A STUDY OF THE RELATIONSHIP BETWEEN PERINATAL RISK FACTORS AND SUBSEQUENT SCHOOL PLACEMENT

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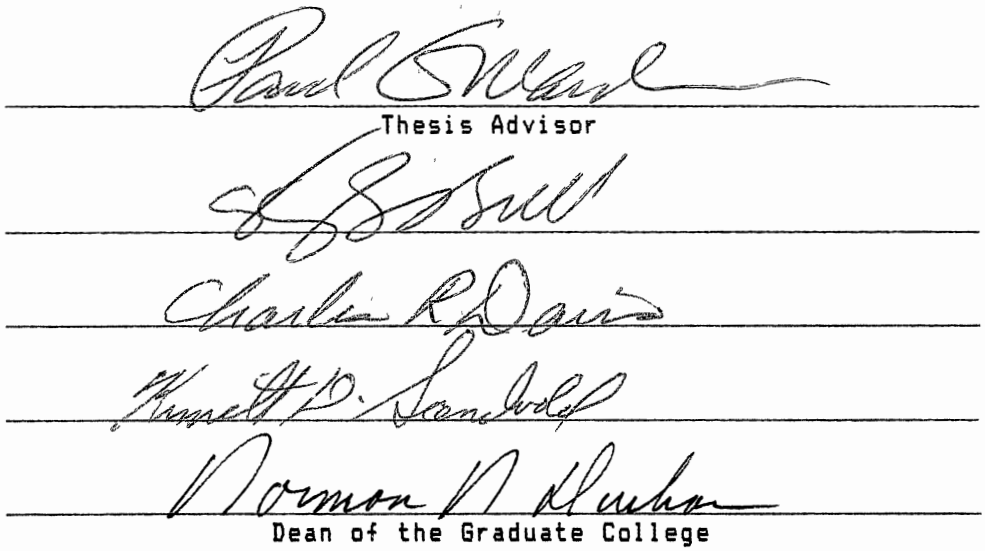

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CHAPTER I

INTRODUCTION

High-risk births (less than optimal conditions of labor and birth weight) have been associated with serious lifetime disabilities (Behrman, 1977), result in an estimated 25% of the survivors having serious lifetime disabilities (Behrman, 1977). Resulting neurological morbidity may be expressed in major cognitive disabilities [i.e. cerebral palsy, mental retardation, learning disability, and the like] (Strom, 1988). With the recently mandated Public Law 99-457, an attempt has been made to operationalize early identification and intervention with the child at risk for educational difficulties. However, a review of the literature has shown that much of the investigation in the area suffers from the use of psychometrically insufficient instruments. Moreover, although it has been well established interrelationships exist between perinatal factors which contribute to cognitive deficits, a univariate approach to the issue has been commonplace (Cohen, Parmelee, Sigman, Beckwith, 1982; Fitzhardinge & Steven, 1972; Francis-Williams & Davies, 1974; Nelson & Browman, 1977). There are specific perinatal indicators identified, studied in a univariate fashion, which will be predictive of subsequent neurological handicap. The literature has shown, however, that few specific perinatal factors may predict subsequent handicap. Conditions of labor and delivery, neonatal gestation and birth weight have been shown to

collectively distinguish groups of children diagnosed as developmentally disabled from low-risk-birth children (Gray, Dean, Strom, Wheeler, & Brockley, 1987). In other words, outcomes are the result of complex interactions among these antecedant variables. This makes a univariate, or item by item analysis questionable. Therefore, a multivariate analysis of perinatal risk factors would appear to improve the predictive capabilities of individual risk factors which have been studied previously (Lester, Emorty, Hoffman, & Eitzman, 1976).

Perinatal risk factors can be defined as deviations from an expected course of events during pregnancy, labor and delivery with the inclusion of early neonatal period. Perinatal variables may serve as potential diagnostic markers of developmental disability or mental retardation (Gray, Dean, Strom, Wheeler, Brockley, 1987). A multivariate approach allows us to examine the interrelationship between perinatal complications and later cognitive weaknesses. Cognitive weaknesses result in academic difficulties in school, where learned behavior is not a primary reason for the difficulty, which result in school placement in special education programs. Studies have examined the perinatal factors which most often place an infant at risk for developmental disability (Freeman, 1985; Strom, 1988; Tjossem, 1976). Perinatal factors examined were Transition Scale items (see Appendix A), premature and low birth-weight infants born to adolescent mothers, and low socioeconomic status. One must keep in mind that as few as 15 percent of all cases of developmental disability have known etiologies (Gray, Dean, Strom, Wheeler, & Brockley, 1987).

Neuropsychological and cognitive/developmental delays also have been shown to be related to perinatal complications (Gray, Dean, Strom, Wheeler, & Brockley, 1987). Nelson and Browman (1977) have shown that certain events during gestation increased the risk of later neurologic disability. In Gray et al.'s study, perinatal asphyxia and problems in postnatal stabilization were seen as causally related to central nervous system depression, and low birth weight and/or obstetric complications were seen in children 2 years of age with cognitive delays.

Events occurring during the perinatal period have been shown to influence the child's educational development (Cohen, Parmelee, Beckwith, Sigman 1986; Colletti, 1979; Fitzhardinge & Steven 1972; Francis-Williams, & Davies, 1974). A study by Zubrick, Macartney, & Stanley (1988) identified preterm birth, low birthweight, and time to spontaneous respiration as interactive predictors of poor academic outcomes. Their assessment of poor academic outcome was by means of academic attainment and teacher ratings of 371 identified children. Cohen, Parmelee, Beckwith, & Sigman (1986) described a consistent relationship between birth weight, gestational age and educational placement (regular class vs special education class). Length of labor, Apgar scores, induced births, and complications of labor (i.e. length of labor & placental abnormality) were seen to be related to significantly lower grade level of a group of 50 learning disabled children 7-12 years of age (Colletti, 1979).

The purpose of this study was to examine the interrelationships between the categorical variables of school placement (learning

disabilities or educable/trainable mentally-handicapped or regular class placement) and each perinatal risk factor by utilization of multiple regression analyses. In general, the research hypothesis holds that a greater number of abnormal perinatal conditions appear among the birth records of children with learning disabilities or mental retardation than among normal children. Since the Transition Scale was specifically designed as a future predictor of neurological morbidity, this study attempted to identify the relationships between specific perinatal risk factors and later learning difficulties which result in special education placement. There was an investigation of the following perinatal risk conditions: all items from the Transition Scale, birth type, and Apgar score.

In this study, perinatal factors were identified as items on the Transition Scale (see appendix A). The Transition Scale was developed as a measure of perinatal risks observed at the time of birth. Items included on the Transition Scale were obtained from a large pool of factors routinely considered by medical personnel at the time of birth. Specifically, conditions observed which have been associated with morbidity, as it pertains to cerebral palsy and mental retardation accompanying cerebral palsy, were selected as items included for the Transition Scale (Strom, 1988). For this study, the Transition Scale was utilized as a screening measure for at-risk conditions of infants. Many items from the Transition Scale have been established, through independent studies,as predictive of developmental disability, particularly mental retardation (Fotheringham, 1983; Gray, Dean, Strom, Wheeler, &

Brockley, 1987; Zubrick, Macartney, & Stanley, 1988). Items were constructed in such a fashion that respondents were required to indicate the presence or absence of each perinatal circumstance queried. Following the selection and construction of items a draft of the measure was reviewed by two perinatal specialists, and a neonatologist. Sixteen items were selected for inclusion in the final version of the scale, however, only 13 were selected for this study and are organized into the format displayed in Appendix A. Three items from the Transition Scale, infant more than 42 weeks and less than 26 weeks gestation, and seizure activity, were deleted from the data collection due to lack of accessability from hospital records. As a potential predictor of neurological outcome, the Transition Scale items were specifically selected as factors routinely considered by medical personnel which have been associated with infant mortality and neurological morbidity. Focusing on certain high-risk conditions, the Transition scale would be an efficient addition to the existing system of record of the findings (pregnancy and perinatal events) from the newborn examination. Indeed, early identification of the child at risk seems critical to prevention and early intervention. In addition, there could be a significant contribution to the School Psychologist's understanding of the interrelationship between perinatal conditions and subsequent learning difficulties in children. In addition, other conditions were also be examined as measures of at-risk: type of delivery (breech, normal, & caesarian), and Apgar score. The presence of any one item from the

Transition Scale or other listed conditions may indicate at-risk status.

