled Workers and Foremen	Semi- skilled Workers	Servant Workers	Other Laborers (except Farm)
7						Domestic servant Window washer	Unskilled worker (ash col- lector, excavator, factory laborer, etc.)

Some sample occupations, illustrating rating plan for occupations.

From Intelligence and Cultural Differences, Kenneth Eells, Allison Davis, Robert Havighurst, Virgil Herrick and Ralph Tyler. Copyright 1951 by The University of Chicago Press, Chicago, Illinois. Used with permission of the publisher.

1309 Lincoln
Norman, Oklahoma 73069
August 14, 1973

The University of Chicago Press
University of Chicago
Chicago, Illinois 60637

Dear Sirs,

At the present time I am working on a dissertation which will fulfill part of the requirements for a Ph.D. degree at the University of Oklahoma. The dissertation is being done relating auditory discrimination skill of first grade students to the occupational backgrounds of their parents. I hope to be able to use the "Census Classification of Occupations" from Intelligence and Cultural Differences by Kenneth Eells, Allison Davis, Robert J. Havighurst, Virgil Herrick, and Ralph Tyler to rate the occupational levels of the parents. This book was published and copyrighted by your press in 1951.

Would you please let me know the process of obtaining permission from these authors to include a copy of the "Census Classification of Occupations" in the dissertation?

Thank you very much for your help.

Sincerely,

Mozelle Phillips Leach

T H E U N I V E R S I T Y O F C H I C A G O P R E S S

5801 S. Ellis Avenue - Chicago - Illinois - 60637

August 22, 1973

Mozelle Phillips Leach
1309 Lincoln
Norman, Oklahoma 73069

Dear Requester:

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APPENDIX D

COOPERATING SCHOOLS

TULSA COUNTY SCHOOLS SERVED BY TITLE III ESEA PROJECT
AND INVOLVED IN THIS STUDY

Bixby Public Schools, Independent District No. 4
Broken Arrow Public Schools, Independent District No. 3
Collinsville Public Schools, Independent District No. 6
Glenpool Public Schools, Independent District No. 13
Jenks Public Schools, Independent District No. 5
Keystone Public Schools, Independent District No. 15
Liberty Public Schools, Independent District No. 14
Mingo Public Schools, Dependent District No. 16
Owasso Public Schools, Independent District No. 11
Sand Springs Public Schools, Independent District No. 2
Skiatook Public Schools, Independent District No. 7
Sperry Public Schools, Independent District No. 8

Tulsa County Schools Served by Title III ESEA Project
But Not Involved in This Study

St. Anne's Parochial School, Broken Arrow
Berryhill Public School, Independent District No. 10
Leonard Public School, Dependent District No. 18
Union Public Schools, Independent District No. 9

APPENDIX E

COMPLETE RAW DATA

TABLE 12

COMPLETE DATA COMPILED ON ALL SUBJECTS INCLUDING
AUDITORY DISCRIMINATION SCORES AND
ENVIRONMENTAL FACTORS

Subjects	1	2	3	4	5	6	7	8	9
	Age	Occupational Level	Years Mother Worked Outside	Father's Educational Level	Mother's Educational Level	Number of Siblings	Order of Birth	Number of Errors	Adequacy/Inadequacy of Auditory Discrimination Score
<u>Males</u>									
001	7	1	2	19	15	3	2	3	A
002	6	1	0	16	14	2	2	1	A
003	6	1	3	19	13	3	3	5	A
004	7	2	0	16	14	3	2	2	A
005	6	2	1	13	12	2	2	3	A
006	6	2	0	14	15	2	2	4	A
007	7	2	5	14	15	2	2	4	A
008	6	2	0	14	13	3	2	8	I
009	7	2	0	12	12	2	1	6	I
010	7	3	5	16	16	2	1	2	A
011	7	3	0	13	12	2	2	5	I
012	6	3	0	13	13	2	2	8	I
013	7	3	0	14	12	1	1	6	I
014	6	3	0	13	12	3	2	5	A
015	7	3	0	14	12	5	5	4	A
016	7	3	0	15	12	3	2	1	A
017	7	3	5	9	12	2	2	4	A
018	7	3	1	12	12	4	2	2	A

TABLE 12--Continued

Subjects	1	2	3	4	5	6	7	8	9
	Age	Occupational Level	Years Mother Worked Outside	Father's Educational Level	Mother's Educational Level	Number of Siblings	Order of Birth	Number of Errors	Adequacy/Inadequacy of Auditory Discrimination Score
019	6	3	5	12	12	2	1	10	I
020	6	3	0	12	12	2	1	8	I
021	7	4	2	12	12	2	2	7	I
022	7	4	4	16	12	2	2	1	A
023	7	1	1	12	9	2	2	5	I
024	7	4	0	15	12	2	1	7	I
025	7	4	1	12	12	3	3	4	A
026	7	4	0	15	12	3	2	4	A
027	7	4	1	12	12	4	3	0	A
028	7	4	0	9	13	2	2	5	I
029	6	4	0	16	12	3	1	5	A
030	7	4	0	14	13	3	3	2	A
031	6	4	1	12	9	2	2	1	A
032	7	4	0	9	13	2	2	2	A
033	6	4	4	9	9	2	2	3	A
034	7	4	0	14	9	4	4	2	A
035	6	4	0	15	12	2	1	5	A
036	7	5	0	12	12	3	3	3	A
037	7	5	0	12	12	1	1	7	I
038	8	5	1	14	12	2	2	7	I
039	6	5	1	12	9	3	2	5	A
040	7	5	1	12	8	2	1	1	A

