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The Social Ecology of Central Nervous System Pathology

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THE SOCIAL ECOLOGY OF CENTRAL NERVOUS SYSTEM PATHOLOGY

by

Dominic Amante

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Doctor of Philosophy

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In writing this dissertation, I have benefited from the continued encouragement, advice, and constructive criticism of my dissertation committee represented by Drs. M. O. Wagenfeld, J. Bosco, M. Robertson and C. Hunt. My sincere appreciation to them, especially to Dr. Wagenfeld; to the staff at the Center For Educational Studies in Grand Rapids, Michigan; to the staffs of the various public and parochial schools in Grand Rapids—and to the children and their parents or guardians—who participated in the study; and to the staff at the Computer Center at Western Michigan University, especially to C. Townsend.

My hope is that someday developmental defects in children will be controlled to such a degree that it will no longer be possible nor necessary to conduct empirical studies such as this to document the tragic amount of human wastage that occurs in America today.

Dominic Amante
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CHAPTER I

INTRODUCTION

There is growing recognition that cases of Central Nervous System (CNS) damage or dysfunction in children are not randomly distributed in the population at large. There is considerable empirical evidence, most of it medical in nature, supporting this statement (Pasamanick and Knoblock 1961; Birch 1968; Birch and Gussow 1970).

However, since neurological problems are known to be related to academic achievement (Lerner 1971) and to various categories of psychological function—such as sensation, perception, motoric activity, general intelligence, and psycholinguistic phenomena (Birch 1964; Clements 1966; Benton 1971)—it should be possible to specify the distribution of CNS pathology by means of psychoeducational procedures. Further, since many of the etiological factors appear to be closely related to social class position and ethnicity (Birch and Gussow 1970), we might expect that it would be apparent that the broad outlines of the distribution are predictable in sociological terms.

The central purpose of this empirical study is to delineate the ecological distribution of neurological pathology in children—
operationally defined in terms of specific psychological test performance parameters—along social class and ethnic group lines.

The following two hypotheses are posited:

1. Cases of CNS damage or dysfunction are inversely related to socioeconomic status (SES) in the case of all children.

2. There are inter-ethnic group differences in the prevalence of CNS pathology. Rates of neurologically-based pathology are higher among black children of any given social class level relative to white children of comparable social class position.

It is necessary to clearly define CNS pathology at the outset, and to specify some of the common symptomatic correlates.

A. The Definition of CNS Pathology

Central Nervous System (CNS) damage or dysfunction refers to any structural (anatomical) and/or functional (physiological) anomaly in the brain or spinal cord, however caused, which leads to some deleterious psychobiological effect(s) having behavioral consequences. This condition is to be differentiated from various other neurological disorders involving the peripheral and/or the autonomic nervous systems.

In all probability, the neurological deficit in question involves some anatomical and/or physiological disturbance at the inter- or
intracellular (neuronal) level in various cortical or subcortical centers which affect information processing characteristics (Morgan 1965; Thompson 1967; Rose 1973). Neuronal malfunction, in turn, appears to be associated with such phenomena as threshold excitability, the relative and/or absolute refractory periods, the discharge and propagation of the bioelectrical neural impulse, or synaptic activity (Rozin 1970). In some cases, the deficit may be centered in the spinal cord, as in poliomyelitis, although in the great majority of cases the brain appears to be the biological organ involved.

Neurological integrity is seriously compromised by a great variety of pathological events or processes occurring at various points in the life cycle which lead to neuroanatomical or neurophysiological (including biochemical) deficits, acute or chronic (Freedman, Kaplan, and Sadock 1972; Rose 1973; Stern 1973). Neurophysiological conditions may occasionally lead to neuroanatomical disorders, and vice versa. Neurological integrity may be reduced at any given point in time due to metabolic insufficiency involving the inadequate delivery of oxygen, glucose, and various other essential substrates. Further, blood chemical changes involving the introduction of high concentrations of alcohol, various drug or toxic agents, bacterial or viral infection, and so forth may induce transitory or permanent neurological changes. Frequently, if not inevitably, these neurological alterations are succeeded by various psychological changes in the
areas of sensation, perception, affect, thought and behavior.

B. The Symptomatic Correlates of CNS Pathology

Serious forms of neuropathology in children are related to such problems as cerebral palsy, convulsive disorders (epilepsy), certain aphasic conditions, blindness or deafness, and mental retardation (Robinson and Robinson 1965; Clements 1966). The symptomatic behavior which is frequently associated with minimal brain damage or dysfunction may include hyperactivity, short attention span, impulsivity, distractibility, psycholinguistic disabilities, intellectual deficits and various perceptual-motor problems (Knobloch and Pasamanick 1959; Anderson 1963; Werry 1968; Wender 1971). Academic learning problems--particularly reading difficulties--are often related to the underlying neurological deficit (Johnson and Myklebust 1967; Frierson and Barbe 1967; Natchez 1968; McCarthy and McCarthy 1969; Sapir and Nitzburg 1973). Further, neurologically handicapped children occasionally exhibit major (Robinson and Robinson 1965) or minor (Waldrop and Goering 1971) physical anomalies in one form or another. It should be recognized from the outset, however, that this is a very heterogeneous group of children. The symptomatic patterns indicated are ideal. They are not observed in any simple fashion in the case of all neurologically handicapped children. Certain symptoms appear to be more common than others and are more easily detected and measured. In short, the symptom-
atic indicators present in the case of any given child or group of children is quite variable (Chess 1968). Neurologically impaired children exhibit a broad range of affective, cognitive, and behavioral phenomena and unfortunately their problems frequently go undetected and untreated (Birch, Thomas, and Chess 1964).

C. Etiological Considerations

CNS pathology is known to arise from the operation of a broad spectrum of causal factors during the prenatal, the natal, and the postnatal stages of development (Robinson and Robinson 1965; Yacorzynski 1965; Koch and Dobson 1971; Wender 1971). Brain damage or dysfunction may be induced at any point during the life cycle from the earliest stages of embryonic development to the final stages of senescence. Some of the presumed causal factors of interest include genetic mutations and chromosomal aberrations (Melnyk and Koch 1971), endocrinological malfunction (Ferreira 1969), trauma and accident, toxic and infectious conditions of many kinds (Hardy 1965), extreme conditions of sensory restriction or sensory bombardment (Riesen 1968), malnutrition and undernutrition (Birch and Gussow 1970; Birch 1971; Birch 1972), and various complications of pregnancy, labor and delivery (Drillien 1970; Stone, Smith and Murphy 1973). There are several other contributing factors, many of which appear to be functionally related to the general etiological variables mentioned above, including the age of the mother at the
time of conception, high or low parity, short birth intervals, a
history of maternal illness, drugs used for general obstetric
analgesia or anesthesia, short stature, exposure to adverse environ-
mental circumstances, maternal habits or behavioral patterns
involving the consumption of alcohol, drugs, and perhaps caffeine
and nicotine, emotional pathology during pregnancy, marital status,
and the adequacy of pre- and postnatal child care (Stechler 1964; Kron,
Stein, and Goddard 1966; Ferreira 1969; Joffe 1969; Birch and

The above are the major biological and psychological causes
of neurological pathology. There is, however, another important
group of causes, toward which little systematic attention has been
directed, which are largely social in nature. The purpose of this
study is to delineate the role of these social factors and to indicate
some of the manifold ways in which they may interact with biological
and/or psychological determinants to produce CNS damage or
dysfunction and its sequelae.

It is important to recognize that many of the causal factors
referred to are closely related to such sociological factors as socio-
economic status, ethnicity, and minority group membership. For
this reason, cases of CNS pathology do not vary randomly in space or
time. Rather, such disorders are highly concentrated in the socially
disadvantaged or poverty segments of the community (Amante, et al.
Both the incidence (the rate of new cases over a given period of time) and the prevalence (the total rate of new and old cases at a given point in time) of these conditions appear to be especially high in the poor white and Negro sectors of the population. From all indications, the prevalence of neurological pathology is considerably higher in the case of black children of lower socioeconomic origin relative to their white counterparts (Birch and Gussow 1970).

Bronfenbrenner (1967, p. 913) summarizes the essential relationships in these terms:

Though the Negro infant is not biologically inferior at the moment of conception, he often becomes so shortly thereafter. The inadequate nutrition and prenatal care received by millions of Negro mothers result in complications of pregnancy which take their toll in extraordinarily high rates of prematurity and congenital defect . . . . Many of these abnormalities entail neurological damage resulting in impaired intellectual function and behavioral disturbances, including hyperactivity, distractibility, and low attention span. Of particular relevance is the significant role played by paranatal and prenatal factors in the genesis of childhood reading disorders.

Unfortunately, we have long underestimated the prevalence of such neurologically-based disorders (Bell 1965), although our knowledge of the relationship of poverty to physical and mental health, the effects of nutritional deprivation, and the inadequacy of medical care in poverty populations should have alerted us to the problems many years ago (Mechanic 1968; Kosa, Antonovsky, and Zola 1969; Allen 1970).

In summary, a variety of environmentally-based factors—most
of them closely related to both ethnicity and socioeconomic status—appear to be the primary determinants of the ecological distribution of CNS damage or dysfunction. Further, as indicated by Birch and Gussow (1970), there is growing evidence that certain adverse conditions—including higher rates of physical pathology, undernutrition and malnutrition, and inadequate obstetrical and pediatric care—appear to be considerably more prevalent within the lower class black population in comparison with the lower class white population. Presumably, these factors determine the inter-ethnic group differentials in terms of the frequency of neurological pathology among black and white populations of roughly comparable socioeconomic status. Most of the problems appear to be common to the state of poverty, but some of them may be socioculturally specific to certain ethnic groups and are transmitted intergenerationally via a process of differential socialization (Mechanic 1968).