Subsequent development of learning problems was identified by placement in special education programs (learning disabilities, & mental retardation) in elementary school. The categorization of children for school placement in this study was accomplished by interdisciplinary team process. Placement was in one of three categories: learning disabilities, educable/trainable mentally handicapped, or regular class placement. Regular class placement also occurred as a result of the team process (Students were referred for consideration of special education placement and did not meet team criteria).

Early identification and intervention with the child at-risk for educational difficulties seems appropriate. Basic to the premise is the realization that there is remarkable plasticity of the central nervous system during infancy and the early years (Tjossem, 1976). This establishes the potential for remediation of difficulties identified early in life. A hospital at-risk scale could be utilized at birth for all children, rural or urban, which would identify potential children in need of special services. Having this at-risk scale which would identify children, there still remains a need to establish a critical link between screening-diagnosis-intervention. "If the outcome for such children is to be improved, assessment of the risk in early infancy would mobilize preventative efforts and programs for intervention before the neonate's problems are compounded by an

environment that cannot understand him without such help" (Brazelton, 1976, p.325).

Statement of the Problem

A review of the perinatal risk studies indicates that risk factors do implicate later disabilities. The studies in general have taken a univariate approach to investigation. There have been studies that have established a trend towards viewing perinatal variables collectively, since complex interactions are believed to be involved.

In addition, several areas and stages of development are recognized as part of the early screening process. Perinatal includes prenatal, birth and postnatal conditions. Early infancy is also evaluated since the developing child is able to compensate for some insults and adapt/grow, thereby making for inaccurate perinatal assessments. In this area of developmental assessment, from birth to 3 years of age, there probably should be the most flexibility to allow for error.

With further evaluation and research towards gaining knowledge about perinatal risk factors, hopefully there will be less margin for error when infants are screened for potential intervention.

Significance of the Study

Additional information about the interrelationship of perinatal items can help determine a clearer definition of "at-risk"

infants. The present study will hopefully add to the understanding of the interrelationships and possibly identify groups of related variables.

Perinatal items have been used for predicting future risk and serve to identify infants with special needs for early intervention. This information will be of particular significance for the School Psychologist. Under current legislation (Public Law 99-457) School Psychologists will be involved in early detection of developmental problems which may lead to cognitive deficits such as learning disabilities, mental retardation and cerebral palsy. Hopefully, a scale such as the Transition Scale can be incorporated into delivery-room protocol to be used with the Apgar Scale. With the establishment of a link between hospital delivery-room staff and local health guidance service staff, the early intervention would be more efficient.

Purpose of the Study

The basic purpose of the study is to investigate the relationship between perinatal risk factors (Transition Scale items, Apgar Score, length of labor, and birth type) and subsequent school placement.

Hypotheses

The purpose of this study was to investigate the relationship between perinatal risk factors and categorical variables of school

placement (learning disabilities, educable/trainable mentally handicapped, and regular class placement). The following null hypotheses were established on the basis of this objective.

1. There is no significant relationship between Transition Scale items and Apgar score.
2. There is no significant relationship between the presence of Transition Scale items and subsequent school placement.
3. There is no significant relationship between other perinatal conditions (length of labor and birth type) and Apgar score.
4. There is no significant relationship between the presence of other perinatal conditions (length of labor and birth type) and subsequent school placement.
5. There is no underlying construct of factors that explains the relationships among the Transition Scale variables.

Limitations

In regards to limitations of the present study, it is important to note the generalization of findings are limited by the population characteristics. Subjects for the study were drawn from a population representing a limited geographical area. All perinatal risk items collected were obtained from hospital records of one hospital. The hospital serves four surrounding counties that are predominately rural.

The method of identification for school placement, team decision, was based upon federal and state guidelines. However, the determination of learning disabilities placement was not

well-defined and there was some variability among educators' philosophies and practices.

The most critical limitation to the study may be the retrospective approach to perinatal data collection. The number of medical staff supportive of deliveries may be small, however, there is still some variability in their expertise and hence, the reliability of the perinatal information. The perinatal information is objective and requires no subjective responses from parents. The majority of the perinatal information came from doctors' summaries and the remainder from nurse reports.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Included in the review is a description of the at-risk infant by examination of the perinatal factors associated with infants who later experience learning difficulties in school. In addition to the perinatal factors, there is a review of the research on neuropsychological implications for later learning difficulties. Next, identification of at-risk infants is discussed-- which will include the newly-developed Transition Scale. Finally, intervention approaches are described.

At-Risk

Tjossem (1976) specifies 3 categories of vulnerable infants: 1) established risk: related to diagnosed medical disorder of known etiology bearing relatively well-known expectancies for developmental outcome within specified ranges of developmental delay. These established risk infants are identified by the early appearance of aberrant development, or deviation from the expected course of development. A Down syndrome infant is an example of established risk. 2) Environmental risk: biologically sound

infants for whom early life experiences including maternal and family care, health care, opportunities for expression of adaptive behavior and patterns of physical and social stimulation, are limiting to the extent that without intervention there is a high probability for delayed development, 3) biological risk: specifies infants presenting a history of prenatal, perinatal, neonatal, and early developmental events suggestive of biological insult to the developing central nervous system and which, either singly or collectively, increase the probability of later aberrant development. Developmental delay should be considered a tenative diagnosis. The implications of this diagnosis can be varied: there is a less serious reduction in adaptive functioning than retardation; the delay is temporary; or there is a specific learning deficit that will persist; or, more often in infant assessment, the developmental delay is ascribed since the cause of the deficit behavior has not yet been clarified. Social cultural variables not withstanding, it seems clear that complications in the perinatal period may have a negative impact upon the infant's later development (Gray, Dean, Rattan, 1987). These categories are not mutually exclusive. Frequently, the interaction of the elements from these categories increases the degree of or probability of delayed development for many children.

When looking at the research literature of perinatal conditions, preterm infants and infants of low birthweight are the most common conditions noted. These are often determining factors for placement of the infant in special care. In the United States several hundred thousand infants are born prematurely or of low

birth weight. In a study by Zubrick, et.al.(1988) poor academic outcomes (as measured by the WRAT) were shown to be likely to occur in the preterm low-birthweight group, including those with a non-spontaneous respiration rate and a low gestational age. Substantial evidence has been accumulated indicating that infants who are small at birth are at risk for intellectual impairment (Drillien, 1964; Wiener et.al., 1968, Wright et.al., 1972). For example, in a study by Drillien of 110 infants of low birthweight, 75 percent of the children at school age were found to have some congenital defect or mental retardation. In Lubchenco's study (1972) 66 percent of infants under 1500g had visual or central nervous system handicaps. In another study, 34 percent of infants under 1500g had IQ's under 80 (Wright, Blough, & Chamberline, 1972). Performance of very-low-birth-weight babies on measures of intellectual functioning in early and middle childhood is consistently lower than that of full-term controls (Brann, 1985; Goldenberg, & Nelson, 1977; Ross, & Leavitt, 1970). Traumatic injury to the brain, skull, spinal cord, peripheral nerve, and muscle of the newborn occur, and the infants at greatest risk are premature infants who weigh between 750 and 1500 grams and those born during difficult and breech deliveries (Brann, 1985).

Neuropsychological Implications

Among the medical researchers, there is a biological approach has evolved to investigation of perinatal conditions which involves extensive neurological or neurodevelopmental

perspectives. Lipton (1978) described at risk children as children who are at risk for normal development as a consequence of genetic, intrauterine, neonatal, and postnatal hazards. There is a widespread notion among neonatologists, neurologists, and neuropathologists that asphyxia is the source of most acquired abnormalities in the neonatal brain. In the current texts of neuropathology some 28 distinct morphologic abnormalities of the neonatal brain are attributed to asphyxia, hypoxia, or anoxia (Brann, 1985). It is not clear which neonatal brain abnormalities persisted to later learning difficulties for the infant. Lubchenco's at-risk inventory takes into account the perinatal events that predict to morbidity in the neonatal period (1972). Since risk factors predict outcome for a group of infants "on the average", this correlational approach gives little information on any individual baby. The problem of predicting the outcome of individuals on the basis of pregnancy and perinatal problems has not been solved since it is simply not possible to know the infant's developmental status from the infant's prior exposure to risk factors or even the infant's prior distress conditions. As each infant has had an individual pattern of early trauma, each will show an individual course in CNS compensation. Hartlage and Telzrow (1983) have stated that the human brain is vulnerable to a variety of insults, especially during the few weeks prior to and in the few months following birth, when brain growth is most rapid. The specific etiology of the brain insult may be traced to some alteration in the intrauterine environment, perinatal hypoxia, or birth trauma. Neuropsychological assessment of young

brain-injured children can localize specific injuries, thus facilitating intervention programs.

