CHARACTERISTICS OF PRESCHOOL CHILDREN PRONE TO LEARNING DISABILITIES

by

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Date: November 9, 1979
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ABSTRACT

Fifty preschool children were tested on McCarthy Scales of Children's Abilities (MSCA). Half of these children began life in an intensive care nursery; the other 25 had relatively benign neonatal courses.

The primary purpose of the study was to examine and compare the two group's performances on the MSCA. The secondary purpose was to determine whether parents of the two groups of children differed in selected family characteristics and perceptions of their children.

The results indicated that the high risk group performed lower than the contrast group on the following 5 subsets: Pictorial Memory, Tapping Sequence, Numerical Memory, Opposite Analogies, and Arm Coordination. However, even though these differences on the 5 subsets were found to be statistically significant, their clinical significance is doubtful. In relation to variability both groups had relatively the same degree of variance of performance across the subtests. Also, the analysis of scores on the six scales indicated there were no significant differences between groups providing the father's education was held constant. In addition the parent questionnaire revealed significant differences between the groups were found in father's and mother's education, assistance from others in child rearing and perception of likelihood of the child to be successful in life.
CHAPTER 1

INTRODUCTION

The importance of the early detection of children with learning disabilities is widely stated throughout the educational literature. The present trend in research is to detect children prone to learning disorders prior to their entrance into elementary school. The philosophy behind this movement is that early detection avoids the secondary social and emotional problems of school failure. Prevention of learning disabilities is seen as more cost effective than remediation in terms of dollars and human suffering.

An inherent difficulty in any research involving the terms preschool and learning disabled is that some experts doubt that these two entities coexist. There is not a consensus among professionals as to whether a child who is not yet in an academic setting can be labeled as learning disabled. In a publication of Head Start, the authors refer to this ongoing argument: "Experts agree that learning problems can be identified in children younger than seven. They disagree, however, over whether these problems can be diagnosed as learning disabilities at the preschool age" (Hayden et al., 1978, p. 13).

Kirk and Gallagher' (1979) attempted to resolve this argument by separating learning disabilities into academic learning disabilities and developmental learning disabilities. A definition of learning disabilities which applies to preschoolers as well as older children is suggested by Kirk and Gallagher. They state that developmental disabilities
include "(1) disorders of attention, (2) perceptual and perceptive disorders, (3) limited use of mental operations of memory, seeing relationships, generalizing, associating and so forth, and (4) language disorders including a limited ability to decode and encode concepts, either verbal or motor" (Kirk and Gallagher, 1979, p. 290).

The research in the past, mainly retrospective studies (Weiner, 1968; Fitzhardinge and Steven, 1972), has identified certain groups of children who have a high incidence of learning problems in relation to the general population. The homogeneity in this group of children lies in the fact that they had numerous neonatal problems (Hoffman, 1971; Mercer and Trifiletti, 1977). These findings do not imply that other children with normal neonatal courses do not develop learning disorders, but rather that the probability is much less (Dagbjartsson, Robinson, and Dyment, 1971; Lee, 1977). Based on this assumption, the comparison of a so-called "high-risk" preschool group's performance on a psychoeducational battery to that of a group of children having had no neonatal illnesses may yield differences. These differences can then be offered as guidelines in identifying children prone to learning disabilities.

Purpose of the Paper

The intent of this study is to determine identifying variables in the performance of preschool children likely to be learning disabled, thereby enabling the educational system to intervene before the child enters the primary grades. These factors will be derived by comparing

Assumptions

In determining characteristics of preschool children likely to have learning problems, the following assumptions have been made:

1. Characteristics of learning disabilities do exist in the preschool child. This statement is based on Kirk and Gallagher's (1979) discussion regarding the diagnosis of learning disabilities in the preschool child.

2. Identifying these characteristics before entrance to school is educationally beneficial. Williams (1976, p. 515). "the need for early identification of at-risk children is desirable to prevent secondary mental health and social problems."

3. The McCarthy Scales of Children's Abilities (McCarthy, 1972) are sensitive to these characteristics. Kaufman and Kaufman (1977, p. 12) state that "the specific areas assessed by the McCarthy-language, perception, conceptualization, and memory--correspond to the typically problematic areas of functioning for learning disabled children.

4. Difficulties in performance on the MSCA are indicative of possible learning problems in later years. Based on Kaufman and Kaufman's (1977) discussion and analysis of the MSCA, poor performance on such prerequisite school related skills as short term memory, listening and following directions, and the knowledge of number concepts may predict later school problems.
**Definition of Terms**

1. High-risk infant—a child who spent his first few days after birth in an intensive care nursery.

2. Low-risk child—a child having no problems at birth or during the first month of life.

3. Learning disability—

   a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell or to do mathematical calculations. Such disorders include such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such term does not include children who have learning problems which are primarily the result of visual, hearing or motor handicaps, of mental retardation, of emotional disturbances or environmental, cultural or economic disadvantage (Education for all Handicapped Children Act of 1975, P.L. 94-142).

4. Prenatal—period of pregnancy.

5. Prematurity—birth before 37 weeks gestation.


7. Low Birth Weight—a birthweight less than 2500 grams.

8. Hyperbilirubinemia—a yellowing of the skin more commonly known as jaundice.

9. Respiratory Distress Syndrome—severe lung disease due to the immaturity of the lung.

10. Variability in Test Performance—the standard deviation for a child based on the individual's mean score.
Research Questions Addressed in This Study

Five questions have been addressed in this study:

1. Are the scores of the children in the high risk group significantly different from those of the low risk group on the
   a. 18 subtests of the MSCA
   b. 6 scales of the MSCA?

2. Are there differing degrees of variability in the performances of the two groups reflected in their test profiles?

3. Are the parents' expectations and perceptions of their child different depending on whether or not the child began life in an intensive care nursery?

4. Are there differences between the families of the groups in terms of:
   a. mother's age?
   b. marital status and stability?
   c. family size?
   d. parental discipline?
   e. parent education?
   f. assistance from others in child rearing?

5. If differences exist in these family variables, then what impact, if any, do they have on the child's test performance?

Limitations of the Study

Conclusions and implications from the study are limited by the following factors:
1. Random sampling of the high-risk group was not possible due to the limited number of participants in the original study being conducted at The University of Arizona. Those children in the follow-up program who were ages four to five years, and had a previously established McCarthy General Cognitive Index of at least 80 were used as the experimental group. This GCI limit was used in order to assure that all children in the experimental group were of average intelligence. The children excluded by this limit were primarily Spanish speaking.

2. Selection of the contrast or low-risk group was limited to children attending either one of two preschools in the Tucson area. Preschool selection was determined by the local school district's research director.

3. Since the experimental group was tested by one examiner and the contrast group by another, some variation in administration was possible.
CHAPTER 2

REVIEW OF THE LITERATURE

The studies relating to the prediction and detection of children with learning problems follow three basic research models. The first approach is the prospective study which focuses on and follows a selective population defined by a specific etiological factor thought to be relevant to later learning problems. An example is the examination of premature babies at a later age to determine if school achievement is affected by a child's early medical insult. Another type of prospective study uses a random sample of a population to whom tests are given to determine patterns of functioning at the present and to predict future outcomes. For instance, administering a screening test to preschoolers to indicate their future performance in school. The last research model pertinent to the study of learning problems is retrospective research. In this paradigm deviant characteristics of the present are related to past experiences. In this case the medical and developmental histories of groups already designated as learning disabled are reviewed.