In a very general sense, the distribution is assumed to be a product of a broad-ranging, interrelated set of cultural, social, demographic, political and economic forces (Pettigrew 1964; Meissner 1966; Mechanic 1968; Lengthening Shadows 1971; Pratt 1971; Rosen 1971; Lambert and Heston 1972). The reference here is to such factors as population growth and distribution, the level and form of industrial technology, prejudice and discrimination in the areas of education, employment, and medical care, patterned
economic activity involving fluctuating levels of income and cyclic phases of employment and unemployment, and interclass and ethnic group patterns of sociocultural learning (socialization) involving the acquisition of maladaptive values, attitudes, perspectives, beliefs, and health or medically-oriented behavioral phenomena. Minority group status and poverty life styles involving powerlessness, social isolation and alienation, and economic deprivation are central to this theoretical mode of analysis (Miller and Riessman 1968; Moynihan 1969; Lewis 1970; Matza 1971). These various forces appear to be related to the environmental determinants of health prevailing at the community level, the availability and adequacy of medical care services, the prevalence of nutritional problems, the nature of one's living conditions and the quality and quantity of ambient stimulation.

D. The Empirical Evidence Related to the Distribution of CNS Pathology

Over the years, Pasamanick and his co-workers have reported a number of studies which are more than pertinent to the "explanation" of the epidemiological distribution of CNS pathology in children (Pasamanick and Knobloch 1958; Knobloch and Pasamanick 1966; Pasamanick and Knobloch 1966). Their research indicates that a number of variables are related to neurological status during the fetal or neonatal stages of development. The most important of these
include complications of pregnancy, labor and delivery. These obstetrical (medical) conditions involve such variables as the length of labor, birthweight, preeclampsia, hypertensive disease, pyelitis, placenta previa, malpresentation of the fetus at birth, operative procedures employed at the time of delivery, and a variety of other health conditions on the part of the maternal host which might be expected to influence fetal or neonatal neurological integrity. Relative to prematurity, certainly one of the most serious complicating conditions, Birch and Gussow (1970, p. 51) observe:

Of all the known complications of pregnancy and parturition, no single condition is more clearly associated with a wide range of insult to the nervous system than the too early expulsion into the world of a child scarcely able to function as an independent organism. Survivors, especially those in the lowest birth-weight ranges, are at much greater risk than full-term infants of severe neurological, mental, sensory, or other defects.

This conclusion is strongly supported by a variety of other investigators (Harper, Fischer, and Rider 1959; Drillien 1964; DeHirsch, Jansky, and Langford 1966; Meier, Segner, and Grueter 1970; Wright 1971; Freedman, Kaplan, and Sadock 1972). Premature children are at higher risk for a variety of neurologically-based disorders--including epilepsy, mental retardation, cerebral palsy, strabismus, deafness, blindness, and various congenital anomalies--in addition to reading problems, speech and language pathology, perceptual-motor problems, and reduced stature.
Pasamanick's data indicate that both the incidence and the prevalence of prematurity and complications of pregnancy are closely related to social class position and ethnic group membership. In addition, other possibly interrelated variables of etiological significance were considered including malnutrition, stress, infection, and "psychosocial deprivation" (Pasamanick and Knobloch 1961). They demonstrated that prematurity was negatively correlated with socioeconomic status in the white sample and that its frequency was higher in the Negro population. The incidence figures were 5.0 and 7.6 percent for the upper and lower white socioeconomic groupings respectively, and 11.4 percent in the Negro sample. The statistical data presented in relation to the distribution of pregnancy and birth complications are even more striking: An incidence figure of 5.0 percent was reported for the white upper socioeconomic group, 14.6 percent for the white lower socioeconomic group, and 50.6 percent in the case of the Negro sample. Prematurity and the various obstetrical complications were also indicated to be closely related to certain symptomatic indicators of CNS damage or dysfunction such as behavioral problems and academic learning disabilities.

It should also be observed that the data reported by Pasamanick and his co-workers are quite consistent with the data of a variety of other investigators in the United States (Donnelly, et al. 1957; Donnelly, et al. 1964; Ross 1964; Ferreira 1969; Jordan 1971).
Furthermore, there is some evidence that the same trends involving an inverse correlation of rates of pregnancy and birth complications with social class position are cross-culturally valid (Edwards 1958; Kincaid 1965; Sarram and Saadatnejadi 1967; Drillien 1970). The association of poverty—a social condition—with the various obstetrical complications which are known, in turn, to be related to fetal or neonatal neurological status—a biological condition—appears to be quite strong.

More recently these same relationships have been demonstrated by a number of investigators utilizing a variety of assessment devices. Cohen (1969) and Grothberg (1970) reviewed several empirical studies indicating that disadvantaged and minority group children exhibit higher rates of visual-motor malfunction, auditory perceptual handicaps, intellectual deficits and psycholinguistic disabilities—all of which appear to be symptomatic of neurological pathology. These various cognitive deficits appear to be associated with academic learning disabilities. The problems they observed pertain to disadvantaged white, black, and Puerto Rican children. Very few problems were observed in the case of Chinese American children.

Utilizing the Bender Gestalt as a measure of visual-motor development, Koppitz (1959) reported clear cut social class differences in test performance in a study involving 143 first grade children representing a socioeconomic cross section of Greater
Columbus, Ohio. More recently, Willis (1970) has also reported social class differences on the Bender Gestalt in a sample of 60 middle class and 60 lower class male and female white Kindergarten, First, and Second grade children. The lower class children exhibited more visual-motor immaturity than their middle class counterparts. Amante, et al., (1970) have demonstrated both ethnic group and social class differences in Bender Gestalt performance parameters. Unfortunately, none of the studies have clearly demonstrated social class differences across all class levels, very few ethnic groups have been studied, and social class position has not always been well-controlled when the research focus has been on ethnicity.

Peixotte (1954) long ago demonstrated inter-ethnic group differences on the Bender Gestalt in the case of 35 subjects (Ss) representing seven ethnic groups on the island of Hawaii. The results are seriously limited due to the small sample size, but they nevertheless suggest that the test is not entirely culture free. Carlson's (1966) results suggest the same interpretation. She reports statistically significant differences on the Bender Gestalt between white and black adult schizophrenic patients admitted to Bryce Hospital in Tuscaloosa, Alabama. Taylor and Thweatt (1972) have very recently reported that 6 to 7 year old Navajo children exhibit more visual-motor immaturity than do caucasian children of comparable chronological age. At 12 years of age, however, the inter-ethnic group differentials were statistically insignificant.
Henderson, Butler, and Goffeney (1969) report lower levels of general intelligence and higher rates of visual-motor malfunction in non-white as compared with white children. Intelligence was measured by the Wechsler Intelligence Scale For Children and visual-motor development was assessed by means of the Bender Gestalt. McNamara, Porterfield, and Miller (1969), testing a small sample (N=42) of Negro children of either sex enrolled in Day Care Centers and Head Start Programs in Dade County, Florida, report evidence of marked intellectual deficits (as measured by the Wechsler Preschool and Primary Scale of Intelligence and the Coloured Progressive Matrices) and serious perceptual-motor problems (as measured by the Bender Gestalt) in the sample of children selected for study. Kennedy, VanDeRiet, and White (1963) report rather extreme intellectual deficits in a large sample of southeastern Negro children, and in a later follow-up study (Kennedy 1969) and a related publication (Kennedy 1968) suggested that the original observations might be related to high rates of neurological malfunction as revealed on a psychomotor drawing test. Sylvia Farnham-Diggory (1970) utilized a variety of procedures to assess some of the high level verbal, maplike, and mathematical symbolic or cognitive process in the case of black and white children from grades one to four of variable socio-economic status. She reports that blacks have a special perceptual problem, and not necessarily a global IQ deficit—a conclusion
entirely consistent with L'Abate, Oslin, and Stone's (1973) very recent review of the literature.

Tarnopol (1970) reports that minority group ghetto subjects who had dropped out of school and exhibited varying degrees and forms of juvenile delinquency were characterized by a multiplicity of serious intellectual deficits, perceptual-motor problems, and academic learning difficulties. Approximately two thirds of his sample (N=102) exhibited some visual-motor malfunction as measured by the Bender Gestalt. Albott and Gunn (1971) have recently reported a small study involving 35 Negro first grade children residing in a deprived, rural area in northern Illinois. Their results indicate that visual-motor development in the case of black children as compared to white children is approximately one year retarded--a difference they suggest which may be related to the difficulties culturally deprived children frequently encounter in their attempts to master the reading process. Rice (1971) employed the Otis-Lennon Mental Ability Test, the Bender Gestalt, and selected subtests from the Illinois Test of Psycholinguistic Abilities in a sample of 153 Head Start children. Sixty-six of his Ss were Negro, 71 were Latin American, and 16 were white. Visual-motor deficiencies, as measured by the Bender Gestalt, were indicated to be the most serious disability characterizing the sample. Negro children exhibited higher rates of perceptual-motor problems than
the Latin American children. Levels of intelligence in the white children were indicated to be average, whereas there was a greater depression of general intelligence in the case of both the blacks and the Latin American children. The battery of tests employed by Rice proved to be an effective screening device to identify "problem children." Finally, it should be mentioned that the cognitive deficits reported in the various studies appear to be interrelated. For example, several of the studies indicate a substantial correlation of Bender Gestalt test performance with measurable intelligence (Henderson, Butler, and Goffery 1969; McNamara, Porterfield, and Miller 1969; Cerbus and Oziel 1971; Matranga, Jensen, and Prandoni 1972).