The underlying nature of learning difficulties in children, whether they are reflected in learning disabilities or mental retardation, is not completely understood. It is becoming more obvious that the neuropsychological approach to evaluating learning difficulties has implications to diagnosis and remediation (Fotheringham, 1983; Hartlage, & Telzrow, 1983; Obrzut, & Hynd, 1983; Rourke, Bakker, Fisk, & Strang, 1983). According to Colletti (1979), children learn normally only when certain basic integrities are present: 1) psychodynamic factors, 2) peripheral nervous system factors, and 3) Central Nervous System functions. Obrzut & Hynd (1983) report that disrupted cortical zones are implicated in reading-disabled children's brains. They state there is evidence available as to the neurodevelopmental abnormalities that may disrupt the functional system of cortical zones important in learning among children. The research on cerebral asymmetries (e.g. dichotic listening and visual half-field) as well as behavioral investigations, elaborate on cognitive effects of these neurodevelopmental abnormalities. Factors related to brain injury include perserveration, confusion, conceptual and reasoning difficulties, and visual-motor difficulties. An overall reduction in the level of intelligence (for age, education, socioeconomic status, and related factors when these are held constant) is an integral finding in some cases of brain damage or specific impairment of selective areas of cognitive functioning (Sattler, 1988). Children are certainly in a

stage of rapid change and growth. On-going assessment of children identified as at risk may be the most reliable means of determining subsequent learning difficulties. The neurological (neonatal brain abnormalities) implications of learning difficulties is a complex and inconclusive area of study. There are numerous factors which can affect neurodevelopmental outcome. For example, predicting abnormality may be confounded by an individual infant's ability to recover from a neurological insult. In addition, the recuperative ability is relatively stronger when the insult is at an early age (Strom, 1988).

Events occurring during the perinatal period have been shown to influence the child's educational development (Cohen, Parmelee, Beckwith, Sigman 1986; Fitzhardinge & Steven 1972; Francis-Williams & Davies 1974). A study by Colletti (1979) found a significantly higher number of pregnancy and birth complications on birth records than the norm ($p<.05$). Among these children with pregnancy/birth complications, a pattern of significantly lower scores was found on the Wechsler Arithmetic and Digit Span ($p<.05$). Academic achievement was found to be significantly below grade level in all academic areas. In a similar investigation with school children, (Gray, Dean, Strom , Wheeler, & Brockley, 1987) found a close link between complications occurring during the perinatal period of development and intellectual functioning (developmental disabilities- mental retardation/special education). Some 83 percent of children examined in the study were correctly diagnosed on the basis of information from the perinatal period.

The double jeopardy thesis holds that biologic (in-utero) brain injury and socioeconomic disadvantage have a greater combined effect than does either alone. "The child with prenatal or perinatal brain insult who is discharged into an unfavorable environment will be at higher risk for failure to 'catch-up' for school failure and inability to compete" (Avery, 1985, p.10). Social cultural variables not withstanding, it seems clear that complications in the perinatal period may have a negative impact upon infants' later development (Gray, Dean, Wheeler, & Brockley, 1987). Supporting evidence from the Kauai Pregnancy Study related risk to subsequent Cattell IQ and Vineland Social Quotient. In this longitudinal study, 2 of 3 at-risk children (60male,84female) --all of whom encountered 4 or more cumulative risk factors before age 2-- developed serious learning or behavior problems by age 10, or had delinquency records, mental health problems, or had experienced teenage pregnancy by age 18. Children were categorized according to socioeconomic status, family stability, and estimate of maternal intelligence (Werner, Bierman, & French, 1971). Escalona reports similar results in a group of premature infants evaluated sequentially with Bayley Scales of Infant Development and the Stanford-Binet Intelligence Scale: Form L-M to 3.3 yrs.(Avery, 1985). The Kaui findings indicate that there was a clear relationship between the rated severity of perinatal complications and physical status and intellectual development. The effects of perinatal complications on intellectual status were more pronounced in the children of parents who were poor, had little education or were socially or emotionally unstable or

transient. There was a significantly high incidence of severe perinatal stress in children age 10 and up considered in need of long-term mental health services. The effects of perinatal events were not transient regardless of postnatal environmental factors, although in other cases effects were exacerbated by adverse postnatal circumstances. Overall, the Kauai study data seem to indicate that perinatal complications are related to later physical and psychological development especially-- rather than only-- when combined with and suppported by persistently poor environmental circumstances (Joffe, 1982).

Parnas, Schulsinger, Teasdate, Schulsinger, Feldman, & Mednick (1982) studied obstetric complications in relation to schizophrenia. They found that there seemed to be an interaction with genetic influence towards schizophrenia and that such complications occurring prior to schizophrenia in the offspring are independent stressful factors and not manifestations of schizophrenic genes. Schizophrenics were found to have had the most complicated births. This study does not suffer from the potential bias of retrospective data collection since the data were all recorded at the time of birth. Complications decompensated the individual towards later schizophrenic breakdown. Gray, Dean, & Rattan (1987) found that a large number of studies had assessed cognitive, behavioral, tempermental, and/or language functioning of high risk preschool children and found higher rates of cognitive, neurodevelopmental, and behavioral problems.

A study by Hartsough & Lambert (1985) suggests that prenatal and perinatal factors predispose some children to the risk of several types of developmental abnormalities, including hyperactive behavior. But it is the interaction of the child's environment and psychological status, along with his/her medical history, that will determine the prognosis for successful long-term outcomes. In their study, prenatal and perinatal inquiries significantly distinguished between groups of hyperactive children and their asymptomatic counterparts. These results closely parallel the results of the Collaborative Perinatal Project--which is a study of the relationship between a large variety of medical variables, identified as antecedent variables, and several outcomes from those perinatal conditions. Hyperactivity was an outcome included in the study. The results indicate a small probable predispositional influence (from the medical factors) in subsequent hyperactivity behavior.

In New Zealand, Moffitt & Silva (1987) followed approximately 1000 children longitudinally from birth to 11 years of age. The children were assessed every two years for health, development and behavior. The WISC-R was administered at 7, 9, and 11. Perinatal data was collected, e.g. low birth weight for gestational age, twin status, low Apgar, with one or more conditions/or Apgar score indicative of perinatal difficulty. Early childhood neurological abnormalities were assessed by combining neurological examinations of the children that were conducted at birth and at ages 3 and 5 years. They were testing the hypothesis that a statistically abnormal VIQ/PIQ score signals clinically abnormal status in the

neurological history, behavior or achievement for a child from the general population. From the results there were no significant etiological variables identified and the medical histories were weak (however, this is frequently the amount of information that the practicing psychologist receives). The greater PIQ than VIQ pattern was observed for all three ages at a significantly high frequency, but did not remain stable across childhood. These results support various authors' assertion that VIQ/PIQ discrepencies are of doubtful diagnostic value given the different base rates of brain disorder and VIQ/PIQ discrepency in the population. The weak approach to assessment of perinatal risk confounds the study from the perspective of predictiveness.

A study by Kochanek, Kabacoff, and Lipsitt (1990) examined longitudinally children's development from birth to seven years of age. The sample was taken from participation in the National Collaborative Perinatal Project who were also judged to be handicapped after school entry. Results indicate that ecological determinants (i.e. parental traits such as maternal education) are more accurate predictors of the subsequent status of the child than the child's own behavior from birth to three. Their emphasis was on researcher's becoming aware of the complexity of development. The study suggested that early intervention models that focus on developmental delay or adverse medical events are not complete and cannot fully identify children who will be subsequently handicapped in school. They emphasize the development of screening initiatives that are multivariate and account for the changes in strength of the risk factors over time.

They utilized an enormous number of variables in this study and were unable to provide consistent data and sample sizes. The prenatal and perinatal data failed to yield significant results with univariate analysis. An important point made was the issue of specificity (i.e. accurately predicting handicapped status) as the sensitivity (adjusting the criteria used to assign students to outcome groups) is increased. This was encouraged, since the present trend seems to be attempts to more accurately identify a greater number of handicapped infants/toddlers which results in a higher number of false positives (children inaccurately identified as handicapped). This study is strong support for a multivariate approach to identification of at-risk children and it re-emphasizes environmental variables as necessary components of at-risk identification.