Prospective Studies Using a Selected Population

The first type of prospective study has been conducted by numerous researchers. In spite of similar approaches the findings in these studies tend to contradict one another because of differences in the definition of indicators of learning problems. Some researchers used
only the I.Q. as opposed to other measures for determining the existence of learning problems. Dweck et al. (1973) and Eaves et al. (1970) concluded that infants of low birth weight have the same mean I.Q. as children of appropriate birth weight. This conclusion of their study regarding I.Q.'s misleads the reader into thinking that children who are premature are likely to be successful in school. The fact is that I.Q. alone is not a predictor of school performance. In contrast, those studies which evaluated more than I.Q., find the outcomes of these low birth weight infants to be worrisome in relation to later school success. One such study, conducted by Weiner (1968), has one of the longest follow-up periods. He followed a group of prematurely born infants from birth to twelve years of age. His findings did confirm the previous studies in that the mean I.Q. for the prematures was equal to the mean I.Q. of term babies. However, he also examined the more basic indicators of school success, i.e., math achievement, reading achievement and grade placement. Based on his data and school records, the low birth weight child remained academically impaired. He found that the premature group compared to the term group at ages 12-13 years had lower math and reading scores and were found more frequently either in special classes or in a class a year behind. Rubin, Rosenblatt, and Balow (1973) and Fitzharding and Steven (1972) both got results confirming Weiner's finding that I.Q.'s for the prematures tend to be normal but poor performance in school is present. As many as 50 percent of the boys and 36 percent of the girls in the later study had poor school performance. Rubin also found specific lags in language development and school readiness. Another study having
similar findings (Lubchenco et al., 1972) found that children with normal I.Q.'s starting life as prematures tend to have problems in learning math or reading and also exhibit behaviors that interfere with learning, i.e., hyperactivity.

As can be seen from the studies mentioned, researchers have concluded that prematures and low birth weight children have problems in language, math, and reading achievement. Those studies which have gone beyond these basic academic problems have also found deficits in specific skills. DeHirsch, Jansky, and Langford (1964, 1966) followed a group of kindergarten children, formerly premature babies, who were exhibiting problems in the areas of oral language and reading readiness. Further examination showed that they had weaknesses in tapping patterns, language comprehension, word finding, number of words used, mean of five longest sentences, sentence elaboration and definitions. Another study which describes specific task performance in addition to I.Q. scores was that of Taub, Goldstein, and Caputo (1977). In using the Wechsler Intelligence Scale for Children on 7-9.5 year olds, they found no differences in verbal I.Q., but significantly lower performance I.Q.'s. The specific areas that discriminated between the two groups were math, block design, picture completion and object assembly. Yet another study (Lee, 1977) looked at effects of birth weight on perceptual motor performance at five and six years of age. The conclusions were that children in low weight groups tend to score lower than term infants on tasks involving body image, balance and locomotor ability.
Those studies discussed focus on the developmental affects of only two neonatal factors, low birth weight and prematurity. In addition to these variables a multitude of other neonatal problems have been found to put a baby at risk developmentally. The reason for so many studies on outcome of prematures and low birth weight infants is that they comprise 70 to 80 percent of the babies in intensive care nurseries. Other illnesses, of equal severity, occur less frequently. Just within the last 15 years researchers have begun to assess the effects of these other illnesses such as hyperbilirubinemia (Crichton et al., 1972) and respiratory distress syndrome (Outerbridge, Ramsay, and Stern, 1974). Some researchers in fact have studied the effects of combinations of prenatal, perinatal, and neonatal problems on later learning in the hopes of devising a predictive instrument based on a summary of early events (Parmelee and Schulte, 1970).

A few of these studies on multiple neonatal problems have been prospective (Denhoff, Hainsworth, and Hainsworth, 1972) but the majority have been retrospective (Mercer and Trifiletti, 1977). Denhoff et al. (1972) found that a cumulative score, First Year Index of obstetric, neonatal and first year stresses relates significantly to a seven year neurologic examination and several psychologic measures. Included in these stress items were the common factors of low birth weight, respiratory distress syndrome and prolonged hospitalization. The authors found that combinations of these factors significantly related to performance on the Meeting Street School Test and the Wide Range Achievement Test.
Thus children who were unsuccessful in school tended to have higher scores on the stress index.

**Retrospective Studies**

In contrast to Denhoff's study the retrospective research has examined populations already designated as being learning disabled. In an article reviewing different approaches to screening procedures for the early detection of children with learning disabilities, Mercer and Trifiletti (1977) discussed methods using not only prenatal, neonatal, and developmental histories, but also environmental factors, dental enamel defects, physical anomalies and family history. One of the more extensive works referred to in this review is the research by Hoffman (1971). He gathered information on 1,000 children labeled as learning disabled to determine common historical factors. The predominant factors were prematurity, postmaturity, induced labor, prolonged labor, difficult delivery, breech delivery, and Caesarean-section. In addition to these early stresses he also recorded major lags in early development, i.e., late walking, prolonged tiptoe and late or abnormal speech. From this information he developed the LPII (Learning Problem Indication Index) which suggested that a combination of abnormalities increased the suspicion of eventual learning problems.

Of the most recent retrospective studies relating learning disabilities and early problems only one study (Umansky, 1977) reviewed found no correlations between the two. The major reason given by the author for not finding a link was that he did not have a representative
sample of high risk neonates. Instead of choosing either a school population of learning disabled or a population of children having had severe neonatal problems, his subjects had no significant problems in the present nor when they were babies. Consequently, when he compared the performances on the Frostig Developmental Test of Visual Perception and the Perceptual Motor Pre-academic Scale to historical information, he found no relationships. Without the inclusion of children presently with problems or those having had problems in the newborn period, the lack of correlations is expected.

Among those retrospective studies finding a connection between combinations of early factors and subsequent learning problems, a basic difference exists in relation to the definition of learning difficulties. Some projects use the general criterion of being placed in a learning disability class or being referred to a learning disability center as the dependent variable whereas, others use specific behaviors to relate to early factors. Dagbjartsson, Robinson, and Dyment (1971) examined the records of children already in a learning disabilities program. They found that aside from the 30 percent who were in the program for psychosocial reasons, 20 percent had an abnormal perinatal history, i.e., premature delivery, difficult labor, and neonatal distress. Similarly, Kenny et al. (1972) examined records of children referred to a center for reading problems. He concluded that 42 percent of the children referred had suffered a central nervous insult during either the perinatal or infancy period. In contrast to these two studies which used the general term learning disability to relate to early factors, Smith and
Wilborn (1977) looked at specific deficits and specific behaviors of learning disabled children. These researchers revised the Learning Problem Indication Index, mentioned earlier, to see if specific learning problems are associated with perinatal factors. Of 11 diagnostic categories all but one showed that perinatal and perinatal factors were predictive of later developmental problems. Deficits in three performance areas were found to have significant relationships to perinatal factors; speech problems were predicted from blood incompatibilities, induced labor, postmaturity, and hand eye dominance; reading difficulties were predicted from problems during pregnancy, hand eye dominance, type of birth and induced labor; visual motor problems were predicted from prematurity, convulsions, hand eye dominance and toxemia. Problems in visual perception, language development, auditory discrimination, and visual memory were also connected to prenatal and perinatal factors. The recurring neonatal factors related to these problem areas were toxemia, prepost maturity, blood incompatibility, and induced labor.