The data available regarding the ecological distribution of CNS pathology is not entirely consistent or mutually supporting. Some of it, in fact, is logically contradictory with much of the data reviewed above. For example, White and Charry (1966) report that rates of CNS damage or dysfunction are higher in middle or upper class circles than in working class or lower class positions. This conclusion is based on questionnaire data secured from forty-six school psychologists representing a non-random sample of 2,866 children referred to them for study in nineteen school systems. The study was conducted in Westchester County, New York which, according to the authors, is an atypical county in terms of its socioeconomic
distribution. Professional and managerial occupational positions appear to be over-represented in the county and clerical and sales workers, operatives and service workers are under-represented.

Alley and Solomons (1971) have recently reported that rates of neurological pathology are not high in lower class social positions as originally reported by Pasamanick and his co-workers. Nor are they high in middle class or upper class circles as reported by White and Charry. Rather, as indicated in their report, CNS damage or dys-function is "... distributed proportionately with a diagnosis of normal across all five levels of social class..." as measured by the Hollingshead Two-Factor Index of Social Position (Alley and Solomons, 1971, p. 18). They maintain that the conflicting results reported by Pasamanick and White and Charry are probably due to selective sample bias and background and attitudinal factors on the part of the clinician in formulating the diagnosis of CNS pathology—a particularly interesting observation in view of the fact that the neurological diagnosis arrived at in their study was predicated upon "... subjective clinical judgment..." (Alley and Solomons 1971, p. 18) and involved a non-random sample of 591 patients who were seen at a Child Development Clinic in Iowa City, Iowa.

The conclusions of McDermott, Harrison, Schrager, Wilson, Killins, and Waggoner (1967) are roughly consistent with those of both White and Charry and Alley and Solomon. According to
McDermott and his co-workers, there are no social class differences in the frequency of historical and behavioral data traditionally assumed to be related to neurological status. The reference here is to such indices of obstetrical incompetence as prematurity and complications of pregnancy, labor and delivery and behavioral data--such as reduced attention span and hyperactivity--assumed to be symptomatic of CNS pathology. Further, they report the lowest incidence of diagnosed neurological pathology and mental retardation to be in the lowest socioeconomic stratum. Rates of CNS damage or dysfunction are higher in middle and upper class positions. Their results were also based on intra-agency data--specifically, a non-random sample of 853 children who were seen at the University of Michigan Children's Psychiatric Hospital.

In summary, the various methodological approaches utilized by different investigators to delineate the ecological distribution of CNS pathology--the medical versus the psychoeducational--have produced conflicting results, although the bulk of the evidence suggests that cases of CNS damage or dysfunction run higher in the minority group and poverty segments of the community. It is reasonable to conclude that neurological status may be assessed or evaluated by a multiplicity of methods. However, it should be explicitly recognized that some of the studies reported are of uneven quality and are seriously limited by a variety of research design constraints. This factor, in conjunc-
tion with some of the conflicting or contradictory data, is sufficiently serious to obscure the "true" nature of the ecological distribution of CNS damage or dysfunction in different ethnic groups of variable socioeconomic status.

Sociologists have clearly demonstrated that such social phenomena as values, attitudes, life expectancy, distributions of morbidity and mortality, behavioral patterns of many kinds, and various forms of deviant behavior--including crime and juvenile delinquency, academic underachievement, and certain forms of emotional maladjustment--are not randomly distributed, but rather vary by ethnic group membership and social class position (Susser and Watson 1962; Svalastoga 1964; Trow, 1966; Mechanic 1968; Schur 1968; Dohrenwend and Dohrenwend 1969; Heller 1969). There is a good deal of medical, sociological, psychological, and educational data available which rather clearly suggests that cases of CNS damage or dysfunction--like other forms of physical and emotional pathology--are more prevalent in the socially disadvantaged segments of the population (Mechanic 1968; Ferreira 1969; Kosa, Antonovsky, and Zola 1969; Birch and Gussow 1970). However, there are enough ambiguous data available, and several contradictory reports, to argue that the actual distribution of CNS pathology across social class and ethnic group lines is not entirely clear. It is the primary purpose of this empirical study to clearly delineate the ecological distribution
of neurological damage or dysfunction. If the hypotheses are supported, an additional purpose of the study will be to sketch in some detail a theory and a longitudinal data collection strategy for understanding some of the ramifications of neurologically-based disorders in children.
CHAPTER II

PROCEDURES AND METHODOLOGY

A. Introduction and Overview

The empirical study to be reported was conducted in Grand Rapids, Michigan in the Fall and Winter of 1971-72 under the aegis of the Center For Educational Studies (CES). A random sample (N=508) of fourth and fifth grade children of both sexes--representing all of the major ethnic groups and social class positions in the city at large--was individually tested with the Bender Gestalt in order to assess the level of visual-motor development. The psychometric data obtained was related to various categories of demographic information, much of it provided by the parents or guardians in the form of a mailed-in questionnaire. The purpose of the research project was to test the two hypotheses mentioned earlier.

The sample of children tested were drawn from thirteen different schools throughout the area, all of which are identified below with pseudonyms. Three of the schools were parochial and the remaining ten were public schools. All of these schools were purposively selected to adequately represent the population of interest. Various staff members at CES assisted in the selection of the ten public schools. The parochial schools were selected

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with the help of the CES staff, in conjunction with the investigator's knowledge of the Grand Rapids area, the presumption being that the schools so selected represented an adequate cross section of parochial school children of variable socioeconomic status and ethnicity. The three parochial schools included one Christian Reformed school, Our Redeemer, and two Catholic schools, St. Jeans and St. Dominics. The public schools included Beach Park, Cherry Park, Hill, Snow Flake, Nelson, Marquette, Hamilton, Angela, Park Avenue, and Frobel. It may be appropriate at this point to provide a demographic description of relevant aspects of the community followed by a more extended discussion of methodology.

B. Community Profile

Grand Rapids is located in Kent County in Western Michigan. The population of the county was 411,044 in 1970. Six and one-tenth percent were Negroes and "other races," and the remainder were Caucasians. Kent is a predominately urban county as indicated by the fact that only 14.9 percent of the population was classified as "rural non-farm" and 2.8 percent as "rural farm" in the census.

The population of the Grand Rapids Standard Metropolitan Statistical Area was 539,225 in 1970. Whites represented approximately 95 percent of the total population, and Negroes and other ethnic groups represent the remainder. Actually, the non-white segment of the population is made up of approximately 90 percent
The fertility ratio—the number of children under age five per 1,000 women aged 15 to 49—was 382. Thirty seven and eight-tenths percent of the population was under 18 years of age, 53.3 percent were between the ages of 18 and 64, and 8.9 percent were 65 and older. The median age in the City of Grand Rapids was 27.1 years at that time. Sixty seven and five-tenths percent of the males 14 and older were married in 1970, as compared with 61.4 percent of the females. The mean family size was 3.74.

In 1970 the median education for males 25 years and older was 12.1 years, and for females it was 12.2 years. The median income in the area was $10,630 and the mean was $11,898. The mean income of families headed by a female was $7,222. The median income of males 16 and older ($8,205) vastly exceed that for females ($3,456). Six and one-tenth percent of the population had incomes below the poverty level in that year, while 21.9 percent had incomes in excess of $15,000 per year. Thirty three and three-tenths percent of the persons employed in the area were working in manufacturing industries, 45.6 percent were in white collar occupations, and 9.7 percent were government employees. In 1970 5.7 percent of the civilian labor force was unemployed, and 4.1 percent of the people were receiving "Public Assistance Income." One and nine-tenths percent of the housing units in the county were "lacking some or all
plumbing facilities." The median number of rooms in housing units in the county was 5.5, and the median value of occupied units $16,000 (the comparable value for the state as a whole was $17,500).

Blacks in Grand Rapids are more socially disadvantaged than whites in terms of a variety of socioeconomic indicators. For example the median number of years of school completed is 9.9 years for black males and 10.3 years for black females. The median income for black males was $5,941 and for females it was $3,334.

Rates of unemployment among the black population considerably exceeded the rate observed in the general population. Thirteen and eight-tenths percent of black males and 10.8 percent of black females were unemployed in 1970, as compared with rates of 5.1 percent and 6.7 percent among males and females in the general population.

Twenty one and seven-tenths percent of black families were receiving Public Assistance in 1970, and 27.1 percent of the families had incomes below the poverty line. In 1970 the mean family size for blacks was 4.20.

Table 2.1 presents selected public health statistical data which allows for a comparison of Kent County with the State of Michigan and with the nation as a whole (Reported Health Indicators: 1969, 1972.. Several other health indicators, related to a wide variety of public health problems, reported for Michigan and Kent County are favorable when compared with national data--suggesting that public health

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in Michigan in general, and Kent County in particular, is satisfactory or better than in many regions of the nation. It should be recognized that the public health statistics presented pertain to the population as a whole and, hence, in many cases obscure rather than clarify inter-class and ethnic group differentials (Ruiz 1970-72).