In review, perinatal risk factors have been identified extensively and several have been intensely evaluated (periantal asphyxia, small for age neonate, and premature infant). Variables that contribute to risk status are wide-ranging and complex. The puzzle of interrelationships of socio-cultural, medical, environmental, and biological risk is one that researchers will not unravel in a simple fashion. In addition to the possibilities for etiological factors, there is the complex effects that those risk factors may induce. Neurological morbidity has been linked strongly with several risk factors and ability to learn. Brain plasticity and other "compensators" for developmental delays will make for difficult prediction of later learning difficulties.

at birth. The Apgar scoring is somewhat subjective requiring a rating of 0,1,or 2, while the Transition Scale utilizes a more objective format, present/ not present. Items from the Transition Scale are more numerous and measure more than cardiopulmonary functioning. The results of the study suggest that the relationship between the two measures is strong and rather complex. In addition, it was felt that the Transition Scale seemed to offer unique information. Characteristics identified from the study for the Transition Scale were: small for gestational age, large for gestational age, male, and both moderate and severe asphyxia.

Studies have shown that problems in identification of retarded children are significant (Meier, 1976; Tjossem, 1976). The elapsed time between first suspicion and confirmation of retardation was twelve months for mild mental retardation, and 6.2 months for profound retardation (Tjossem, 1976). Retardation seemed to be suspected and confirmed at considerably later ages in rural as compared to urban-suburban areas. A delay, to near school-age for a diagnosis of mental retardation in those mildly afflicted and past one year for profoundly afflicted, points to marked deficits in our diagnostic capabilities and screening diagnosis service delivery system. In the development of assessment of young children suspected of being mentally retarded or having a serious delay in development, Fotheringham (1983) utilizes the incorporation of risk data, or risk characteristics, such as: during pregnancy-- serious bleeding with cramps, elevated blood pressure, severe diabetes, infections such as rubella and

cytomegalovirus-- and delivery, neonatal delivery complications, very low birth weight, cerebral hemorrhage, seizures, evidence of serious congenital abnormalities such as hydrocephalus or meningomyelocele. During the prenatal period the child's genetic program helps to determine the range of possibilities, and the mother's physiochemical environment determines which of the possibilities will gain expression to create the internal environment of the fetus.

Identification of at-risk infants involves the application of scales for objective collection of medical, perinatal, and behavioral conditions. It seems obvious from the literature that comparing groups of items is more effective than looking at individual factors. There will be similarities among items that lend themselves to clusters. The Transition Scale seems appropriate as a measure due to it's similarity with a historically proven scale (Apgar) which includes ease/objectivity of administration, and it's collection of items noted in the research literature as indicative of at-risk. Tjossem (1976) states an urgency for identification of children at an earlier age is effective in promoting the development of children identified as at risk. This follows the premise that early intervention is a form of prevention and will lessen the degree of later difficulties.

There are other developmental disabilities that appear to have similar etiological factors and deserve mention. The results of studies with hearing and vision impaired infants/children has shown similarities to studies of cognitive developmental

disabilities. Shah & Clay (1983) identified prematurity, hypoxia, and birth trauma as causes of hearing impairment. They went on to develop a high risk register for neonates, during the 1978 Saskatoon Conference on Early Development of Hearing Loss, which includes family history of severe hearing loss in early childhood, significant viral illness during the mother's pregnancy, prematurity with a birth weight of less than 1500g., hypoxia at birth, persistent neurological abnormalities, neonatal icterus with a serum bilirubin of 20mg. or greater in an infant of normal weight or a lower value in a smaller infant. In addition, Fewell (1983) has noted that vision screening tests at birth includes factors that place children at risk for visual impairment: 1) prenatal infectious processes such as maternal rubella, inutero toxoplasmosis or cytomegalic inclusion disease; 2) congenital conditions such as cyanotic heart disease or glaucoma; 3) family history of vision problems; 4) the supplemental oxygen therapy often necessary for premature infants, which can cause retrolental fibroplasia. Many visual problems can be corrected if proper treatment is begun early.

Intervention

Brazelton (1976) points out that parents of children with clinical syndromes such as failure to thrive, child abuse, repeated accidents and ingestions, and infantile autism are often successful parents of other children, but are unable to "understand" the at-risk infant from neonatal period onward, and

they claim a difference from other children in his earliest reactions to them. Tjossem (1976) speculates that physicians, because of their training, are unlikely able to see the need and value for nonmedical services such as education, social action programs (i.e. Head Start), and behavioral management for preventing and/or ameliorating mental retardation when there is no physical handicap. Physicians are accustomed to the establishment of firm diagnoses before proceeding to treatment. This can be difficult to impossible where the children present with mild forms of mental retardation of uncertain etiology. Physicians are inclined to wait for the gradual unfolding of development which establishes a pattern of retarded development before making a diagnosis and referral. Physicians are aware of the often wide intraindividual variation in cognitive developmental characteristics of infancy and early childhood and frequently reserve diagnosis in the hope of spontaneous improvement, thereby sparing the parents the anxiety provoked by threatening diagnosis (without available remediation in many areas).

Early intervention has been demonstrated to actually be preventative in purpose in related areas of functioning (e.g. vision & hearing). Studies have shown that intervention in infancy for blind infants, which consisted of guidance for the parents and treatment/therapy for the infant, during the first two years of life demonstrably facilitated the development of these children (Fraiberg, 1980). They demonstrated that the human attachment, language, and motor capabilities of blind children who received intervention during the first two years of life were more like

sighted children. In this study, the Child Development Project staff felt that, based upon the evidence from their program, intervention in infancy was intervention at the most favorable stage of the growth cycle. This program was the first of its kind and was implemented 1969-72. Laws will facilitate the implementation of intervention programs. For instance, the Saskatoon conference in 1978 passed a resolution requesting provincial and local governments make registration mandatory (Shah, & Clay, 1983). A register would increase the probability of early identification of hearing-impaired infants and would lead to supervision including periodic screening of hearing loss not apparent in the first month of life.

The Portage Project is a home-based program where there is no classroom program; all instruction takes place in each child's home and teaching is done by parents (Shearer & Shearer, 1976). An average of 128 prescriptions or goals were written per child over the program year. The children were successful on 91 percent of the prescriptions written by professional and paraprofessional staff. Most of the programs developed for intervention with at-risk infants have been similar to the Portage Project. The general approach to assessment of the at-risk infant for these projects varies. Several programs begin assessment at birth and the others begin assessment during infancy. Another project, the National Collaborative Infant Project (Haynes, 1976), expresses the national concern for high-risk infants through its efforts to identify and demonstrate exemplary models of service for these children and their families. What is emphasized with this project

is the establishment of normal infant-mother (caregiver) attachment behaviors. There is early referral of infants for service and the early establishment of a family care plan complete with optimal learning conditions for the infant. The extension of professional services is viewed as moving primarily through parent (caregiver) to infant. Professional assistance is aimed at strengthening and expanding parent understanding and skills in the care and training of the atypical infant and young child.

The main theme of this section is early intervention. The implications are that actions taken early in infancy and childhood may counteract or reduce later problems. There has been hesitation by various professionals due to indecision of the diagnosis for at-risk. Early intervention projects mentioned seem to substantiate the contention that the approach is worthwhile. There are other developmental disabilities mentioned, vision and hearing, which show similar etiologies and similar success from intervention. Intervention methods are described with a couple of main themes: multidisciplinary involvement and parent-training.

The review has touched upon a definition of at-risk, the complex variables that make up an at-risk infant. There has been an examination of the implications of perinatal factors to later learning difficulties and how neurological deficits may interact in the development of the at risk infant. In addition, identification of at risk infants by a standard approach is presented. Finally, there would be little point in identification if treatment or intervention cannot follow. There are numerous programs available for at-risk infants, and through federal

legislation the growth may be exponential. Only a few programs were reviewed and are certainly not representative of all forms of intervention programs. However, the basic components probably have been identified to be multidisciplinary involvement and parent-training.

CHAPTER III

METHODOLOGY

Subjects

The sample selected consisted of 159 children randomly-selected from a referred population. The majority of referrals came from elementary schools (a minority of the referrals coming from private schools and parent-referral) within a three year period - 1986 to 1989. These children were evaluated within a educational psychology/ child outpatient department for academic problems at a mental health clinic. The evaluation was a part of the placement process, and the school placement team decided placement of each child. The children ranged from 3 to 13 years of age (see Table 1) and came from lower class to upper middle class socioeconomic families living in two small cities and the surrounding rural areas. Racial representation was Caucasian: eighty-seven percent, Black: ten percent, and American Indian: three percent.