Paul Nichols (1977) was another researcher also interested in relating specific characteristics of learning disabled children to early health factors. He looked at poor school achievement, hyperactivity, and neurologic soft signs and related these to ten perinatal antecedents. Of the 10 perinatal factors examined, he found that the combination of breech delivery, birthweight < 2000 grams, and mother's excessive smoking, prenatally increases the likelihood of academic, behavior, and neurologic problems. Thus, both the retrospective and prospective studies cited
which analyze relationships between learning problems and neonatal factors conclude that children with problems at birth tend to have deficits in language, speech, reading, and math.

**Prospective Studies Using a Random Population**

The last area of the literature to be discussed is that of the prospective studies which begin at the preschool years. The purpose of such a study is to evaluate a population of preschoolers using a screening tool in order to predict later school problems. The only prospective study reviewed that focused on preschool children was conducted by Camp et al. (1977). They evaluated children from four to six years old and then re-evaluated at seven to nine years old using the Denver Developmental Screening Test and the Stanford Binet. The findings, as far as predictability was concerned, showed that the DDST is accurate 69 percent of the time in identifying those with later school problems. However, 32 percent of those scoring normal on the DDST had school problems. The two inherent problems in using this as a screen are that (1) the depressed performances may in large part be due to environmental causes as this group was from low-income families; and (2) the DDST is a gross test of development. Considering that the four categories of fine motor adaptive, gross motor, personal-social and language are comprised of a very few items, it is impossible to pinpoint specific deficits. One established program for screening kindergarten children was discussed by Logan (1975). Follow-up of these children was not presented in the article, but a detailed account of a step-by-step
procedure for screening was given. In conjunction with the last study this program in Denver also used the DDST, but recognized the importance of other information so as not to omit children needing help. In addition to the DDST, observations were made of the child in the classroom and on the playground. The screening also involved interviews with the parents to obtain information on (1) prenatal and developmental problems, (2) behavior and adjustment, and (3) family history. As was revealed by the scarcity of articles on both preschool screening and the predictive capacity of the instruments used, further research needs to be conducted to determine factors of the younger child that relate to later learning problems.

To supplement this lack of information on screening some of the studies of older children with learning disabilities describe characteristics which are detectable at younger ages. Two such studies refer to an unevenness in developmental patterns as being indicative of later learning problems. Bell and Aftanas (1972) found that poor readers had a significantly greater number of specific deficiencies. These deficiencies were determined through a battery of tests including the Stanford Binet, Goodenough Draw a Person, and Bender Gestalt. Smith et al. (1977) found that a high degree of variation for an individual was characteristic of a learning disabled child. On the WISC-R (revised) the learning disabled child not only showed a significantly higher performance I.Q. in relation to the verbal I.Q., but the heterogeneity among mean subtest scale scores was greater. These two findings suggest that in screening for potential learning problems in younger children, the individual profiles serve as indicators.
Thus, an infant with multiple problems at birth is likely to have some aspect of his learning ability impaired. The academic deficits are in language, reading, and math, while skill deficits range from language comprehension and vocabulary to more process oriented deficits of visual perception, auditory discrimination, and visual motor. The presence of each of these problems in addition to varied profiles are all indicative of a preschool child with possible learning problems.
CHAPTER 3

METHODS AND PROCEDURES

This chapter will discuss the manner in which the subjects were selected, the instruments used to gather the data, the procedures utilized in administering the test, and the manner in which the data were collected and analyzed.

Selection of Subjects

The high-risk group of 25 children is a subset of a population participating in a longitudinal study at the Arizona Health Sciences Center. This original study, conducted by Dr. Elsa Sell and funded by the Robert Wood Johnson Foundation, enrolls children who are admitted to the intensive care nursery at either the University Hospital or Tucson Medical Center. For the present study 25 children were chosen from that population based on the following characteristics: (1) chronological age of four-to-five years, (2) hospitalization for two weeks or more in the nursery, (3) presence of at least three major neonatal complications, (4) previous administration of the McCarthy Scales of Children's Abilities and Parent Questionnaire, (5) General Cognitive Index of over 80, and (6) English speaking proficiency. Table 1 describes the incidence and types of medical problems of these children. The cognitive index restriction was applied in order to avoid those children who were of possible borderline intelligence. Children with severe abnormalities, i.e., blindness, cerebral palsy, were omitted.
### Table 1. Neonatal Characteristics of the High-risk Group.

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<thead>
<tr>
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<th>Number</th>
<th>Mean</th>
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<tr>
<td><strong>Birthweight</strong></td>
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<tr>
<td>&lt;1500 gram</td>
<td>9</td>
<td>1239 gr.</td>
</tr>
<tr>
<td>1500-2500 gram</td>
<td>9</td>
<td>2066 gr.</td>
</tr>
<tr>
<td>2501-3300 gram</td>
<td>6</td>
<td>2605 gr.</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>2043 gr.</td>
</tr>
<tr>
<td><strong>Gestational Age</strong></td>
<td></td>
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<tr>
<td>&lt;32 weeks</td>
<td>6</td>
<td>29 wks.</td>
</tr>
<tr>
<td>32-36 weeks</td>
<td>13</td>
<td>34 wks.</td>
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<tr>
<td>37-40 weeks</td>
<td>6</td>
<td>38 wks.</td>
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<td></td>
<td>25</td>
<td>34 wks.</td>
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<tr>
<td><strong>Respiratory Assistance</strong></td>
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<tr>
<td>for Other Illnesses</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hyperbilirubinemia</td>
<td>11</td>
<td>44%</td>
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</table>
The contrast group is comprised of children from two preschools in Tucson District I, Marshall and Hudlow Schools. Consent forms (see Appendix A) were distributed to the parents of 40 children. From the 35 returned signed consents, the following criteria were used for selection: (1) the child was never admitted to an intensive care nursery, (2) each child matched an experimental child for age at test as closely as possible, (3) the contrast children had to be English speaking, and (4) this group had to have the same sex ratio as the experimentals.

**Description of Assessment Instruments**

Two assessment instruments were utilized in gathering the data for this study. The first instrument, the McCarthy Scales of Children's Abilities, was designed to measure a child's mental and motor functioning. The second instrument, the Parent Questionnaire, was used to assess family characteristics and parents' perceptions of their child. The stated purpose and benefit of this test is as follows:

With the increasing recognition of the early years as critical in the child's development, psychologists are evaluating children at younger and younger ages to determine their general intellectual level as well as their strengths and weaknesses in important abilities. The McCarthy Scales of Children's Abilities (MSCA) were designed to satisfy the need for a single instrument to facilitate such measurements... It is hoped that these measures of important areas will provide a better understanding of both normal children and those with learning disabilities (McCarthy, 1972, p. 1).