TABLE 2.1--Public health data

<table>
<thead>
<tr>
<th>Public Health Indicator*</th>
<th>U.S.A.</th>
<th>Michigan</th>
<th>Kent County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence of prematurity (birth weight of 5 lbs. and 8 ozs. or less)</td>
<td>81.6</td>
<td>78.3</td>
<td>68.4</td>
</tr>
<tr>
<td>Infant death rate</td>
<td>20.7</td>
<td>20.2</td>
<td>18.5</td>
</tr>
<tr>
<td>Neonatal death rate</td>
<td>15.4</td>
<td>15.4</td>
<td>25.4</td>
</tr>
<tr>
<td>Perinatal death rate</td>
<td>--</td>
<td>27.1</td>
<td>25.4</td>
</tr>
<tr>
<td>Illegitimacy rate</td>
<td>95.0</td>
<td>98.5</td>
<td>94.4</td>
</tr>
</tbody>
</table>

*Rate per 1,000 cases

There is some evidence of increasing public health problems in the county (personal communication, Kent County Public Health Department). For example, rates of prematurity have gradually increased in the area from 66.5 in 1960 to 68.4 per 1,000 live births in 1969. This small increment may be due to chance. Conversely, it may be related to the strong increase in rates of illegitimacy observed in the county over a twenty year period of time. In 1950
the illegitimacy rate was indicated to be 21.7 per 1,000 and by 1969 it was 94.4 per 1,000. On the positive side, the fetal and infant death rates have declined through time. The resident live birth rate has also decreased in the decade from 1960 to 1970.

Generally speaking, the low socioeconomic status and minority group residential areas in the city are characterized by various public health problems, the lowest level of education and income, and the highest rates of public welfare assistance, poor housing, geographical mobility, and illegitimacy (Michigan Health Survey, 1970). These same urban regions are in general the areas characterized by the highest rates of fetal mortality, neonatal mortality, and prematurity (Program of Prenatal and Postpartum Care For Low Income Mothers in Kent County, Michigan, 1971). Further, there is clear evidence that low income expectant mothers in the Grand Rapids area do not secure prenatal care that is comparable to that of high income mothers. Low income mothers had less prenatal contacts with qualified medical personnel and they initiated their prenatal care later in the pregnancy cycle. The bulk of these high risk mothers are clearly drawn from the disadvantaged or poverty segments of the population.

A recent health survey in the area indicates that non-whites in Grand Rapids are highly segregated in the central city regions (Ruiz 1970-72). The survey in question has revealed a number of social (demographic) and public health characteristics of the areas, most of
which are clearly consistent with the trends mentioned above. For
the most part, the reported data refer to a number of indicators
which are suggestive of low socioeconomic status, social disorgan-
ization, poor health practices, and a high prevalence of chronic health
problems.

C. Methodological Considerations

This is an epidemiological study which is designed to clarify
the distribution of CNS damage or dysfunction in children across
social class and ethnic group lines. Ethical considerations preclude
the possibility of experimentally manipulating the causal variables
behind the ecological distribution of neurological pathology. Knobloch's
(1966, p. 12) statement is relevant here:

While the latter type study (the experimental study) is much
more likely to offer definitive conclusions, the naturalistic
study is frequently the only method available for research
on human populations, particularly in the chronic disorders.

Joffe (1969, p. 308), after reviewing much of the human epidemiologi-
cal research and a great deal of experimental evidence related to
prenatal factors in animal research, comes to a similar conclusion:

It may be a negative virtue but it seems that there is greater
validity in drawing conclusions from studies of humans--
despite their limitations--than in extrapolating from animal
experiments without evidence from man. More positively,
the human studies provide sufficient evidence to enable
preventive prenatal action to be initiated with regard to a
variety of pregnancy and childhood disorders without waiting
for the methodological issues to be unravelled precisely--
though the action may be more effective when they are.
D. Sample Selection and General Design Considerations

Contact with all of the public schools in Grand Rapids was effected through the Center For Educational Studies. The contact with the parochial schools was established by the investigator, who worked directly with the superintendents and principals responsible for these schools. Shortly after these initial contacts, all of the principals were sent a standard form letter which explained the research design. A copy of this letter is included in Appendix A.

A computerized print-out containing various categories of demographic information on each child in the public school system was secured from the CES. Comparable information was obtained directly from the principals at each of the parochial schools. If there was ever any doubt concerning the validity or reliability of the data contained on the print-out or class lists provided by the principals--such as the identity and residence of a given child, his/her birthdate, ethnic group, and so forth--the information was rechecked with the child, the teacher or the principal directly at school. Several obvious errors were observed, but in each case these were corrected at the school. In some cases the information contained on the print-out or the class lists was out-of-date due to the high rate of geographic mobility prevailing in some of the neighborhoods. If a given child was not available because his/her family had moved, the adjacent name on the print-out or class list
was randomly selected with the flip of a coin. If new children had entered the school and were not listed, their names were obtained and added to the data pool from which the sample was drawn. Small random samples were selected representing the populations of fourth and fifth grade children at each school. This involved the selection of every Nth child—usually every 2nd or 3rd name—from the print-out or class list, both of which were alphabetically arranged, giving rise to a one-third or fifty percent random sample at each school. The sample selection point—the top or the bottom of the list was randomly determined, and if more than one list was involved at a given school, which was inevitably the case, the selection of children from successive lists was counter-balanced.

Approximately seven to ten days prior to the scheduled testing of the children in school, the principal was given a set of unsealed, large manila envelopes with the names of the children to be tested on the outside. Each manila envelope contained an introductory letter to the child's parents or guardians (Appendix B), a questionnaire (Appendix C), and a self-addressed, stamped envelope for them to return it directly to the CES. The questionnaire was revised several times prior to its use in the study, shortened once, and pre-tested on a small non-random sample of white working class and middle class females. If the questionnaires were not returned within a two week period, the parents were sent a follow-up letter
(Appendix D). If the questionnaires were still not received shortly thereafter, a second follow-up letter was mailed to the parents (Appendix E). No further efforts were made to secure the questionnaires if the parents did not respond to the second follow-up letter.

All of the items contained on the questionnaire were selected for one of several reasons—namely, for convenience, because they were necessary to identify the child or to facilitate communication with the parents (if necessary), to expedite the mailing out of the parental report letters, and because a comprehensive review of the literature strongly suggested that various factors (indicated by the questionnaire item content) represented variables potentially related to obstetrical competence on the part of the maternal host and/or neurological status on the part of the child. The reference here is to the variety of items assessing socioeconomic status (estimated from the reported occupation and education of the major breadwinner) at three points in time, maternal age, family size, ordinal position (parity), legitimacy or illegitimacy of birth, and various complications of pregnancy, labor and delivery (Pasamanick and Knobloch 1961; Birch 1968).

There is growing evidence that obstetrical competence is affected by a variety of socioeconomically-related factors—including nutritional history, physical health status, growth and development—occurring in the lives of women long before they reach child-bearing
age (Birch 1972). Maternal social origins may therefore be one factor potentially related to pregnancy outcome, and for this reason an effort was made to assess some parameters of social class background on the part of the child's mother. Basically, the presumption was that women deriving from lower socioeconomic backgrounds would be characterized by a higher probability of experiencing obstetrical complications which, in turn, might adversely affect fetal neurological development. If some of these women were socially mobile through time and were middle class when their children were born, there is some possibility that they might still be more likely to experience pregnancy and birth complications than would women of comparable socioeconomic status who were not born in socially dis-advantaged circumstances.

The questionnaire also attempts to assess the socioeconomic status of the major breadwinner in the child's family at the time of child's birth and at the present time. This was presumed to be necessary for two reasons. To begin with, it makes considerably more theoretical sense to assess socioeconomic status at birth rather than at the present time because the various factors potentially capable of inducing neurological differentiation among large groups of children—nutrition, poor medical care, pathogenic conditions of environmental stimulation, and so forth—would be expected to be of substantial importance during the early phases of
neurological development (that is, during the prenatal and early postnatal stages) and perhaps of less importance when most of the children tested are chronologically nine to eleven years of age (Ferreira 1969; Birch and Gussow 1970). Further, assessing the socioeconomic level prevailing in the child's household at birth and at the present time allows for an analysis of the impact (if any) of upward or downward social mobility on the observed distribution of CNS damage or dysfunction. To some degree, data pertaining to the mother's social origins would also allow for an evaluation of the importance of social mobility relative to the distribution, and it would facilitate an understanding of the impact of certain social forces related to events (childhood neurological status) far removed in time. In short, it was presumed that the analytic separation of socioeconomic level at three points in time would allow for a more accurate understanding of the ecological distribution of CNS pathology and the influence of various social factors related to the distribution.

The rationale behind one other questionnaire item—question number 5 (Appendix C) which seeks to determine if the child is biologically or non-biologically related to the mother—should be clarified. It was necessary to determine the status of the child's relationship with its mother in order to clarify the nature of some of the background factors presumably related to the distribution of CNS pathology. Kenny, Baldwin, and Mackie (1967) and Silver (1970)
have reported data indicating lower levels of neurological integrity in adopted children as compared with non-adopted children, an observation that appears to be related to the fact that many adopted children are born of women of working class or lower class socioeconomic status who are characterized by various obstetrical problems related to maternal age at conception, poor nutrition, stress, inadequate prenatal care, and so forth. It is probable that middle class families will later adopt many of these children. This may be an important point to consider from an epidemiological point of view. An unspecified number of these children in middle class families might be expected to inflate the reported prevalence figures of neurological pathology in middle class families. Evaluating this possibility becomes a matter of some importance in research such as this.

All of the children originally selected for study were individually tested regardless of whether the questionnaires were returned. All of the questionnaires that were returned were carefully screened by the investigator in order to ensure that they were both legible and complete. If they were not, the parents or guardians were contacted by phone to obtain the necessary data or to clarify a point in serious question. If this proved to be impossible, they were contacted by mail in order to secure the necessary data. This procedure proved to be effective in the great majority of the cases. If it was impossible to secure the relevant information, the missing data was ignored.
in the final data analysis.