Instrumentation

The Transition Scale was examined in a study done by Strom (1988). From this study it was concluded that there is some common variability shared between the Transition Scale and the Apgar

scores (30.84% of Apgar information is redundant with 9.7% of factor scores from the Transition Scale). In the same study, interrater reliability was measured to be high (overall .98). Evidence of the Transition Scale's concurrent validity was shown in the percentages of agreement between the raters responses and information gleaned from the medical chart (.90 to 1.00). The Transition Scale was designed to be utilized during the 30 minute period following birth. As such, observations are less likely confounded by the execution of immediate resucitative measures. In fact, it is recommended that the clinician postpone considering the measure until stabilization of the infant is accomplished. In this study, the method of data collection being retrospective, this was not controlled for on all cases. Various items from the Transition Scale had been recorded prior to the stabilization of the infant. The intent here is to provide a scale which reflects reliable information concerning the infant's functioning across both clinical and research settings. This information has traditionally been recorded through the doctor's notes and birth summary. The Transition Scale has only recently been developed (Strom, 1988) and has not been adopted universally as yet. Therefore, the information was retrievable though not as easily as with the use of the Scale. Since this is a retrospective study, the scale could not be utilized as designed. However, since the information is often routinely recorded by nurses and doctors, the retrieval of this scale data can still occur. The items from the Transition Scale are conditions that must be recorded in medical records charts. Hence the items were collected from birth records.

This procedure as described above for data collection applied to all data collected. The Apgar has five categories selected to portray the infant's need for cardiopulmonary resucitation (color, heart rate, reflex response, muscle tone, and respiratory effort). As routinely administered, the infant is evaluated at one and five minutes after delivery. The practitioner's clinical observations and judgement are the basis for rating each area (zero, one or two) where zero indicates a condition requiring medical intervention. Summing across the five component scores provides a total score. A total Apgar score of ten would indicate the absence of those five cardiopulmonary deficits. This study only utilized the five-minute Apgar due to it's higher reported reliability, Strom (1988). The Apgar is utilized by doctors/nurses as a standard measure five minutes post delivery. Therefore the Apgar results were similar to the Transition Scale items in that they have been recorded prior to stabilization of the infant.

Procedure

This study is retrospective and all data was collected from hospital birth records and mental health clinic records. Over 300 cases were identified from clinic records by selection of cases referred for educational evaluation. Data collected from those files was school placement (whether or not the child was placed in special education classes), age of child when the school placement decision was made, and date of birth. From this list of cases there was a random selection of cases with delivery at one

hospital identified prior for medical records data collection. Other hospitals were not considered due to time limitations and potential policy and procedure differences.

All names were coded into a number system with all items from the Transition Scale, birth type, Apgar score, labor duration, demographic information (race, mother's age), and category of either special education or non-special education (in addition, special education was subdivided into two categories: learning disabilities and educable mentally handicapped/ trainable mentally handicapped). If a subject did not meet all criteria (have all information required for this study), then he/she was discarded and replaced with a randomly selected subject from a reserve group. No direct contact was made with children or parents. Throughout the investigation, the subjects were identified by number. After the results were coded and tallied for computer analysis, the data collected were destroyed.

All items were submitted to multiple regression analyses. The results of the analyses should explain the interrelationships that exist between Transition scale items and children identified as in-need of special education.In addition, all variables/items of the Transition Scale were submitted to a factor analysis. This was an attempt to determine whether or not there exists significant relationships between Transition Scale variables.

CHAPTER IV

RESULTS

The sample eventually selected contained 159 children in elementary and secondary schools. There were 106 (67 percent) males and 53 (33 percent) females which were represented by 87 percent Caucasian, 10 percent black, and 3 percent American Indian races. The school placement categories were represented as L.D. (learning disabilities) 73 (48 percent), EMH (educable mentally handicapped) 33 (15 percent), TMH (trainable mentally handicapped) 11 (7 percent), for a total special education category of 107 (70 percent). The remaining category 52 (30 percent) were in regular education.

There were a significant number of missing values for Apgar individual item scores. Therefore, Apgar was represented only as a total score. There were no cases of neonates with a 26 week gestation, gestation greater than 42 weeks or neonates with the presence of seizure activity. These three original Transition Scale items were not utilized.

The data was analyzed in the following manner: a) examination of the hypotheses statements concerning school placement using all three categories of special education collapsed into one category (preliminary analyses utilizing the three categories individually yielded statistically insignificant results due to the low number

of cases represented); b) the hypotheses statements concerning Transition Scale items examined the data in two ways: by utilizing each item from the Transition Scale as a variable, and by recoding the Transition Scale items into one variable -- positive (presence of at least one Transition Scale item) and negative (absence of all Transition Scale items).

The school placement variable is presented as six variables: SCHLPLCMld (school placement for learning disabilities), SCHLPLCMmr (school placement for educable and trainable mentally handicapped), SCHLPLCMsped (school placement for special education which includes mentally handicapped and learning disabilities categories), SCHLPLCMtmh (school placement for trainable mentally handicapped), SCHLPLCMemh (school placement for educable mentally handicapped), and SCHLPLCMreg (regular class placement). A breakdown of number of cases per category that displayed the Transition Scale items is located in Table 2. The Pearson product moment correlation matrix of the 24 variables utilized is presented in Table 3. The analyses utilizing a total (or collapsed) special education category are presented in Table 5. Initially the groups were tested separately (ld, emh, tmh) as an attempt to predict categories within special education. It was hoped that there would be a definitive group of factors which could predict learning disabilities or mental retardation. The mentally handicapped category (emh/tmh) was the only special education category for which significant results were obtained (Table 6). Therefore, the collapsing of all special education

TABLE 1

AGE OF CHILDREN WHEN SCHOOL PLACEMENT OCCURRED

	Age										
	3	4	5	6	7	8	9	10	11	12	13
Number of cases	1	7	2	26	41	33	12	19	11	6	1

Explanation of variable abbreviations:

Transition Scale items

OXYGEN= oxygen required for infant to maintain color INTUBATION= intubation of airway, AIRWYPRS= airway pressure required to maintain breathing, TONE= poor muscle tone, LT38WkS= a gestational age of less than 38 weeks, LT32WkS= a gestational age of less than 32 weeks, SGA= small for gestational age, LGA= large for gestational age, CARDIAC= cardiac resusciation required, PROM= premature rupture of membranes, STABILIZ= prolonged (30 min.) stabilization of the infant, MECONIUM= meconium staining, TRANSCL= presence of at least one Transition Scale item

TABLE 2

NUMBER OF CASES FOR EACH PERINATAL RISK FACTOR

	Category of school placement			
	LD (N=73)	EMH (N=33)	TMH (N=11)	Regular (N=52)
MALE	47	15	8	30
OXYGEN	10	6	5	7
INTUBAT		2	1	
AIRWYPRS	3	3	2	4
TONE	1	1	3	1
LT38WKS	3	1	2	2
LT32WKS	1		1	1
SGA			1	
LGA	8	2		14
CARDIAC	1	1	2	1
PROM	19	4	1	16
STABILIZ	2	2	2	2
MECONIUM	5	4	1	2
C-SECBIR	9	3	1	5
BREECH	2			1
LABORUR				
13-24HRS	7	5	2	3
>24HRS	2			2

TABLE 3

PEARSON CORRELATION MATRIX OF ALL VARIABLES WITH SPECIAL EDUCATION CATEGORY REPRESENTING ALL SPECIAL EDUCATION CATEGORIES (N=159)

	SCHLPLCM	APGAR	MALE	OXYGEN	INTUBAT	AIRWYPRS
OXYGEN		**-.54				
INTUBAT		**-.31		**.29		
AIRWYPRS		**-.55		**.58	**.51	
TONE		*-.18		*.22		
LT38WKS		**-.32		*.22	*.20	**.30
LT32WKS				*.17		**.33
SGA		*-.21				
LGA	**-.23					
CARDIAC					**.24	**.24
PROM		*-.19	*-.18			
STABILIZ		**-.43		**.38	**.42	**.43
MECONIUM		*-.19				
TERM		** .43		**-.36	**-.31	**-.49
CSECBIRTH		*-.19				
MOTHERAGE					*.17	*.19
TRANSCL		*-.18	**.60	*.20		

	TONE	LT38WKS	LT32WKS	LGA	CARDIAC	PROM	STABILIZ
CARDIAC			**.24				
STABILIZ		**.25	*.20		**.31		
CSECBIRTH						*-.19	*.19
LABORDUR						**.29	
TRANSCL				*.18		**.25	

	BREECH
INDIAN	*.18

	MECONIUM
BLACK	*.21

*: alpha .05
**: alpha .01

categories seemed appropriate. Significant results from these analyses will be presented later.