This test was designed for children aged two and a half to eight and a half years and was standardized on a representative sample of 1032 children within this age range. To insure that the results would be
applicable to most children in this age range, the group was stratified on age, sex, race, father's occupation, geographic region, and urban versus rural residence.

The test itself is comprised of 18 short tests taking about 45 minutes to administer to each child. These subtests have been grouped to form six scales: Verbal, Perceptual-Performance, Quantitative, General Cognitive Index, Memory and Motor. The first three contribute to the global General Cognitive Index (GCI) which is comparable to an IQ score (standard score with a mean of 100 and standard deviation of 16). The five scales excluding the GCI are based on standard scores with a mean of 50 and standard deviation of 10. Test-retest reliability coefficients were evaluated at one month intervals resulting in coefficients of 0.90 for the GCI and about 0.81 for the five scale indices.

Based on Kaufman and Kaufman (1977), the variety of skills examined in these five scales (excluding GCI) are as follows: the Verbal Scale involves vocal expression, verbal concept formation, language development, and short term memory; the Perceptual-Performance involves non-verbal reasoning, visual-motor coordination, visual perception and spatial relations; the Quantitative Scale requires numerical reasoning, memory and counting ability; the Memory Scale involves sequencing ability, the ability to attend, auditory perception and short term memory; and the Motor Scale assesses both fine and gross motor coordination.

Parent Questionnaire

This parent questionnaire is a revised form of a tool being used in the ongoing longitudinal study at the Arizona Health Sciences Center
The revisions involved omitting those questions which were not pertinent to the present study. Those areas of interest which are covered include questions about income level, age, and educational level of parents, and parents' perceptions of their child. Administration of both this tool and the McCarthy involved only the contrast group as the data on the experimentals had already been obtained.

Procedures

The initial step was to distribute the consent forms to the teachers of the prospective contrast group. Parents were asked to return the forms to the teachers as soon as possible. Once these consent forms were returned, those children matching as closely as possible the ages of the experimental group were scheduled for testing. In the meantime, the Parent Questionnaire was mailed to the parents of the contrast group, along with a stamped envelope addressed to the experimenter.

Testing took place during class hours at the school the child attended. In order to reduce the possibility of stranger anxiety, the experimenter attended each of the two classes once before beginning the testing. The classes met for approximately three hours allowing for two students to be tested and scored each day. The actual testing period ranged from the end of October to the middle of November.

For the administration of the test, both schools provided a quiet, vacated room. The child was told ahead of time that he or she would be asked to play some games with the examiner. Only one child refused to go for testing; his reluctance appeared to be related to being new to the class and the neighborhood. Immediate feedback of test
results was given to the child's teacher so that parents could be in-
formed of the results.

Data Collection and Analyses

Information on the experimental group's test performance and
responses to the Parent Questionnaire had previously been entered and
stored in the hospital's computer. The corresponding data on the con-
trast group were compiled and merged with the data on the experimentals.

Information from the questionnaire and McCarthy test were re-
corded on IBM computer sheets. The standard scores from the six McCarthy
Scales were entered into the computer. The individual raw scores of the
subtests were revised due to the varied ranges of scores per test and
the variation of ages within the groups. In spite of the attempt to
match ages, the controls and experimentals differed in their ratios of
children aged four to four and a half and four and a half to five. This
difference in the breakdown of the ages, even though the mean age of 53
months is the same for both groups, is critical to the analysis because
McCarthy states in one of her tables that a six-month difference in age
yields different scores. In Table 17 of the McCarthy Manual, the means
and standard deviations listed for the ages 4-4½ and 4½-5 are different.
In order not to confound the results with the age factor, all subtest
raw scores were converted to a uniform system. Using Table 17 of the
McCarthy Manual, the scores were converted using a standard normal curve
with a mean of 50 and a standard deviation of 10. Depending on where
the child's score lies in relation to the standard deviation diagram (Fig. 1) the following scores were assigned: ($x =$ raw score; $\bar{x} =$ mean score for that age)

![Standard Deviation Diagram](image)

**Fig. 1. Standard Deviation Diagram.**

1. $x = -2$ S.D. to $-3$ S.D.
2. $x = -1$ S.D. to $-2$ S.D.
3. $x = \bar{x}$ to $-1$ S.D.
4. $x = \bar{x}$ to $+1$ S.D.
5. $x = +1$ S.D. to $+2$ S.D.
6. $x = +2$ S.D. to $+3$ S.D.

For example, a score of 10 on block building for a 4 year old child was compared to the mean of 8.6 and a standard deviation of 1.6 for children of the same age in the standardization sample. By adding the mean and standard deviation the score of 10 is found to be above the mean and less than 1 S.D. (10.2). The converted score is then 4, meaning that the raw score is between the mean and 1 S.D. for children of that age.
After the revision of the scores the data were then analyzed. In order to answer the first research question, "are the scores of the children in the high-risk group significantly different from those of the low-risk group", the revised subtest scores and the scale scores were analyzed for the significance of the difference of the means, using a two-tailed t-test for matched groups.

In order to answer the second question, "are there differing degrees of variability in the performances of the children in each group reflected in their test profiles", the mean subtest score and mean standard deviations for the children in both groups were compared by applying a two-tailed t-test.

To answer the third question, "are the parents' expectations and perceptions of their child different depending on whether or not the child began life in an intensive care nursery", differential responses between the two groups were analyzed for significance using the square.

The fourth question, "are there differences between the families of the groups in terms of mother's age, marital status and stability, family size, parental discipline, parent education and assistance from others in child rearing", was answered by applying a two-tailed t-test to determine the significant differences.

In order to answer the last question, "if differences exist in these family variables, then what impact, if any, do they have on the child's test performance", those family characteristics listed in the fourth question which were found to be significantly different for the two groups were then correlated with all test items using Pearson
Correlation Coefficients. If any of the resulting significant correlations involved a test previously proven to differentiate between groups, then a regression analysis was applied to determine the independent effect of the particular family characteristic on the corresponding test score.
CHAPTER 4

RESULTS

In this chapter the results of the comparison of the performances of the two groups of four-year old children will be presented. The data has been analyzed in order to answer the following questions:

1. Are the scores of the children in the high-risk groups significantly different from those of the low-risk groups on
   a. the 18 subtests of the McCarthy Scales of Children's Abilities?
   b. the 6 scales of the McCarthy Scales of Children's Abilities?

2. Are there differing degrees of variability in the performances of the two groups reflected in their test profiles?

3. Are the parent's expectations and perceptions of their child different depending on whether or not the child began life in an intensive care nursery?

4. Are there differences between the families of the groups in terms of:
   a. mother's age?
   b. marital status and stability?
   c. family size?
   d. parental discipline?
e. parent education?

f. assistance from others in child rearing?

5. If differences exist in these family variables then what impact, if any, do they have on the child's test performance?