After all of the testings were completed, those parents who had completed the questionnaire were mailed a private report letter (Appendix F) concerning their child's performance on the psychological examination. The parents were encouraged to contact the school thereafter in order to provide the teacher with some direct feedback concerning the children tested from their classrooms. In addition, a more comprehensive report was forwarded to the principal at each school.

E. The Measure of Neurological Integrity

The Bender Gestalt—a measure of visual-motor functioning—was utilized to diagnose neurological status. The rationale for this is both clear and simple. It is well-recognized, both clinically and experimentally, that visual-motor malfunction is frequently symptomatic of an underlying neurological disorder (Battersby 1956; Birch 1964; Morgan 1965). William M. Cruickshank (1972, p. 384), referring to the well-recognized relationships between neurological status, perceptual-motor skills, and learning disabilities, states the basic rationale in these terms:

I would like to suggest . . . that, irrespective of the presence or absence of diagnosed neurological dysfunction, learning disabilities are essentially and almost always the result of perceptual problems based on the neurological system . . . . Perception and perceptual dysfunction in relation to a motor response to a stimulus, perceived or mis-perceived, are the bases to the great majority if not all of the learning problems of these children.
Various aspects of psychological functioning are adversely affected by neurological pathology. The general relationships involved are very well-stated by Freedman, Kaplan, and Sadock (1972, p.175) in a recent medical (psychiatric) text:

Disease or injury at the higher levels of the central nervous system is likely to be reflected in disturbances in mentation, feeling, and conduct. It is this fundamental fact that makes behavioral assessment a necessary part of clinical neurological evaluation, particularly when the question of disease involving the cerebral hemispheres has been raised.

To a considerable degree, the aspects of behavior sampled by clinical observation and by neuropsychological tests are the same--for example, speed of response, level of comprehension, use of language--but the tests assess these aspects of behavior with greater reliability and precision. The tests go on to sample other aspects of behavior, such as visual memory and psychomotor skill, that are not readily elicited in the general examination. Hence, neuropsychological tests both validate the impressionistic findings of the general clinical examination and provide additional information about other aspects of intellect and personality."

Clearly, CNS damage or dysfunction--a biological variable--has certain behavioral (psychological) consequences, one of which is measurable visual-motor or perceptual malfunction (Benton, 1971).

It is therefore possible in many cases to diagnose the former through the latter. In all such cases, the latent biological state or process--neurological integrity--is inferred through its manifest behavioral consequences. Naturally enough, this process is not entirely error-free, and all such diagnoses break down to probability statements.

The Koppitz (1964) method of analysis was utilized to assess neurological status in the sample of children tested. Neurological
integrity, as conceived in terms of Bender Gestalt performance parameters, is assumed to vary along a measurable continuum approximating the normal curve in form. Neurological deficit has reference to a performance region or sector of this curve which is well above the point of central tendency. The basic indicators of CNS damage or dysfunction involve the following two elements (Koppitz 1964).

1. A visual-motor developmental (D) score--a measure of error frequency--which is one or more standard deviations (84th percentile) above the mean level of performance characterizing groups of children at any given age. There is an inverse relationship between the magnitude of the D score and the actual integrity of visual-motor functioning.

2. The presence of several statistically significant (.05 level) or highly significant (.01 level) (sic.) errors or indicators of brain injury--that is, two or more of the error types listed by Koppitz (1964, p. 189) in her test manual. These include such errors as figure rotations, perservation, angulation difficulties, failure to integrate the component parts of a figure, the conversion of dots to circles, and so forth.

These two factors--the high or extreme visual-motor D score in conjunction with the presence of several statistically significant errors indicative of neurological pathology--were taken to support the
diagnosis of CNS damage or dysfunction wherever they appeared in a
given test protocol. The absence of such factors is presumed to
support the diagnosis of neurological normalcy. For the most part,
the method is entirely objective and diagnoses of neurological
pathology based upon it are known to correlate reasonably well with
medical or laboratory data. Diagnostic false positives and false
negatives, however, do occur although it is difficult to determine the
exact frequency of such diagnostic problems (misses) on the basis of
existing empirical data.

There is considerable evidence that performance on the Bender
Gestalt is related to neurological status or to various correlates of
CNS damage or dysfunction, especially perceptual-motor malfunction
and academic learning disabilities (Hain 1964; Koppitz 1964;
DeHirsch, Jansky, and Langford 1966; Hartledge 1966; Canter 1968;
Wagner and Murray 1969; Koppitz 1970; Wikler, Dixon, and Parker
summary statement is pertinent at this point:

In general, there is overwhelming evidence that the Bender
performance of diverse organically impaired groups, includ-
ing paretics, organic geriatric patients, and exogenous
mental defectives, can be successfully differentiated from
groups of comparable non-organic psychiatric patients
and from normals. This finding applies equally well to
child and adult Ss and seems independent of the specific
method of Bender evaluation utilized. Patients with polio-
myelitis and idiopathic epilepsy may very well represent
exceptions to these findings.
While there is some negative evidence (Schulman, Kasper, and Thorene 1965), the bulk of the data clearly indicates that the Bender Gestalt is a very useful diagnostic technique for the assessment of neurological status. Typically, various psychological tests—including the Bender Gestalt—will correctly diagnose neurological status in from 77 to 90 percent of the cases (Levine and Feirstein 1972). The technique is also parsimonious. Lacks, Colbert, Harrow, and Levine (1970) have recently demonstrated that the Bender Gestalt is as effective a screening device for organicity as is the more lengthy Halstead-Reitan battery.

Klatskin, McNamear, Shaffer, and Pincus (1972) report a clear relationship between the conventional neurological examination and psychological testing involving the Wechsler Intelligence Scale for Children and the Bender Gestalt when both methods of assessment are employed in the case of children suspected of minimal CNS damage or dysfunction. Their results suggest that neurological disorders may give rise to a multiplicity of intellectual and perceptual-motor problems, some of which are clearly apparent when psychological testing procedures are employed, whereas others are revealed by the neurological examination, and that both methods of assessment appear to complement one another and are equally efficacious from a differential diagnostic point of view. Kenny and Clemmens (1971), however, report that there is little relationship...
between the findings of medical, neurological, and electroencephalog-"graphic methods of assessment and learning disabilities in the case of children presumed to be characterized by minimal neurological pathology. Interestingly enough, however, the presenting symptomatology and the results of a battery of psychological tests, among them the Bender Gestalt, were indicated to be strongly related to such learning problems. Their conclusions are highly pertinent to this general discussion (Kenny and Clemmens 1971, pp. 276-277):

The current study indicates that the children referred for a "complete evaluation" in a medical setting are at high risk for learning problems. As a whole, the group stands at the fourteenth percentile in intelligence. The Bender Gestalt findings also indicate that the group has a high risk for learning problems. On the face of this evidence, these children require extraordinary educational attention and techniques . . . .

The diagnostic evaluation of children with learning disabilities has varied from one center to another, and in the extreme has included an elaborate and time-consuming sequence of consultations and investigations. The approach that has been advocated seems to overemphasize the medical aspects of the problem. The results of the present study indicate that extensive medical evaluations are relatively unrewarding. . . .

The final diagnosis is more contingent upon symptomatology and the results of psychological studies than any specific medical, neurologic or electroencephalographic findings, since no significant commonality results from these findings.

In the present investigation, all Bender Gestalt D scores were converted to standard scores (z values) and related to the following continuum of neurological status:

1. Very superior neurological integrity (z values of -2.00 or greater)

2. Superior neurological integrity (z values of -1.00 to -1.99)
3. Mildly superior neurological integrity (z values of -.67 to .99)

4. Normal neurological integrity (z values of .00 to +/- .66)

5. Mild neurological immaturity or visual-motor developmental lag (z values of .67 to .99)

6. Minimal CNS damage or dysfunction (z values of 1.00 to 1.99)

7. Serious CNS damage or dysfunction (z values of 2.00 or greater)

The continuum is broad enough to encompass the full range of neurological integrity and in principle is capable of assessing neurological normalcy as well as positive or negative deviation. The cutting points, which are largely arbitrary, are based on conventional psychometric or statistical criteria involving quartiles and standard deviations units.

The continuum specified attempts to make a statistical differentiation between minimal and serious neurological pathology. Some such distinction as this must be made. CNS damage or dysfunction is known to vary according to degree. A similar distinction, although frequently non-specific, is repeatedly suggested in the literature (Clements 1966; Johnson and Myklebust 1967). Kawi and Pasamanick (1959, p. 59), for example, refer to a "continuum of reproductive casualty," which is in essence a continuum of severity of neurological deficit:

A continuum of reproductive casualty is postulated, extending from death--abortion, stillbirth, and neonatal--through a descending gradient of brain damage manifested in
neuropsychiatric disorders. That the significance of the relationships between the prenatal, paranatal, and neonatal complications and these neuropsychiatric disorders, namely, cerebral palsy, epilepsy, mental deficiency, behavioral disorders, and now reading retardation, makes up a descending series with the more significant relationships first in the list above, appears reasonable since certainly reading disability is a much more subtle condition and more subject to environmental influences than cerebral palsy or epilepsy.

It may well be that the cutting points specified above are not entirely satisfactory. If future research indicates that indeed this is the case, they should be discarded and new cutting points substituted. In any case, it is the writer's contention that minimal and serious CNS damage or dysfunction will eventually have to be conceptualized quantitatively. A clinical or intuitive approach will simply not suffice indefinitely.