An examination of the mean total Apgar scores showed that overall, the sample population scored well within normal limits. Cases representing at least one Transition Scale item were high (85 percent). Caesarean section births represented 13 percent of the total sample. Concerning labor duration, 84 percent of the neonates were born after less than 12 hours labor, 14 percent were born between 13 and 24 hours labor, and 3 percent were born after an excess of 24 hours. There were 92 percent full-term deliveries, 4 percent 38 week gestation deliveries, and 2 percent 32 week gestation deliveries. The percent of mothers 19 years of age and younger was 81 percent.

A Pearson product moment correlation matrix of all variables resulted in several significant correlations at the alpha .05 and .01 levels (see table 3). The majority of the correlations were related to Apgar and perinatal risk variables. Mothers, age 20 years and older, correlated with longer labor duration and the neonate's need for airway pressure. There was a significant correlation of Indian infants and breech deliveries, and there was a significant correlation of Black infants and meconium staining. Presence of at least one Transition scale item correlated significantly with Apgar and male variables.

Hypothesis 1: There is no significant relationship between Transition Scale items and Apgar score.

Multiple regression of Transition Scale items on the dependent variable of Apgar score yielded significant results at the alpha

.05 level. There were several moderate correlations (see Table 4). Multiple R squared was .570 and adjusted multiple R squared was .531. Several variables were significant (t-tests, one-tail): 38 weeks gestation ($p < .029$), Small for gestational age ($p < .000$), Premature rupture of membranes ($p < .000$), Meconium staining ($p < .000$), Oxygen required ($p < .018$), Airway pressure ($p < .000$) Tone ($p < .000$), Cardiac ($p < .015$), Stabilization ($p < .000$). Semipartial correlations of the independent variables, which shows the unique variance shared with the dependent variable is represented in Table 4.

Hypothesis 2: There is no significant relationship between the presence of Transition Scale items and subsequent school placement.

Multiple regression of Transition Scale items on the dependent variable of school placement (special education variable comprising all three categories collapsed into one) yielded a multiple R squared of .111 and adjusted multiple R squared of .031. The results were not significant at the .05 level (see Table 5). When examining the significance of the t-tests (one-tail), there were two significant variables: Large for gestational age ($p < .000$) and Meconium staining ($p < .032$). Semipartial correlations of the independent variables, which shows the unique variance shared with the dependent variable is large for gestational age 5.3%, and Meconium staining 1.2%. Multiple regression of Transition Scale items on the dependent variable of mentally handicapped (educable/trainable mentally handicapped) did, however yield significant results. There were significant

TABLE 4

HYPOTHESIS 1: MULTIPLE REGRESSION OF TRANSITION SCALE VARIABLES ON TOTAL APGAR SCORE.

DEP VAR: APGAR N: 159 MULTIPLE R: .755 SQUARED MULT. R:.570
ADJUSTED SQUARED MULT. R: .531 STANDARD ERROR OF ESTIMATE:.61

VARIABLE	BETA COEFFICIENT	P(2 TAIL/1 TAIL)
MALE	0.026	.808
LT38WkS	-0.498	.057/.029
LT32WKS	-0.097	.814
SGA	-2.408	.000/.000
LGA	-0.023	.869
PROM	-0.490	.000/.000
MECONIUM	-0.591	.002/.001
OXYGEN	-0.364	.035/.018
INTUBAT	-0.042	.927
AIRWYPRS	-1.047	.001/.000
TONE	-0.767	.003/.001
CARDIAC	0.668	.030/.015
STABILIZ	-1.306	.000/.000

ANALYSIS OF VARIANCE

SOURCE	DF	P
REGRESSION	13	<0.000
RESIDUAL	145	

% VARIANCE ACCOUNTED FOR IN THE INTERRELATIONSHIP OF SIGNIFICANT TRANSITION SCALE VARIABLES WITH THE DEPENDENT VARIABLE OF APGAR.

38 wks. gestation	10%
SGA	4%
PROM	3.6%
Meconium staining	3.6%
Oxygen	29%
Airway Pressure	30%
Tone	3.4%
Cardiac	0.5%
Stabilization >30 min.	18.5%

TABLE 5

HYPOTHESIS 2: MULTIPLE REGRESSION OF TRANSITION SCALE VARIABLES ON SCHOOL PLACEMENT (SPECIAL EDUCATION CATEGORY WITH ALL SPECIAL EDUCATION CATEGORIES COLLAPSED INTO ONE).

DEP VAR: SCHLPLCM N: 159 MULTIPLE R:.333 SQUARED MULT. R:.111
ADJUSTED SQUARED MULT. R: .031 STANDARD ERROR OF ESTIMATE:.46

VARIABLE	BETA COEFFICIENT	P(2 TAIL/1 TAIL)
MALE	0.116	.161
LT38WKS	-0.056	.777
LT32WKS	-0.206	.509
SGA	-0.241	.617
LGA	-0.331	.002/.001
PROM	-0.090	.301
MECONIUM	-0.265	.063/.032
OXYGEN	-0.007	.959
INTUBAT	-0.474	.169
AIRWYPRS	-0.103	.647
TONE	-0.064	.740
CARDIAC	0.041	.858
STABILIZ	-0.083	.711

ANALYSIS OF VARIANCE

SOURCE	DF	P
REGRESSION	13	0.170
RESIDUAL	145	

t-tests (one-tail): Intubation ($p < .004$), LGA ($p < .07$), SGA ($p < .024$), and Tone ($p < .005$). In addition, there were several moderate correlations (see Table 6).

Hypothesis 3: There is no significant relationship between other perinatal conditions (length of labor and birth type) and Apgar score (see Table 7).

Multiple regression of other perinatal conditions on the dependent variable of Apgar yielded a multiple R squared of .206 and an adjusted multiple R squared of .185. The results were significant at the .05 level. The t-tests for the independent variables were not significant. Independent variables utilized were length of labor, normal birth infants, c-section birth infants, and full-term infants. The full-term infants variable was significant (t-test $p < .000$) with the dependent variable of high Apgar score.

Hypothesis 4: There is no significant relationship between the presence of other perinatal conditions (length of labor and birth type) and subsequent school placement (special education variable comprising all three categories collapsed into one).

Multiple regression of the variables, length of labor and birth type on the dependent variable of school placement yielded insignificant results (see Table 8).

A Pearson product moment correlation matrix was used with the Transition Scale items on the dependent variables of the three categories of special education: learning disabilities, trainable mentally handicapped, and educable mentally handicapped, These

TABLE 6

MULTIPLE REGRESSION OF TRANSITION SCALE ITEMS ON MENTALLY HANDICAPPED (EDUCABLE/TRAINABLE)

DEP VAR: SCHLPLCM N: 159 MULTIPLE R:.473 SQUARED MULT. R:.224
ADJUSTED SQUARED MULT. R: .118 STANDARD ERROR OF ESTIMATE:.39

VARIABLE	BETA COEFFICIENT	P(2 TAIL/1 TAIL)
APGAR	0.011	.837
MALE	0.002	.975
LT38WKS	0.201	.563
LT32WKS	0.463	.279
SGA	0.848	.048/.024
LGA	-0.130	.147/.07
PROM	-0.108	.191
MECONIUM	0.191	.128/.06
OXYGEN	0.001	.990
INTUBAT	0.844	.007
AIRWYFRS	0.011	.956
TONE	0.453	.010
CARDIAC	0.176	.379
STABILIZ	0.232	.253
LABORDUR	0.071	.345
MOTHRAGE	-0.001	.990

ANALYSIS OF VARIANCE

SOURCE	DF	P
REGRESSION	19	0.007
RESIDUAL	145	

PEARSON PRODUCT MOMENT CORRELATION OF SIGNIFICANT TRANSITION SCALE VARIABLES (N=159)

	SCHLPLCMENT (MENTALLY HANDICAPPED: TMH/EMH)
OXYGEN	*.19
INTUBAT	**.27
TONE	*.19
CARDIAC	*.17
STABILIZ	*.19

*: alpha .05
**: alpha .01

TABLE 7

MULTIPLE REGRESSION OF OTHER PERINATAL VARIABLES ON APGAR.