Comparison of Two Groups in the McCarthy Scales of Children's Abilities

In order to address the question of whether the scores of the children in the high-risk group differ significantly on the MSCA from those of the children in the low-risk group, the means for the 18 subtests and 6 scales were computed and are presented in Tables 2 and 3 respectively.

Table 2 lists the mean of the revised scores for each group on each of the tests. For those starred items which represent significant differences in the means, the contrast group scored between 4 and 5 on all but 1 subtest; whereas, the experimentals hovered between 3 and 4. The contrast group was scoring above the mean for children of similar ages and the experimental group tended to score below the mean on 6 subtests: Pictorial Memory, Tapping Sequence, Arm Coordination, Numerical Memory, Counting and Sorting, and Opposite Analogies. On Pictorial Memory the comparison of mean yields a t value of 2.05 (df=46.97) with a probability of 0.046. On the Tapping Sequence the t value is 2.69 (df=46.61) resulting in a probability of 0.01. For Arm Coordination both groups again differed significantly with a comparison of means yielding a t value of 2.07 and a probability of 0.044. In the area of numbers, two of the subtests of the Quantitative Scale resulted in
Table 2. Scaled Scores on the Subtests of the McCarthy Scales of Children's Abilities for the Experimental and Contrast Groups.

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Block Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.36</td>
<td>0.95</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.68</td>
<td>0.56</td>
</tr>
<tr>
<td>2. Puzzle Solving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.96</td>
<td>0.98</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.44</td>
<td>0.87</td>
</tr>
<tr>
<td>3. Pictorial Memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.68</td>
<td>1.11</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.08</td>
<td>0.95</td>
</tr>
<tr>
<td>4. Word Knowledge I &amp; II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.76</td>
<td>0.78</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.36</td>
<td>0.91</td>
</tr>
<tr>
<td>5. Number Questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.92</td>
<td>1.00</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.60</td>
<td>0.76</td>
</tr>
<tr>
<td>6. Tapping Sequence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>4.40</td>
<td>1.08</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.64</td>
<td>0.91</td>
</tr>
<tr>
<td>7. Verbal Memory I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.56</td>
<td>0.77</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.44</td>
<td>1.08</td>
</tr>
<tr>
<td>Verbal Memory II</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.36</td>
<td>0.57</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.08</td>
<td>0.81</td>
</tr>
<tr>
<td>8. Right-Left Orientation (omitted due to being administered only to children 5 years and over)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Leg Coordination</td>
<td></td>
<td></td>
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<tr>
<td>Contrast</td>
<td>3.28</td>
<td>0.98</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.56</td>
<td>0.82</td>
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<tr>
<td>10. Arm Coordination I &amp; II &amp; III</td>
<td></td>
<td></td>
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<tr>
<td>Contrast</td>
<td>4.08</td>
<td>0.95</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.56</td>
<td>0.82</td>
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</table>
Table 2, Continued.

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiative Action</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.56</td>
<td>0.85</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.32</td>
<td>0.77</td>
</tr>
<tr>
<td>Draw-a-Design</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.60</td>
<td>0.91</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.44</td>
<td>1.04</td>
</tr>
<tr>
<td>Draw-a-Child</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.64</td>
<td>1.04</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.56</td>
<td>0.71</td>
</tr>
<tr>
<td>Numerical Memory I</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>*4.76</td>
<td>1.05</td>
</tr>
<tr>
<td>Experimental</td>
<td>4.00</td>
<td>0.87</td>
</tr>
<tr>
<td>Numerical Memory II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>3.44</td>
<td>0.96</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.08</td>
<td>0.28</td>
</tr>
<tr>
<td>Verbal Fluency</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>4.00</td>
<td>1.08</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.88</td>
<td>1.01</td>
</tr>
<tr>
<td>Counting and Sorting</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>*4.28</td>
<td>0.74</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.32</td>
<td>0.99</td>
</tr>
<tr>
<td>Opposite Analogies</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>*4.36</td>
<td>0.76</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.48</td>
<td>0.96</td>
</tr>
<tr>
<td>Conceptual Grouping</td>
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<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>4.08</td>
<td>0.76</td>
</tr>
<tr>
<td>Experimental</td>
<td>4.04</td>
<td>1.02</td>
</tr>
</tbody>
</table>

*p < 0.05

Note: The scores listed are derived from Table 17 of the McCarthy Manual.
Table 3. Performance on the Scales of the McCarthy Scales of Children's Abilities.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Verbal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>52.3</td>
<td>7.8</td>
</tr>
<tr>
<td>Experimental</td>
<td>50.6</td>
<td>9.5</td>
</tr>
<tr>
<td><strong>Perceptual</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>53.6</td>
<td>7.2</td>
</tr>
<tr>
<td>Experimental</td>
<td>51.4</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>Quantitative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>57.9</td>
<td>6.5</td>
</tr>
<tr>
<td>Experimental</td>
<td>50.0</td>
<td>7.4</td>
</tr>
<tr>
<td><strong>General Cognitive Index</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>106.6</td>
<td>9.7</td>
</tr>
<tr>
<td>Experimental</td>
<td>101.9</td>
<td>14.0</td>
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<tr>
<td><strong>Memory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>50.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Experimental</td>
<td>50.0</td>
<td>7.8</td>
</tr>
<tr>
<td><strong>Motor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>53.4</td>
<td>7.2</td>
</tr>
<tr>
<td>Experimental</td>
<td>49.1</td>
<td>10.2</td>
</tr>
</tbody>
</table>

*p < 0.001
differences in performance for the two groups. On Numerical Memory I
the $t$ value is 2.79 ($df=46.29$) with a probability of 0.008. On Counting
and Sorting the $t$ value is 3.89 ($df=44.39$) and a probability of 0.0001.
The last subtest in Table 2 to show a significant difference is that of
Opposite Analogies; the $t$ value is 3.59 ($df=45.48$) resulting in a proba-
bility of 0.001. In summary the subtest scores of the high-risk group
were significantly lower than those of the contrast group on six subtests.

In addition to the 18 separate test scores the scale scores for
the groups were also compared. In Table 3 the means for the six scales
are relatively higher for the contrast group than for the experimental.
However, judged by the General Cognitive Index, a composite of the verbal,
perceptual, and quantitative scales, the difference between groups is not
significant. The only significant difference in performance is on the
Quantitative Scale. The mean for the controls is 57.9 with a standard
deviation of 6.5; the mean for the experimental is 50.0 with a standard
deviation of 7.4. With a $t$ value of 4.0 ($df=47.31$) the probability is
0.0001. In answer to the first part of the initial question, the high-
risk group performed significantly lower than the contrast group on
Pictorial Memory, Tapping Sequence, Arm Coordination, Numerical Memory,
Counting and Sorting and Opposite Analogies. In relation to performance
on the scales, the only significant difference between groups was on the
Quantitative Scale.
High-risk Group and Contrast Group Profiles

In order to address the question of variability in the high-risk group's and the contrast group's profiles, the mean of the subtest scores (revised) and mean standard deviation for children in the experimental group were compared with those for children in the contrast group.