F. The Measure of Socioeconomic Status

A social class refers to a category or aggregation of people within a system of social stratification who have similar socioeconomic status relative to other groups of people in the community (Svalastoga 1964; Beteille 1969; Heller 1969). The individuals and families representing a given social class position are relatively homogeneous in terms of educational level, occupational status, and prestige. Those who are classified in the same social class are assumed to have roughly comparable "life chances"—that is, they have a similar probability of attaining, or not attaining, certain culturally valued
goals such as good health, a certain level of income, a given amount of education, satisfactory living and working conditions, and so forth as suggested by Max Weber (Gerth and Mills 1946). Members of the various social classes are assumed to have differential access to rewards in all social institutions— including the medical care system (Rosen 1971; Lambert and Heston 1972).

In this study, the Hollingshead Two Factor Index of Social Position was employed as the measure of socioeconomic status (Hollingshead and Redlich 1958). This brief and objective sociological instrument requires only two items of information to assess social class position— namely, the precise occupation and educational status of the respondent or major breadwinner in the family. The technique is frequently utilized for research purposes in order to measure a given individual's social class position. Occupation is assumed to reflect the ability and power individuals exhibit as they perform the various maintenance functions in the social order. Education is assumed to reflect not simply acquired knowledge or achievement, but also cultural tastes, preferences, and so forth. The appropriate combination of these two factors by means of statistical techniques enables a researcher to determine the approximate social position of a given individual within the social stratification system. Occupation and education are ranked from high to low along a seven-point scale. These rankings are respectively multiplied by factor weights.
of 7 and 4. The resulting score is then assigned to a given position along a social class continuum represented by social classes I through V. The possible scores range from 11 to 77. Differences in individual scores within a particular range are ignored. Scores within the range are treated statistically as a single unit. A description of the technique is provided in Hollingshead and Redlich (1958) and in a study by Myers and Bean (1968). Full details concerning the utilization of the instrument are presented by Hollingshead (1957) in a brief manual. Some of the statistical data related to the construction of the Index, and to its reliability and validity, are presented by Hollingshead and Redlich (1958).

Individuals, or groups of individuals, who are presumed to be characterized by relatively specific patterns of behavior, values, attitudes, tastes or preferences, consumption habits, and various other identifiable sociocultural attributes—which are related to the factors of education and occupation built into the Index—represent the constituent population units referred to as "social classes." Various subcultural traits, more or less common to the members of a given class, are acquired or learned through the socialization processes peculiar to that region of the stratification system. According to Hollingshead and Redlich (1958), the various social classes differentiated by the instrument represent distinct subcultural elements. The five social class positions, and their respective
numerical ranges, are indicated below in Table 2.2.

<table>
<thead>
<tr>
<th>Social Class Position</th>
<th>Numerical Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I - The Upper Middle Class</td>
<td>11 - 17</td>
</tr>
<tr>
<td>Class II - The Middle Class</td>
<td>18 - 27</td>
</tr>
<tr>
<td>Class III - The Lower Middle Class</td>
<td>28 - 43</td>
</tr>
<tr>
<td>Class IV - The Working Class</td>
<td>44 - 60</td>
</tr>
<tr>
<td>Class V - The Lower Class</td>
<td>61 - 77</td>
</tr>
</tbody>
</table>

Hollingshead and Redlich (1958) have provided empirical data and a detailed descriptive account of the characteristics and behavior patterns of members of the various social classes in the New Haven, Connecticut area. They maintain that groups of individuals representing the various social class positions differ from one another in residential locus, education, occupation, life style, and in a complex of value, attitudinal, and behavioral patterns related to a variety of social and psychological phenomena. The following brief discussion will clarify some of the dynamics present.

The members of Class I typically represent the dominant business and professional interests in the community. They have the highest level of formal education, the most prestigious occupations, the highest income, and they typically live in the "best" residential areas of the city.
Class II is composed of a group status sensitive, upwardly mobile individuals. Nearly all of the adults in this social stratum have had some formal college or university training, and most of them are college graduates. Occupationally, the members of this class occupy a variety of managerial positions and the "lesser ranking professional" positions. They usually live in one-family homes in the "better" residential areas of the community. Protestantism is the dominant religion in the case of both Class I and II, and the bulk of these people derive from the British Isles or from northern Europe. Finally, these individuals are strongly oriented toward formal and informal group membership.

The typical Class III person is a high school graduate employed as an administrator or in some clerical position. A substantial percentage of these people own a small business. The level of family income is reduced. Generally, they reside in "good" residential areas. The Irish represent the dominant ethnic group. Proportionately more of these people derive from southern and eastern Europe. Catholicism is the dominant religion. Familial instability is more prevalent in this class compared with middle or upper-middle class groups.

The majority of the members representing Class IV, the working class, are semiskilled or skilled workers. Most have not gone beyond the 10th grade of high school. The level of income is
relatively low. These people are more likely to live in a multi-family dwelling, to live in the less desirable residential areas, and generally do not own their home. There is a good deal of ethnic group heterogeneity in Class IV. Many of these people are immigrants or the direct descendents of immigrant families deriving from eastern and southern Europe. Catholicism is again the dominant religion. The average family size is larger, conditions of crowding are more prevalent, and familial instability or disorganization is considerably more common.

Occupationally, the Class V adults are highly concentrated in the semiskilled or unskilled job positions. Most of these individuals have failed to complete the elementary grades of school. They generally reside in typical urban "slum" areas. If not immigrants themselves, they are the first, second, or third generation descendents of immigrants deriving from eastern and southern Europe. Catholicism is clearly the dominant religion. Family instability is very marked, and there is more evidence of various forms of psychopathology and "deviant behavior."

G. Ethnic Group

Ethnicity was assessed socially or subjectively--not genetically or formally--with the aid of the computerized print-out which specified the ethnic group of each child in the public school system. This is regarded as a rather primitive and only partially satisfactory
method of assessment. The method was employed because more
definitive techniques are not readily available. The focus of the
research was on two ethnic groups--blacks and whites.

An ethnic group refers to an aggregation of people who share a
commom cultural tradition with some sense of identity and which exists
as a subsociety within a larger social order (Tumin 1964). The members
of the group differ from the rest of the society with respect to
certain cultural characteristics—including perhaps language, custom,
religion, and so forth. Their way of life is patterned and socially
transmitted intergenerationally through time and across space.

There is apparently no universally agreed upon meaning of the
term ethnic group. Heller (1969) employs the term in a very broad
or general sense to refer to any group of people differentiated by
national origin, race, religion, or some combination of such attrib-
utes. Frequently, but certainly not inevitably, the term is employed
in reference to a minority group. It is often confused with race. The
terms race and ethnic group, however, are not entirely synonymous.
Race has stronger biological connotations than ethnic group
(Dobzhansky 1950; Baker 1974). Dunn and Dobzhansky (1952, p. 118)
define races as "... populations which differ in the frequencies of
some gene or genes." Ashley Montagu (1963, pp. 66-67) defines an
ethnic group as one of several varient populations which "... to-
gether comprise the species Homo Sapiens and which individually
maintain their differences, physical and cultural, by means of isolating mechanisms such as geographic and social barriers." Various ethnic groups may be observed in the case of any given "race."

Finally, it should be observed that ethnic groups, like races, may vary in the relative frequency of specific genes--or sets of genes--but in all probability the former are less genetically homogeneous than the latter.

Race is a biological concept. Ethnic group is largely socio-cultural in nature. In accordance with Montagu's (1963) suggestion, the term ethnic group is employed in preference to race both in order to avoid the perjorative implications of the latter and to emphasize the cultural, rather than the biological, dimensions of group differentiation.

Milton M. Gordon (1969) observes that the dynamics of ethnic group life, both internally and externally, constantly involves the interaction of social class and ethnic group forces. Gordon (1964) employs the term ethclass to conceptually unite both aspects of social reality. The ethclass is a subsociety formed by the intersection of social class and ethnic group. As Gordon (1964, p. 53) observes, with a person of identical social class position but deriving from a different ethnic group, "... one shares behavioral similarities but not a sense of peoplehood." Conversely, with a person of the same ethnic group but deriving from a different social class, both share the sense of
peoplehood but are behaviorally dissimilar. It is only when different people share the same ethnic group background and social class position that both of these criteria are met. Therefore, as Gordon indicates, the concepts of ethnicity and social class can be analytically separated, as they often are, but they may also be combined.