DEP VAR: APGAR N: 159 MULTIPLE R: .454 SQUARED MULT. R: .206
ADJUSTED SQUARED MULT. R: .185 STANDARD ERROR OF ESTIMATE:.80

VARIABLE	BETA COEFFICIENT	P(2 TAIL)
TERM	1.364	.000
LABORDUR	-0.176	.216
NORMBIRTH	-0.036	.931
CSECBIR	-0.338	.445

ANALYSIS OF VARIANCE

SOURCE	DF	P
REGRESSION	4	0.000
RESIDUAL	154	

TABLE 8

MULTIPLE REGRESSION OF OTHER PERINATAL VARIABLES ON SCHOOL PLACEMENT (SPECIAL EDUCATION CATEGORY WITH ALL SPECIAL EDUCATION CATEGORIES COLLAPSED INTO ONE).

DEP VAR: SCHLPLCM N: 159 MULTIPLE R:.072 SQUARED MULT. R:.005
ADJUSTED SQUARED MULT. R: .000 STANDARD ERROR OF ESTIMATE:.48

VARIABLE	BETA COEFFICIENT	P(2 TAIL)
TERM	0.029	.875
LABORDUR	0.026	.761
NORMBIRTH	0.175	.470
CSECBIR	0.219	.403

ANALYSIS OF VARIANCE

SOURCE	DF	P
REGRESSION	4	0.938
RESIDUAL	154	

correlations were significant at the alpha .05 and .01 levels (see Table 9).

The multiple regression analyses of Transition Scale as a single variable, Apgar, and other perinatal risk variables on the dependent variables of learning disabilities, trainable mentally handicapped, and educable mentally handicapped were non-significant. However, the t-tests (1-tail) for two variables from two analyses were significant. The multiple regression analysis of Transition Scale as a single variable, Apgar, and other perinatal risk variables on learning disabilities resulted in Apgar $p<.005$. The multiple regression analysis of Transition Scale as a single variable, Apgar, and other perinatal risk variables on trainable mentally handicapped resulted in Apgar $p<.02$ (see Table 10). It would appear that the presence of individual Transition Scale items results in more significant numbers of correlations than the collapsed variable representing the presence of at least one of those items.

In an attempt to determine whether or not there exists significant relationships between Transition Scale items, a factor analysis was utilized (Table 11). With thirteen of the Transition Scale items entered in the analysis, the six factors with eigenvalues >1.0 were rotated to final solutions using a varimax procedure. The resulting analysis accounted for 65.8 percent of the total variance with six factors reaching criterion. An examination of the variables contributing to the factor structure of the Transition Scale showed distinct clusters of variables identified for each factor. When variables are shown to overlap

TABLE 9

PEARSON PRODUCT MOMENT CORRELATIONS OF THE THREE SPECIAL EDUCATION CATEGORIES.

	SCHLPLCMENT (L.D.)
APGAR	*.19

	SCHLPLCMENT (TMH)
OXYGEN	*.19
TONE	**.30
LT38WkS	*.18
SGA	**.29
CARDIAC	**.24
STABILIZ	*.18
TERM	*.20

	SCHLPLCMENT (EMH)
INTUBAT	*.21

*: alpha .05
**: alpha .01

TABLE 10

MULTIPLE REGRESSION ANALYSIS OF TRANSITION SCALE AS A SINGLE VARIABLE, APGAR, AND OTHER PERINATAL RISK VARIABLES ON THE DEPENDENT VARIABLE OF LEARNING DISABILITIES.

DEP VAR: SCHLPLCM N: 159 MULTIPLE R:.213 SQUARED MULT. R:.045
ADJUSTED SQUARED MULT. R: .008 STANDARD ERROR OF ESTIMATE:.50

VARIABLE	BETA COEFFICIENT	P(2 TAIL)
TRANSCL	0.053	.643
APGAR	0.121	.010
RACE	0.039	.628
BIRTHTYP	0.061	.563
LABORDUR	-0.019	.836
MOTHRAGE	0.067	.519

ANALYSIS OF VARIANCE

SOURCE	DF	P
REGRESSION	6	0.309
RESIDUAL	152	

MULTIPLE REGRESSION ANALYSIS OF TRANSITION SCALE AS A SINGLE VARIABLE, APGAR, AND OTHER PERINATAL RISK VARIABLES ON THE DEPENDENT VARIABLE OF TRAINABLE MENTALLY HANDICAPPED.

DEP VAR: SCHLPLCM N: 159 MULTIPLE R:.184 SQUARED MULT. R:.034
ADJUSTED SQUARED MULT. R: .000 STANDARD ERROR OF ESTIMATE:.26

VARIABLE	BETA COEFFICIENT	P(2 TAIL)
TRANSCL	-0.043	.459
APGAR	0.048	.045
RACE	0.013	.760
BIRTHTYP	-0.029	.596
LABORDUR	0.016	.730
MOTHRAGE	0.030	.572

ANALYSIS OF VARIANCE

SOURCE	DF	P
REGRESSION	6	0.505
RESIDUAL	152	

TABLE 11

FACTOR ANALYSIS OF TRANSITION SCALE ITEMS
6 FACTORS WITH EIGENVALUES GREATER THAN 1.00 AND FACTOR LOADINGS >.50

	I	II	III	IV	V	VI
Oxygen	.59					
Intubation	.78					
Airway Pressure	.78					
Stabilization	.68					
38 wks. gestation	.56					
Male		.72				
Tone				.84		
32 wks. gestation					.90	
PROM		-.72				
LGA			.63			
Meconium			.84			
SGA						-.91

DESCRIPTION OF FACTORS (WITH EIGENVALUE):

Factor I (2.710)- resusciative measures
Factor II (1.443)- male
Factor III (1.189)- meconium staining/large infant
Factor IV (1.118)- poor muscle tone
Factor V (1.092)- premature
Factor VI (1.003)- normal weight

across factors, these loadings are generally in the borderline area of interpretability (factor loading < +/-.5).

Based on these analyses, Factor I clearly accounted for the most substantial amount of variance (19.12 percent). It would appear that the variables associated with Factor I comprise variables often associated with resusciative measures. The presence of oxygen use, airway pressure, intubation (a means of providing a direct airway to the infant's trachea), and prolonged stabilization period comprise the major variables for Factor I. Gestational age of less than 38 weeks is also moderately associated with Factor I.

Factor II accounted for 9.76 percent of the variance and the male variable loaded positively while the premature rupture of membranes was negatively associated. The presence of male gender and absence of premature rupture of membranes in the mother are clearly associated with Factor II.

Factor III appears to address the presence of meconium staining during the labor and delivery process and the large for gestational age infant.

Factor IV represents the infant with poor muscle tone.

Factor V represents the infant with gestational age of less than 32 weeks.

Factor V1 represents the infant that is either within normal weight range or large compared to gestational age.

In order to determine which factors could adequately represent the data, a scree plot was utilized. Based on this plot there is a

distinct break between Factor I and the remaining factors. Therefore, Factor I appears to be representative of this sample.

CHAPTER V

DISCUSSION

The overall purpose of this study was to examine the relationship between perinatal risk factors and subsequent school placement. Since the Transition Scale represents a collection of perinatal risk factors, comparison of it with Apgar score was a secondary intent.

Findings

The multiple regression analysis of Transition Scale items on the dependent variable of mentally handicapped (educable and trainable) was significant indicating that the Transition Scale is effective towards predicting mental retardation. There was a small number of cases representing Trainable mentally handicapped, hence there was less likelihood of discrimination between the categories of mental retardation. Since the severity of cognitive problems is consistently worse with mentally handicapped children, and thus alerts school staff of special needs, it would seem appropriate that this area of special education would be more amenable to discrimination. This would seem to be one category of infant that could be labeled "at-risk". There was a substantial number of learning disability cases; however, the results did not

indicate a predictive equation. A potential explanation for these results might be the less definitive nature of categorization for children in the learning disabilities programs of special education compared to mentally handicapped children (sensitivity as discussed in Chapter II). At present there are complex and varied measures, developed in addition to national regulations, that result in inconsistent categorization of children placed in learning disabilities programs. With this process one would expect more variability and, hence, more difficulty in prediction. Therefore, the results of the overall special education category (variables of learning disabilities, educable/trainable mentally handicapped) analysis are reflective of the learning disabilities results, since there were essentially twice as many learning disabilities cases as mentally handicapped cases in the study.