The mean of all subtest scores for the control group is 3.76 with a standard deviation of 0.370; the mean of all subtest scores for the children in the experimental group is 3.59 with a standard deviation of 0.438. The $t$ value is 1.41 (df=46.69) with a probability of 0.164. Therefore, the mean test score for a child in either group is relatively the same. A more detailed analysis of the mean score for each child was done comparing the standard deviation of test scores for an individual child. The standard deviations for every child in a group were then summed and averaged. The resultant means were compared to determine if a child's variability differed according to grouping. The mean standard deviation for a child in the contrast group is 0.90 with a standard deviation of 0.199; the mean standard deviation for a child in the experimental group is 0.80 with a standard deviation of 0.172. The $t$ value is 1.88 (df=46.99), with a probability of 0.066. Thus, the degree of individual variation for children in both groups does not differ significantly.

Parental Expectations and Perceptions

In resolving the question of whether the parents' expectations and perceptions of their children differed depending on whether their child began life in an intensive care nursery, comparisons of the responses
to five items on the questionnaire revealed no significant differences in the way the two sets of mothers viewed their children.

Most of the mothers from both groups view their child as very attractive (70%), smart (71%) and embraceable (82%). None of the mothers scored their child as low on these characteristics and few rated them average. One question which elicited a more variable response was that of difficulty in raising; 58% checked average and 40% marked easy to raise. Again, these percentages represent the whole group because substantial differences between the groups were nonexistent. The last of these five questionnaire items, on physical structure, shows a varied response similar to that of difficulty in raising. The percentages were 18% rated as tall, 62% as average and 20% as short.

In spite of all these similarities in responses of parents to their child's present characteristics, the chi square done on the results of the last question on success yields a significant difference. Table 4 shows the distribution of ratings for each group. As reflected in the table there is a strong relationship between group and rating of success. The proportion of contrast group being rated high in success is considerably greater than the proportion of experimentals being rated as successful. Thus, the parents' perceptions of their child on present characteristics appear not to be affected by the child's having been ill at birth; however, the parents' expectations of the child's future in terms of success does seem affected by the child's early health problems.
Table 4. Parents' Ratings of Their Child's Likelihood to be Successful.

<table>
<thead>
<tr>
<th></th>
<th>Low-risk</th>
<th>High-risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>Average</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Below Average</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

\[ X^2 = 7.7 \quad p < 0.05 \]
\[ df = 2 \]

Comparison of the Two Groups on Selected Family Characteristics

An analysis of the responses to the fourth question, dealing with differences between the two groups in terms of mother's age, marital status and stability, family size, parental discipline, parent education, and assistance from others in child rearing revealed that both groups are similar on most family characteristics.

The mothers' mean age in both groups is 31.5 years with standard deviations of 4.8 in the experimental group and 5.0 in the contrast group. In the areas of marital status and family stability, all mothers except for 3 in the controls and 4 in the experimentals are currently married and have been for an average of 9.2 years, standard deviation of 4.7.

In addition to length of marriage, marital stability for both groups is further evidenced by the low number of mothers previously married, 4 in the contrast group and 6 in the experimentals. As far as family size, the number of siblings in both groups averaged 1.9 with a standard deviation of 1.8.
Another characteristic of families evaluated by the questionnaire was style of parental discipline. As with the previous characteristics differences between the experimentals and controls were negligible. The results show that the respondents were disciplined by their parents in a variety of ways: 36% were spanked, 26% were yelled at and 28% were reasoned with as a child. The effects of the parents' treatment as children appears to strongly influence the mode of discipline they use with their own child: 42% spank, 14% yell and 32% reason.

Aside from these similarities in the groups, one major difference exists between the families, i.e., parental education. The mean level for the mothers of the contrast group was 15.0 years with a standard deviation of 1.67; the mean number of years for the mothers of the experimentals was 12.8 (2.0 S.D.). With a $t$ value of 4.08 (df=42.87), the probability is 0.000. For the fathers of the contrast group, the mean level was 15.9 (1.8 S.D.) years; the mean level for those of the experimental group was 12.7 (2.4 S.D.). With a $t$ value of 4.89 (df=40.49), the probability is 0.000. Thus, the results indicate that both parents of the low-risk group have significantly more years of formal education than the parents of the high-risk group. The average parent in the former group tended to have a college education, whereas, the average parent in the latter group had only a high school education. Since parent education is known to have a strong effect on a child's developmental and cognitive progress, the effects of this variable on the McCarthy results will be analyzed below.
Another significant difference in family characteristics was in getting assistance in child care. The statistics reveal that the majority (74%) of mothers do obtain help from their spouses; however, the experimental group gets considerably less help from the extended family than does the contrast group. Table 5 shows the distribution of responses on the issue of getting assistance from others in child care. A chi square analysis reveals that mothers of the contrast group get assistance significantly more often from others than do mothers of the experimental group. By comparing percentages only 40% of the contrast group get help either seldom or never; whereas, 88% of the experimental group rarely get help.

In summary, the families are comparable in relation to the mothers' age, marital status, length of current marriage and family size. The two groups do differ significantly in parent education and assistance from others in child rearing.

Table 5. Parental Responses to Getting Help from Others in Child Rearing.

<table>
<thead>
<tr>
<th></th>
<th>Low-risk</th>
<th>High-risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Often</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Seldom</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Never</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>
Relationships between McCarthy Performance and Responses to Parent Questionnaire

The fifth and final question of the study concerned whether differences in family characteristics from the parent questionnaire had an effect on the child's performance, and if so, these effects independent of the child's grouping. Taking the two variables of parent education and assistance in child rearing which differed significantly for the two groups, the relationships of these variables to test performances were examined through Pearson Correlation Coefficients. For mothers' education, there were no significant relationships with test scores. Fathers' education, however, correlated significantly with the scores on Word Knowledge (0.3585, p < 0.18), Number Questions (0.4214, p < 0.005), Counting and Sorting (0.3750, p < 0.13) and the Quantitative Scale (0.4810, p < 0.001). Within these four scores the latter two had shown differences between the experimentals and contrast groups in the first part of the result section. Thus, a step-wise regression analysis was applied to determine if differences in performance on these two items were the result of the father's educational level rather than a result of the group placement. For the Quantitative Scale, fathers' education yields an $R^2$ of 0.23 with $F$ equal to 12.34 [$F_{.99} (1,41) = 7.31$]. This means that independent of grouping the father's education accounts for 23% of the variance on the Quantitative Scale. Grouping, however, has no effect on the scores for this item when father's education is controlled. $R^2$ is 0.26 with $F=4.9$ [$F_{.99} (2,40)=5.8$]. For Counting and Sorting, the father's education is again the main predictor of score
values. Analysis of father's education results in $R^2 = 0.25$ with $F=10.2$ [$F_{.99}(1,41)=7.31$]. Grouping yields $R^2 = 0.24$ with $F=3.09$ [$F_{.99}(2,40)=5.18$]. Therefore, the differences in performance previously noted (Tables 2 and 3, pages 28 and 30) on the Quantitative Scale and on Counting and Sorting are no longer significant when the father's educational level is held constant.