In short, it must be recognized that socialization processes characteristic of a given ethnic group may be relatively independent of various other socialization processes related to social class position. As suggested earlier, this may lead to inter-ethnic group heterogeneity in spite of social class homogeneity. However, in the case of some of the ethnic groups in American society—such as the blacks and Spanish Americans—ethnicity is closely related to reduced socioeconomic status (Pettigrew 1964; Pinkey 1969; Moore 1970) or, as Heller (1969) argues, to caste. At any rate, the important point to observe is that in-group socialization processes associated with social class, ethnic group membership, or both, may be central determining factors behind the behavioral phenomena observed in the case of these various groups. Social class position may vary within and between ethnic groups through time and across space, but in some cases intergenerationally transmitted cultural characteristics may be more closely related to ethnicity than to class.
CHAPTER III

RESULTS

A. Questionnaire Return Rate

The questionnaire, along with the introductory parental letter, was distributed to each family whose child was tested. Sixty-eight percent of the questionnaires (N=346) were returned before any follow-up letters were sent out to the parents. Another 4 percent (N=22) were returned after the first follow-up letter was sent. Finally, 4 percent (N=21) more were mailed in after the second follow-up letter. The total return rate was 76.6 percent. Table 3.1 indicates the questionnaire return rate at each of the schools and its variability by the socioeconomic and ethnic group composition of the schools. The lowest return rates were observed in the case of predominately inner-city black schools. The return rate varied from a low of 49 percent at one of the black schools (Angela) to a high of 94 percent at one of the parochial schools (St. Dominics). It should be observed that neither the first nor the second follow-up letters were employed at either of the Catholic schools. Only the first follow-up letter was employed at the remaining parochial school since at that time the second letter had not been developed. Both follow-up letters were consistently utilized only within the public schools, most of them of
**TABLE 3.1--The relationship of social class position and ethnicity to questionnaire return rate**

<table>
<thead>
<tr>
<th>Name of School</th>
<th>Sample Size</th>
<th>Predominant Socioeconomic Characteristic of School</th>
<th>Ethnic Group Composition</th>
<th>Questionnaire Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Original Return Rate</td>
</tr>
<tr>
<td>1. Our Redeemer</td>
<td>37</td>
<td>Working Class</td>
<td>37 (100%)</td>
<td>30</td>
</tr>
<tr>
<td>2. St. Jeans*</td>
<td>39</td>
<td>Working Class</td>
<td>33 (100%)</td>
<td>33</td>
</tr>
<tr>
<td>3. St. Dominics</td>
<td>17</td>
<td>Working Class</td>
<td>3 (18%)</td>
<td>16</td>
</tr>
<tr>
<td>4. Beach Park</td>
<td>42</td>
<td>Middle Class</td>
<td>42 (100%)</td>
<td>34</td>
</tr>
<tr>
<td>5. Cherry Park</td>
<td>69</td>
<td>Middle Class</td>
<td>67 (97%)</td>
<td>54</td>
</tr>
<tr>
<td>6. Hill</td>
<td>28</td>
<td>Working Class</td>
<td>28 (100%)</td>
<td>18</td>
</tr>
<tr>
<td>7. Snow Flake</td>
<td>24</td>
<td>Working Class</td>
<td>24 (100%)</td>
<td>16</td>
</tr>
<tr>
<td>8. Nelson</td>
<td>51</td>
<td>Working Class</td>
<td>41 (80%)</td>
<td>41</td>
</tr>
<tr>
<td>9. Marquette</td>
<td>53</td>
<td>Lower Class</td>
<td>52 (98%)</td>
<td>33</td>
</tr>
<tr>
<td>10. Hamilton</td>
<td>48</td>
<td>Lower Class</td>
<td>29 (60%)</td>
<td>27</td>
</tr>
</tbody>
</table>

*39 questionnaires were originally distributed at St. Jeans and 33 (85%) were returned. Testing was limited to these 33 children.
<table>
<thead>
<tr>
<th>Name of School</th>
<th>Sample Size</th>
<th>Predominant Socioeconomic Characteristic of School</th>
<th>Ethnic Group Composition</th>
<th>Questionnaire Data</th>
<th>Total Return Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Original Return Rate</td>
<td>After 1st Follow-up Letter</td>
</tr>
<tr>
<td>11. Angela</td>
<td>45</td>
<td>Lower Class</td>
<td></td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>12. Park</td>
<td>55</td>
<td>Lower Class</td>
<td></td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>Avenue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Frobel</td>
<td>6</td>
<td>Lower Class</td>
<td></td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
course being distributed to the schools characterized by the lowest questionnaire return rates.

B. Hypothesis One

The initial hypothesis asserts that the frequency of cases of CNS damage or dysfunction in children are inversely related with social class position. This hypothesis is well-supported by the obtained data.

The most direct way of testing the hypothesis is to draw Ss from all of the schools, regroup them according to social class position, and compare mean differences among them. Reasonably adequate data for such an analysis is available only in the case of white children. Unfortunately, the sub-sample of black children is drawn from families who are highly concentrated in the lower two social class positions. To a large extent, this is also true of the remaining children deriving from other ethnic group backgrounds. Sample sizes are very limited for these latter groups of children, and for this reason they are eliminated from all succeeding analyses. The data presented below in Table 3.2 represents a sample of white children (N=293) who are biologically (or naturally) related to their parents and who are chronologically 9-0 or older.
### TABLE 3.2--The relationship of Bender Gestalt scores and social class position of parents at the time of the child's birth

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Size</strong></td>
<td>25</td>
<td>36</td>
<td>67</td>
<td>114</td>
<td>51</td>
</tr>
<tr>
<td><strong>Mean BG Score</strong></td>
<td>1.6</td>
<td>1.8</td>
<td>1.7</td>
<td>2.2</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Standard Deviation</strong></td>
<td>1.4</td>
<td>1.7</td>
<td>1.9</td>
<td>1.9</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**ANOVA Summary Statistics**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>74,96748</td>
<td>4.00000</td>
<td>18.742</td>
<td>4.659**</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1158.42501</td>
<td>288.00000</td>
<td>4.022</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>1233.39249</td>
<td>292.00000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant at the .05 level
**Statistically significant at the .01 level

The reduced N value at social class position I (N=25) probably renders the descriptive statistics presented somewhat unreliable.

Employing a one-way analysis of variance (ANOVA) design to test the significance of mean differences observed, an F value of 4.66 is obtained. This is statistically significant at the .01 level.

The set of two-tailed t tests indicates that the mean of 3.2 observed in the case of Class V children differs significantly at the .01 level from the observed means in the case of Class I, Class II, Class III, and Class IV children. No other statistically significant differences are observed. Inspection of Table 3.2 indicates that the mean Bender

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Gestalt (BG) score—a measure of error frequency reflecting the level of neurological integrity—tends to increase progressively from Class I to Class V. The only exception to this generalization is in the case of the Class III mean (1.7), which is slightly lower than the Class II mean of 1.8. This small difference, however, is statistically insignificant. The summary ANOVA statistics are presented at the bottom of Table 3.2.

It should be explicitly recognized that the data presented in Table 3.2 is based on the social class position prevailing in the family at the time of the child’s birth. As indicated earlier, it is primarily at this point in the child's developmental cycle that various environmental forces would be expected to influence neurological integrity among diverse groups of children representing various social class positions. It was frequently observed during the data gathering phase of the study that at several individual schools, cases of CNS damage or dysfunction were not concentrated in the lower social class positions as originally hypothesized, perhaps because of the reduced sample sizes and consequent sample bias. In some cases, a higher prevalence of such problems was observed in the upper social class positions. In other instances, cases of neurological pathology was evenly distributed across the entire range of social class positions. In each case, however, when the distribution was plotted against the social class position prevailing in the household at the time of the
child's birth, the majority of cases of CNS damage or dysfunction were clearly concentrated in the lower social classes. It is clear that the reported prevalence figures vary to some degree depending upon the extent of upward and/or downward social mobility through time.

It is therefore interesting to observe that while this factor of social mobility may obscure the nature of the distribution in the case of small samples, it does not appear to do so in the case of a large sample based on data drawn from each of the individual schools. For example, when we conduct a second one-way ANOVA comparable to that reported above (Table 3.2)--considering, however, the social class position prevailing in the child's household at the present time--a similar picture emerges. The relevant data is indicated in Table 3.3, along with the ANOVA summary statistics. The observed F value for this ANOVA (5.61) again reaches significance at the .01 level, and the t test pattern of significant differences among the means is identical to that reported earlier. This suggests that the social class position of the family at the time of the child's birth is a reasonably adequate predictor of the social class position of the family nine or ten years later when the child is in school. This inference is, in fact, well supported by the data. Correlating the present social class position rating with the rating characterizing the child's family at birth, we observe a Pearson's r of .82.
TABLE 3.3--The relationship of Bender Gestalt scores and social class position of the parents at the present time

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>32</td>
<td>51</td>
<td>66</td>
<td>102</td>
<td>41</td>
</tr>
<tr>
<td>Mean BG Score</td>
<td>1.6</td>
<td>1.9</td>
<td>1.7</td>
<td>2.2</td>
<td>3.4</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.7</td>
<td>1.6</td>
<td>1.9</td>
<td>2.0</td>
<td>2.5</td>
</tr>
</tbody>
</table>

ANOVA Summary Statistics

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>89.33913</td>
<td>4.00000</td>
<td>22.3355</td>
<td>5.607**</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1143.32868</td>
<td>287.00000</td>
<td>3.984</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>1232.66780</td>
<td>291.00000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant at the .05 level
**Statistically significant at the .01 level

Table 3.4 is a frequency distribution indicating the relationship of neurological status and social class position at the time the child was born in the case of white (N=229). As indicated in Table 3.4, social class positions I and II have been combined because of the small N values (25 and 36 respectively). The evidence indicates that 13 percent of the Class I and II children exhibit a neurological handicap, 17 percent of the Class III children are neurologically impaired, 21 percent of the working class (Class IV) Ss are characterized by some CNS damage or dysfunction, and fully 35 percent of the Class V children exhibit such a problem. Typically, in white samples the
prevalence of minimal CNS pathology either approximates or exceeds the prevalence of serious neurological pathology.

**TABLE 3.4--Neurological status and social class position: whites**

<table>
<thead>
<tr>
<th>Neurological Status</th>
<th>Social Class Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I and II</td>
</tr>
<tr>
<td>Superior Neurological Integrity</td>
<td>16 (26%)</td>
</tr>
<tr>
<td>Normal Neurological Integrity</td>
<td>29 (48%)</td>
</tr>
<tr>
<td>Neurological Immaturity</td>
<td>8 (13%)</td>
</tr>
<tr>
<td>Minimal CNS Pathology</td>
<td>6 (10%)</td>
</tr>
<tr>
<td>Serious CNS Pathology</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Sample Size</td>
<td>61</td>
</tr>
</tbody>
</table>

Table 3.5 indicates the relationship of neurological status and social class position in the case of black Class IV and Class V children (N=65) at the time of birth. Unfortunately, it is not possible to determine the prevalence of CNS pathology among middle class blacks because of the failure to obtain a sufficiently large sample of such children. In fact, only six middle class black children were obtained in the entire sample. It is of interest to observe that in blacks, as contrasted with whites, cases of neurological pathology are highly concentrated in the lowest social class position. In black children, for example, 67 percent of all cases of CNS damage or dysfunction
are observed in Class V (Table 3.5). In whites, however, only 30 percent of the cases of neurological impairment are concentrated in Class V (Table 3.4). The data suggest that in white children cases of CNS pathology are more evenly distributed over the entire socioeconomic spectrum.