As expected, the Transition Scale items correlated with the Apgar score. This offers an adjunctive and more complete measure of the infant's status. In addition there is evidence that the Transition Scale offers unique information regarding perinatal condition. This would appear to support the use of multiple variables since the variability within the Transition Scale is high having thirteen possible variables and a multitude of combinations. The utilization of the Transition Scale variable (presence of at least one Transition Scale item) was significantly related to Apgar score and the male variable. This may lend to the use of the Transition Scale as ascreening measure like the Apgar; however, the examination of individual items would seem to give

more information and should be preferred until further research proves otherwise.

The factor analysis of Transition Scale items resulted in six factors that were interpretable. One factor resulted that was the most significant of the six, and it represented resusciative measures and the extended stabilization period required by infants with life threatening conditions at birth. Resusciative measures include use of oxygen, intubation, and airway pressure. These three items were a part of Strom's most significant factor and appear to describe perinatal asphyxia. In addition, infants with less than 38 weeks gestation but more than 32 weeks gestation loaded on this factor. A second factor was represented by the male infant with the absence of premature rupture of membranes. The male variable has long been associated with various at-risk conditions and this is not a surprising factor to emerge from this study considering that there is a higher ratio of males than females in learning disabilities classes. The third factor was represented by the large for gestational age infant and the presence of meconium staining. Infants who are large for gestational age are prone to hypoglycemia amd birth trauma (Strom, 1988). Other factors were poor muscle tone, infants with less than 32 weeks gestation, and small for gestational age infants. These are all factors observed to influence development/recovery in hospital nurseries. It is not possible to make comparison with individual Apgar items; however, the correlations of individual Transition Scale items with Apgar score indicates a positive relationship due to the large number of high correlations. Unique

variables of the Transition Scale as compared to the Apgar are gestational age, gender, premature rupture of membranes, meconium staining, and size of infant for gestational age.

Based on the results of this study, it is not clear whether groups of related variables have been identified for potential use as categories. With the future use of the Scale, groups may be discriminated that could be utilized in a structured screening process. There is a multiplicity of biologic and environmental risk factors which may be considered, and some may be difficult to measure due to their length or impractical nature. Examples of biologic and environmental risk would be early developmental events suggestive of biological insult(s) to the developing central nervous system (poor maternal health prenatally or infant trauma), or deprived environmental opportunities for expression of adaptive behaviors as well as decreased patterns of physical and social stimulation. Beckwith (1976) cites numerous studies that indicate the outcome for infants is more strongly related to environmental risk than to prenatal and perinatal difficulties. In addition, she states that problems arising from prenatal and perinatal difficulties are attenuated by environmental factors. The use of this Scale should be considered by medical professionals as a method of initial intervention. By utilizing the Scale with examination of the infant, a specific direction for intervention may be realized. Utilizing multivariate observation, the dimensions of factors considered at-risk are expanded yet organized into a practical approach. An approach such as this

should reduce the margin for error when infants are screened for potential future intervention.

Limitations

There is a slight bias in this study due to the fact that data was collected from a community mental health clinic. The majority of children referred to a clinic represent a atypical child who is of concern to someone. There was a portion of the sample that was not placed in special education classes. However, this is an issue better debated elsewhere since one could argue against data collected from school settings. Obviously a more ideal approach might be to sample more settings and randomly select more cases of each category of school placement.

Age was not considered and represents another possible variable to incorporate into a study such as this. A longitudinal study would appear to be most appropriate for examination of effects of perinatal risk factors, and age of infant/child could also be tracked, defined, and described. The categorical variable representing age of mother was dichotomized into two categories (19yrs. of age and under , and 20 yrs. of age and older) and generally represented mothers. However, the incidence of pregnancies among teenagers is high and would seem an area containing less stablility and in need of finer discrimination, particularly girls fifteen years of age and under. This age range was not clearly represented.

Partially due to geographical area, the racial representation was not representative of many city and rural populations and these variables were virtually unexplored. Environmental variables (i.e. parental systems: socioeconomic status, nutrition, health, educational background, etc.) were not examined and obviously represent significant influence in the development of the infant.

Many of the Transition Scale items were not adequately represented in this study and probably skewed results. For example, variables such as low birth weight infants and premature infants are commonly seen by professionals as the risk factors for the infants. In this study these two variables were poorly represented (ten cases of premature infants and one case of low birthweight infant).

One limitation of this study would be the lack of Apgar information. The time period from which data was collected was a period of less specific Apgar documentation. Doctors and nurses typically reported only the total score in the infant's medical record. The present system of medical records is more comprehensive and collection of most perinatal information is standard.

Implications/Recommendations

There have been consistent reports of dramatic improvement by infants during the first year of life. This would preclude any definitive categorization of infants. Longterm studies fail to take into consideration ongoing changes that affect outcome

measures. In this study it is speculated that the insignificant interrelationship between perinatal variables and special education school placement can be partially attributed to marked improvement in the infants' development either by environmental variables or growth in development.

What was frequently related in Chapter II concerning the "compensatory" development of children (i.e. plasticity of the developing brain) should be considered when examining the perspective of infant development. The combined effect of in-utero injury and socioeconomic disadvantage can be seen as in-utero/environmental factors that can affect the infant's compensation for the neonatal insult. This view of an infant with "resources for adjusting development" can be helpful; however, it can also complicate the decision process of evaluating the at-risk infant. For this reason, a definitive statement concerning projected outcome of at-risk infants would seem inappropriate. In terms of use of the Transition Scale and other perinatal indicators, the need for early intervention would appear to be the most significant reason for early identification, and the variables considered in this study seem to contribute to the recommended multivariate approach to early identification.

Clusters of pregnancy and perinatal events have been more predictive, but even with these there have been a wide distribution of outcomes regardless of the type of measures used. Thus, even though mean-outcome differences for groups of infants considered at risk can be predicted, there is difficulty predicting the outcome of individuals considered high risk on the

basis of pregnancy and perinatal problems (Parmelee, A.H., Sigman, M., Kopp, C.B., & Haber, A., 1975). The transient nature of some neonatal insults (in-utero injuries) and the recurrent observation that environmental factors can have a stronger influence on the outcome than the earlier biological events are significant factors in the problem of prediction. As suggested by earlier studies (Werner, 1971; Parmelee et al., 1975), consider multiple factors as additive in determining degree of risk. Parmelee, et al. recommend an approach to assess these additive factors: (1) score pregnancy, perinatal, neonate biological events and behavioral performance, (2) reassess the infant in the first months of life to sort out those infants with transient brain insult from those with more serious brain injury who remain significantly delayed, (3) reassess the infant again primarily on a behavioral basis later in the first year of life, providing time for environments to have an effect on developmental progress.

An alternative approach to assessment of perinatal influences on development would be frequent, repeated measures and predictions over short periods of time during the infants' development. Such a longitudinal study would allow for the probable occurrances of change and a means to identify some of those changes. This would be one step closer to identifying the constellation of variables which most significantly affect the developing infant.

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APPENDIX

INSTRUMENTATION: PERINATAL RISK ITEMS

APPENDIX

PERINATAL RISK ITEMS

The following items are listed according to the category or scale from which they were taken.

TRANSITION SCALE

1. Oxygen required to maintain color
2. Intubation
3. Continuous or intermittent airway pressure
4. Hypotonic or flacid muscle tone
5. Small for gestational age (according to Dr. & gestational age chart)
6. Large for gestational age (according to Dr. & gestational age chart)
7. Male
8. Cardiac resucitation in process of stabilization.
9. Meconium staining of the amniotic fluid
10. Membranes ruptured for over 24hrs before delivery.
11. Over 30 min. to obtain cardiopulmonary stabilization.
12. Less than 38 wks. gestation
13. Less than 32 wks. gestation

Code for Transition Scale items: 1=OXYGEN, 2=INTUBAT, 3=AIRWYPRS, 4=TONE, 5=SGA, 6=LGA, 7=MALE, 8=CARDIAC, 9=MECONIUM, 10=PROM, 11=STABILIZ, 12=LT38WKS, 13=LT32WKS

APGAR

(taken at 5min. post delivery)
Heart rate, Respiration, Muscle tone, Reflex, Color= Total Score

OTHER DATA COLLECTED

Labor duration (LABORDUR): <12hr, 13-24hr, & >24hr
Type of delivery (BIRTHTYP): breech, normal, caesaerian
Mother age (MOTHRAGE): <20 & >19 yrs.
Race: Caucasian, Black, American Indian
School placement: Learning Disabilities, Educable Mentally Handicapped, Trainable Mentally Handicapped, Regular classroom.

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