The second variable examined for its effects on test performance was that of assistance in child rearing. As a result of analyzing correlation coefficients of all test scores in relation to this item, no significant relationships were found. Thus assistance in child rearing, while different for the two groups, has no effect on the child's test performance.

The conclusions of this study are that:

1. the children of the high-risk group scored significantly lower than the contrast group in Pictorial Memory, Tapping Sequence, Arm Coordination, Numerical Memory I, Counting and Sorting, Opposite Analogies and Quantitative Scale,
2. both the high-risk and contrast groups perform with the same degree of variability on the MSCA,
3. both parent groups' perceptions of their children are equally positive except for the variable of future success,
4. the groups are similar on a number of family characteristics excluding parent education and assistance in child rearing,
5. the father's education has a significant impact on the scores of the Quantitative Scale and on Counting and Sorting independent of the child's grouping.
CHAPTER 5

SUMMARY AND CONCLUSIONS

This chapter will discuss the results of this study and their implications for future research. The major findings of the study will be presented in the following order: (1) the differences and similarities of performance of a high-risk population and low-risk population on the McCarthy Scales of Children's Abilities; (2) the differences and similarities of the parents' responses to questions regarding their perceptions of their child; (3) the impact of parent education on the children's performance; and (4) an explanation of the difference found between parents of the two groups of children on getting assistance from others in child rearing.

The consensus of researchers who have studied the cognitive and academic outcomes of children having had neonatal problems is that school performance is affected by early health complications. Additionally, the children's performance in specific skill areas are inferior to those of children having been healthy at birth. Among the deficits frequently discussed in the literature are those in visual perception, auditory discrimination and visual-motor coordination.

The high-risk childrens' overall performance was similar to that of the contrast group in many variables sampled. Both groups did equally well on 13 of the 18 subtests. Although there were many significant differences in five subtests of the McCarthy Scales of Children's Abilities

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(Pictorial Memory, Numerical Memory, Tapping Sequence, Opposite Analogies and Arm Coordination), the clinical significance of these differences is weak considering that differences in means range from 0.52 to 0.88. In relation to the Scales the high-risk group performed significantly lower than the contrast group on only one item, the Quantitative Scale. This difference in scale scores, however, was no longer significant when the father's education was controlled. Also, the analysis of variability in the profiles of both groups showed no significant differences. Thus, these high-risk children appear to have the same amount of variability in their performance as the low-risk children. Based on these similarities in performance on the majority of subtests and scales, the clinical importance of the differences found in the five subtests mentioned earlier is questionable. From these findings the outcomes for a group of children beginning life in an intensive care nursery are more optimistic than those reported by previous researchers. Whether these five subtests alone are predictive of later learning problems has yet to be proven. In view of the other strengths these children have, chances of later academic problems may be questionable.

Although the similarities between the two groups was evident on the MSICA subtest and scale scores, and the degree of variability, the present study confirms the finding of others in that this high-risk group performed below the low-risk group in the five tasks of MSICA, i.e., Numerical Memory, Pictorial Memory, Tapping Sequence, Opposite Analogies and Arm Coordination.
In examining these five areas short-term memory is found to be related to three of the tasks. The first items of Numerical Memory, Tapping Sequence, and Pictorial Memory involve either auditory or visual memory. This finding may relate to Torgeson and Goldman's (1977) conclusion that children with learning problems have difficulty in tasks involving short-term memory. Their study showed that in the primary grades learning disabled children lack the ability to rehearse nonverbally, a necessary skill for memorizing.

It is interesting that verbal memory in the high-risk group appears unaffected even though all other short-term tasks were affected. One possible explanation is that the verbal memory task requires the child to use his hearing and speech; whereas, the tasks of Pictorial Memory and Tapping Sequence use a combination of auditory and visual perception. The weakness may lie in the ability to integrate the auditory and visual senses. Another explanation for the lower scores in memory is that these children may have difficulty in attending. According to Ross (1976) apparent deficits in memory may be a result of an inability or failure to attend. He refers to a study by Routh and Roberts (1972) in which they found a significant relationship between disorders of attention and memory disorders.

Aside from an inferior performance on the three tasks involving memory, the children also performed lower on the test of Opposite Analogies. According to Kaufman and Kaufman (1977) this subtest of the Verbal Scale is the only one involving verbal reasoning. Unlike the test of Word Knowledge, Verbal Memory and Verbal Fluency, this test requires the
child to give more than a listing of similar words. This test requires the child to solve a semantic problem. Without an understanding of the concept "opposite" children are likely to score low.

The last subtest which differentiated the high- and low-risk groups was arm coordination. The three tasks which measure this coordination are ball bouncing, hitting a target with a bean bag, and catching a bean bag when thrown. Even though the performance of the experimentals was within the normal range, the quality of the maneuvers was relatively poor when compared to the contrast group. This difference may result because of the lack of opportunity or experience. It has been shown (Satterwhite, 1978) that children with chronic illnesses are restricted in activity by their parents. Possibly the parents of these children restricted their motor activity out of fear of exertion. The parallel is that the traumatic event of having a severely ill newborn may affect these parents to the same degree as those having children with ongoing illnesses.

Beyond the test performances examined in this study and in those studies of others are the measures of the parents' perceptions of their child. Regardless of a child's having or not having problems at birth, both sets of parents viewed their child as embraceable, intelligent, easy to raise, and attractive. The perception which differentiated the two groups of parents was likelihood to succeed. Interestingly, even though parents of both groups rate their child as being intelligent, the parents of the high-risk child view his or her likelihood of success with less optimism. Satterthwaite (1978) found that 50% of the parents
of chronically ill children felt that their child's future education, job chances and social life would be affected. He also noted that in school performance more of the ill were underachieving. This inferior school performance may be a result of the child's having a lower energy level, but another explanation is that the parent's expectations may serve as a self-fulfilling prophecy. D'Antonio (1976) supports the notion that parents of ill children tend to treat these children differently from a healthy child. They found that mothers of children with cardiac problems avoid conflicts and are lenient in the amount of discipline used. Even though these two studies concern children with ongoing health problems, the concerns of these parents are likely to be present in those having lived through a newborn crisis. The vital question is whether the mother's expectations for the child's future directly affect his motivation and consequently his achievement in school.

Seligman (1975, p. 151) has addressed this issue with his concept of learned helplessness: "Helplessness in an infant organism has the same consequences as in adults: lack of response initiation, difficulty in seeing that responding works, anxiety and depression. Since helplessness in an infant, however, is the foundational motivational attitude around which later motivational learning must crystallize, its debilitating consequences will be more catastrophic". This aspect of the present research underlines the importance of the postnatal environment on the future development of the child. It also emphasizes the critical impact of parental attitudes in shaping behavior of young children.
Aside from a few differences in test performance and in the parents' perceptions of their child, the two groups differed in two family characteristics, parent education and assistance from others in child rearing. In relation to education both mothers and fathers of the high-risk group tended to have a high school education; whereas, the low-risk children's parents tended to have a college education. This finding is to be expected as many of the studies on ill newborns have found the majority of the parents to be from the lower socio-economic group. Apparently, certain newborn diseases are a result of the mother's poor nutrition and poor health care during pregnancy. In this study the effects of father's education appear to transcend the effects of the child's early health problems in relation to performance on counting and sorting, number questions, quantitative summary score and word knowledge. Other than word knowledge the items related to father's education involved the use and understanding of numbers. The interesting aspect of these relationships is that even though differences existed between groups for the mother's educational level, only the father's related to task performance. Considering that the mother is likely to spend more time with the child this finding is unexpected. Another issue related to father's education is the lack of difference economically between groups. This may reflect the fact that many of the blue collar workers in the Southwest are employed in union jobs such as construction and mining, therefore, they make salaries comparable to more educated white collar workers.