TABLE 12--Continued

Subjects	1	2	3	4	5	6	7	8	9
	Age	Occupational Level	Years Mother Worked Outside	Father's Educational Level	Mother's Educational Level	Number of Siblings	Order of Birth	Number of Errors	Adequacy/Inadequacy of Auditory Discrimination Score
041	7	5	4	12	9	4	2	2	A
042	6	5	2	9	12	4	3	10	I
043	7	5	0	16	12	2	2	2	A
044	6	6	1	12	12	2	2	11	I
045	7	6	1	13	14	4	4	4	A
046	6	6	1	15	12	2	2	2	A
047	6	6	0	12	9	3	2	5	A
048	7	6	0	12	12	4	4	2	A
049	7	6	2	9	12	2	2	7	I
050	6	6	0	9	9	2	1	2	A
051	7	6	0	9	12	3	2	7	I
052	7	6	0	12	12	2	2	4	A
053	6	7	0	12	12	2	2	4	A
054	6	7	4	12	9	2	1	1	A
<u>Females</u>									
055	7	1	0	19	12	3	3	4	A
056	6	1	0	18	16	2	1	6	I
057	7	1	0	14	12	2	1	3	A
058	7	2	3	16	16	2	1	6	I
059	7	2	1	16	12	4	1	5	I
060	6	2	1	16	12	2	1	4	A

TABLE 12--Continued

Subjects	1	2	3	4	5	6	7	8	9
	Age	Occupational Level	Years Mother Worked Outside	Father's Educational Level	Mother's Educational Level	Number of Siblings	Order of Birth	Number of Errors	Adequacy/Inadequacy of Auditory Discrimination Score
061	6	2	0	16	13	3	1	4	A
062	6	2	0	12	12	3	3	2	A
063	6	2	0	14	12	3	3	2	A
064	7	3	5	16	13	3	3	5	I
065	6	3	0	15	12	2	1	2	A
066	7	3	0	16	12	2	1	5	I
067	7	3	2	12	12	3	3	2	A
068	6	3	0	14	12	2	1	4	A
069	7	3	1	12	12	1	1	3	A
070	6	4	1	15	16	2	2	2	A
071	7	4	1	12	9	2	1	5	I
072	7	4	0	14	13	2	2	2	A
073	7	4	0	15	14	3	3	8	I
074	7	4	0	12	12	2	2	2	A
075	7	4	0	12	14	3	1	3	A
076	7	4	0	12	12	3	2	5	I
077	6	4	0	12	12	1	1	4	A
078	7	4	2	12	12	5	3	4	A
079	7	4	0	12	12	2	2	1	A
080	7	4	0	13	12	2	1	6	I
081	6	4	5	12	13	2	1	2	A

TABLE 12--Continued

Subjects	1	2	3	4	5	6	7	8	9
	Age	Occupational Level	Years Mother Worked Outside	Father's Educational Level	Mother's Educational Level	Number of Siblings	Order of Birth	Number of Errors	Adequacy/Inadequacy of Auditory Discrimination Score
082	7	4	0	13	12	2	2	11	I
083	6	4	0	9	12	7	6	3	A
084	7	4	0	9	9	5	5	5	I
085	7	5	0	12	12	3	2	2	A
086	6	5	0	12	9	7	6	4	A
087	7	5	0	9	9	4	2	2	A
088	7	5	3	12	13	4	4	4	A
089	6	5	1	14	14	3	1	2	A
090	6	5	0	9	12	3	1	3	A
091	6	5	0	12	9	4	1	2	A
092	6	5	0	12	12	2	1	6	I
093	6	5	0	12	9	1	1	4	A
094	7	5	0	9	9	6	6	2	A
095	6	6	0	9	9	3	3	5	A
096	6	6	0	12	9	5	5	4	A
097	7	6	0	12	13	2	1	2	A
098	6	6	0	12	12	3	1	4	A
099	7	6	0	9	12	3	3	4	A
100	7	6	0	8	12	9	8	5	I
101	6	6	3	9	9	5	5	5	A
102	6	6	1	12	13	2	2	5	A

TABLE 12--Continued

Subjects									
	1	2	3	4	5	6	7	8	9
	Age	Occupational Level	Years Mother Worked Outside	Father's Educational Level	Mother's Educational Level	Number of Siblings	Order of Birth	Number of Errors	Adequacy/Inadequacy of Auditory Discrimination Score
103	7	6	1	12	12	3	2	4	A
104	6	6	0	9	8	4	4	3	A
105	6	6	0	9	12	3	1	2	A
106	7	7	1	9	9	4	1	4	A
107	6	7	0	8	9	7	7	7	I
108	7	7	1	9	12	4	4	4	A