The other family characteristic differentiating one group from the other is the frequency of help from extended families and baby
sitters in child rearing. The finding was that the high-risk group tended to get less assistance from others in raising their child. One explanation is that the families have an inherently different structure; the low-risk group as opposed to the high-risk group may have more of an extended family living nearby. Another explanation may be associated with the idea of having an ill newborn. Possibly the parents of a child who had been seriously ill develop an overcautious behavior. This feeling may manifest itself in the parent's guilt or fear of leaving the child with others. Consequently, they refrain from asking others to help them.

**Suggestions for Future Research**

The following suggestions for future research regarding the high-risk newborn are proposed:

1. More longitudinal studies on the high-risk newborn need to be conducted to determine if the differences in performance at four to five years are predictive of academic differences in forthcoming school years. The case has been made that newborns with several problems at birth exhibit relative weaknesses in the areas of pictorial memory, numerical memory, tapping sequence, opposite analogies and arm coordination; however, the effects of these differences may be outweighed by the other skill areas in which both children performed equally well.

2. Greater attention needs to be directed to the perceptions and expectations of the parents of children with initial health
problems. These attitudes should be assessed periodically from the newborn period through the early years in school to determine their effects on the child's accomplishments. The mothers in this study show a less than optimal view of their child's likelihood to succeed. The only factor accounting for this belief is that the high-risk group began life in an intensive care nursery.
APPENDIX A

PARENTS' CONSENT FORM
You are being asked to allow your child to participate in a study entitled, "Preschool Characteristics of Children Prone to Learning Disabilities."

Your healthy child's performance on the McCarthy Scales of Children's Abilities will be compared to an already tested high risk group of children (children with problems at birth). The purpose of this study is to determine preschool characteristics of the high risk children who are likely to have learning problems. As a result of these findings those high risk children needing intervention can be helped prior to grade school entrance.

The test procedure takes approximately 60 - 75 minutes and assesses five areas of abilities; verbal, perceptual, quantitative, motor, and memory. This examination will be done at your child's preschool during school hours. The teacher will be consulted a day in advance so that the testing time doesn't conflict with already scheduled activities.

In addition to testing your child, further information will be gathered on family background and home environment through a parent questionnaire. Should you agree to your child's participation in this study, this form will be mailed to you.

Your child's participation is voluntary. He or she may withdraw at any time without ill-will. There will be no costs or risks incurred as a result of your child's participation. The potential direct benefit is your child's gaining experience in test taking and in following directions. The results will remain confidential. If you, the parent, have any questions regarding this study, please call me, Susan Poisson, at 626-6694 (office) or 881-2244 (home).

Consent

I have read the above 'Parents' Consent Form' and hereby give consent to allow my child to participate in the study. I also understand that this consent form will be filed in an area designated by the Human Subjects Committee with access restricted to the principal investigator or authorized representatives of the particular department.

__________________________________________
Child's Name

__________________________________________ Date
Signature of Parent

__________________________________________
Signature of Witness Date

* Please return this form to your child's teacher.

AN EQUAL OPPORTUNITY EMPLOYER
PARENT QUESTIONNAIRE

I am requesting your voluntary participation in the completion of this questionnaire. Answers on this form will yield general information on the background of the control subjects. If you decide to respond to the questionnaire, you may omit any of the questions. Completion of this questionnaire will indicate your consent as a willing participant in this study. All data received will be treated with anonymity and confidentiality. When the form is completed, please mail it in the enclosed, self-addressed stamped envelope.

Part I

1. When were you born? ____________________ ____________ ____________
   Month Day Year

2. Are you presently married, and if so, for how long?
   Yes______ No______ Length of Time________________________

3. If you have been married before, for how long and how many children did you have?
   Marriage I ____________________ ____________________
   Marriage II ____________________ ____________________
   Marriage III ____________________ ____________________
   Length of time ____________________ Number of children

4. What is your spouse's education level?
   8th grade or less ____________
   Some high school ____________
   High school grad. ____________
   Some college ____________
   College grad. ____________

5. What is your level of formal education?
   8th grade or less ____________
   Some high school ____________
   High school grad. ____________
   Some college ____________
   College grad. ____________
6. Please give age and sex of all other children in your home.

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<th>Sex</th>
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7. If your preschool age child has ever been hospitalized, please list his ages at the time of hospitalization.

AGE
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8. How old were you when you were first married? ________ years.

Part II

Please answer all of the following questions. Please check the appropriate blank.

1. When your child has a sore throat, do you
take him to the hospital? ______________
call a doctor for an appointment? ________
wait to see if he gets worse? ____________
treat it yourself? _______________

2. When you disobeyed your parents as a child, did they
spank you? ____________ yell at you? ____________
ignore you? ____________ reason with you? ____________

3. If a child who is less than 3 years old begins to cry, would you
console him? ____________
ignore him? ____________
spank him? ____________
4. If a child who is 3 years old or more disobeys his parents, would you discipline by
   spanking? _______________ reason?_____________
   ignoring? _______________
   yelling? _______________

5. As a mother, do you expect to be working five years from now?
   Likely ____________
   Don't know ________
   Unlikely __________

6. Will the 'breadwinner' in the family likely have the same level of job ten years from now?
   Other job ______________
   Same kind or job ______
   Better job _____________

7. Do you feel that you will be living in the same location for the next several years?
   Likely ____________
   Don't know ________
   Unlikely __________

8. How often have you changed neighborhoods in the last ten years?
   3 times or less __________
   more than 3 times __________
   None _______________

9. What is your family's economic picture, in general.
   Accept some government aid __________
   Just able to get along ______________
   Have an average life style ____________
   Comfortable ________________
10. Do you have much help in child-rearing from others, such as your mother, aunts, and baby sitters?

Often
Seldom
Never

11. How often does your spouse assist you with child-rearing responsibilities?

Often
Seldom
Never

12. Consider your other children, or the average child in your neighborhood, and compare your child to them. (Please circle the response that most closely describes your child.)

Physical Attractiveness
Very attractive Average Not so attractive

Difficult for parent to raise
Difficult Average Easy to raise

Physical structure
Tall Average Short

Mental ability
Smart Average Not so smart

Is the child easy to hold or embrace
Embraceable Average Resistant to physical contact

Likely to be successful in life
Successful Average Not so successful
LIST OF REFERENCES


Smith, M., Coleman, J., Dokecki, P., and Davis, E. Intellectual characteristics of school labeled learning disabled children. Exceptional Children, 1977, 43, 6, 352-357.