TABLE 3.5--Neurological status and social class position: blacks

<table>
<thead>
<tr>
<th>Neurological Status</th>
<th>Social Class Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV</td>
</tr>
<tr>
<td>Superior Neurological Integrity</td>
<td>2 (9%)</td>
</tr>
<tr>
<td>Normal Neurological Integrity</td>
<td>5 (24%)</td>
</tr>
<tr>
<td>Neurological Immaturity</td>
<td>2 (9%)</td>
</tr>
<tr>
<td>Minimal CNS Pathology</td>
<td>5 (24%)</td>
</tr>
<tr>
<td>Serious CNS Pathology</td>
<td>7 (33%)</td>
</tr>
<tr>
<td>Sample Size</td>
<td>21</td>
</tr>
</tbody>
</table>

Inspection of Table 3.1 indicates that the total sample (N=508) is composed of 360 white children, 117 black children, 30 Spanish American Ss, and 1 Oriental child. The questionnaire return rate varies by ethnicity. Relative to blacks and whites, for example, it is apparent that whereas only 55 percent of the black families returned their questionnaires, 83 percent of the white families did so. There is some possibility that the frequency of CNS pathology in both black and white children would differ between these two
components of the sample represented by those families who returned their questionnaire as compared to those families who did not. For example, it might be assumed that that portion of the sample who failed to return their questionnaire, in contrast to those who did return them, differed in socioeconomic status. If, as might be expected, the former were markedly lower in socioeconomic status relative to the latter, rates of CNS pathology may be higher among their children. The relevant data for whites (Table 3.6) and blacks (Table 3.7) is indicated below.

TABLE 3.6 -- Neurological status and questionnaire return rate: whites

<table>
<thead>
<tr>
<th>Neurological Status</th>
<th>Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Returned</td>
</tr>
<tr>
<td>Superior Neurological Integrity</td>
<td>72 (24%)</td>
</tr>
<tr>
<td>Normal Neurological Integrity</td>
<td>115 (38%)</td>
</tr>
<tr>
<td>Neurological Immaturity</td>
<td>49 (16%)</td>
</tr>
<tr>
<td>Minimal CNS Pathology</td>
<td>34 (11%)</td>
</tr>
<tr>
<td>Serious CNS Pathology</td>
<td>29 (10%)</td>
</tr>
<tr>
<td>Sample Size</td>
<td>299</td>
</tr>
</tbody>
</table>

Minimal differences between groups are observed in the case of both blacks and whites. Those differences that are apparent are in all probability a function of chance or perhaps sample bias resulting from the reduced sample size entailed by the data breakdown into various
TABLE 3.7--Neurological status and questionnaire return rate: blacks

<table>
<thead>
<tr>
<th>Neurological Status</th>
<th>Questionnaire</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Returned</td>
<td>Not Returned</td>
<td></td>
</tr>
<tr>
<td>Superior Neurological Integrity</td>
<td>4 (6%)</td>
<td>1 (2%)</td>
<td></td>
</tr>
<tr>
<td>Normal Neurological Integrity</td>
<td>18 (25%)</td>
<td>12 (26%)</td>
<td></td>
</tr>
<tr>
<td>Neurological Immaturity</td>
<td>7 (10%)</td>
<td>9 (20%)</td>
<td></td>
</tr>
<tr>
<td>Minimal CNS Pathology</td>
<td>14 (20%)</td>
<td>5 (11%)</td>
<td></td>
</tr>
<tr>
<td>Serious CNS Pathology</td>
<td>28 (39%)</td>
<td>19 (41%)</td>
<td></td>
</tr>
<tr>
<td>Sample Size</td>
<td>71</td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>

categories. Systematic comparison of the data contained in Tables 3.6 and 3.7 with Tables 3.4 and 3.5 will allow for the inspection of inter-ethnic group differences with and without information related to social class position.

C. Hypothesis Two

The second hypothesis asserts that there are ethnic group differences in the prevalence of CNS damage or dysfunction. The frequency of neurologically-based disorders is assumed to be higher among black children relative to white children of roughly comparable socioeconomic status.

Inspection of the data contained in the two frequency distributions, Tables 3.4 and 3.5, indicate not only class differences in the distribution of CNS pathology, but also strong inter-ethnic group
differences. It is apparent, for example, that whereas 21 percent of the white working class children appear to be neurologically handicapped, 57 percent of the working class blacks are similarly handicapped. Further, 35 percent of the white Class V children exhibit some CNS pathology in contrast to 63 percent of the Class V black children. It is important to observe that in the case of the blacks, the prevalence of serious CNS damage or dysfunction exceeds the prevalence of minimal CNS pathology. As indicated earlier, this contrasts markedly with the severity pattern of neurological impairment observed in the case of the white sub-sample. These varied observations indicate that not only is the prevalence of CNS pathology higher in minority group populations as compared with whites, but also that when a neurological disorder is observed in the case of any given child who is a member of such a group, the probability of its being severe—rather than minimal—is greater.

All of these inter-ethnic group comparisons are limited by the small number of Ss available in the various social class positions, but there is definitely reason to suggest that rates of CNS damage or dysfunction in children vary significantly by ethnicity even when social class position is roughly controlled. This point can be documented more adequately by means of an ANOVA design. The relevant data is presented below in Table 3.8.
TABLE 3.8–Bender Gestalt scores and ethnicity

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Whites</th>
<th>Blacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>165</td>
<td>62</td>
</tr>
<tr>
<td>Mean BG Score</td>
<td>2.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.2</td>
<td>2.9</td>
</tr>
</tbody>
</table>

ANOVA Summary Statistics

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>198.22968</td>
<td>2.00000</td>
<td>99.115</td>
<td>16.673**</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1438.61115</td>
<td>242.00000</td>
<td>5.945</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>1636.84081</td>
<td>244.00000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant at the .05 level
**Statistically significant at the .01 level

The data contained in Table 3.8 pertain to children drawn only from social class positions IV and V, as measured by the social class position prevailing in the household at the time of the child's birth. Further, all of the children were chronologically 9-0 or older and all of them were biologically (naturally) related to their parents.

The significance of the differences among the means contained in Table 3.8 was tested with a one-way ANOVA. The observed F value of 16.7 reached significance well beyond the .01 level, indicating that the mean of 2.5 representing the white children differed significantly from the mean of 4.5 observed in the case of the black children. The
evidence indicates the presence of more visual-motor malfunction among black children as compared to white children.

A two-way ANOVA design was employed to determine the relationship between performance on the Bender Gestalt and ethnicity and social class position simultaneously and to specify the extent of interaction (if any) between the two sources of variance. For this analysis there were 114 working class whites, 20 working class blacks, 51 Class V whites, and 42 Class V blacks. The usual controls for chronological age, social class effects, and parent-child relationship were applied. The obtained means are indicated below in Table 3.9, along with summary statistics.

**TABLE 3.9--Mean BG scores as related to ethnicity and social class position**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Social Class Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV</td>
</tr>
<tr>
<td>Whites</td>
<td>2.2</td>
</tr>
<tr>
<td>Blacks</td>
<td>4.2</td>
</tr>
</tbody>
</table>

**ANOVA Summary Statistics**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rows</td>
<td>119.56875</td>
<td>1.00000</td>
<td>119.56875</td>
<td>20.90161**</td>
</tr>
<tr>
<td>Columns</td>
<td>19.43417</td>
<td>1.00000</td>
<td>19.43417</td>
<td>3.39725</td>
</tr>
<tr>
<td>Interaction</td>
<td>3.19223</td>
<td>1.00000</td>
<td>3.19223</td>
<td>.55803</td>
</tr>
<tr>
<td>Within Cell</td>
<td>1275.68321</td>
<td>223.00000</td>
<td>5.72055</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1417.87836</td>
<td>226.00000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant at the .05 level
**Statistically significant at the .01 level
The observed F of 20.9 reached significance at well beyond the .01 level, indicating the main effects of ethnicity (Rows). The main effects of social class position in this restricted range of the continuum failed to reach statistical significance (F=3.4). Finally, the interaction term involving ethnicity and social class position (F=.6) also proved to be statistically insignificant.

The set of t test values indicated that the working class mean for the whites (2.2) differed significantly at the .05 level from the mean for the Class V whites (3.2)—in spite of the insignificant main effects for class—and at the .01 level from the means for blacks at both Class positions IV and V. Further, the Class V mean for the whites (3.2) differs significantly at the .01 level from the Class V mean for the blacks (4.6). No other significant differences are observed.

D. Summary

In summary, both hypotheses are well supported by the obtained data. However, the second hypothesis is more strongly supported than is the first—suggesting that ethnicity is the more salient variable.

In whites, neurological integrity—as indexed by Bender Gestalt performance parameters—tends to progressively decrease as one moves from the upper middle class to the lower class. There is a minor statistically irregularity in the middle region of the social class continuum which, however, is not statistically significant and does
not seriously obscure the above mentioned trend. In blacks, the data indicates the highest concentration of cases of CNS pathology in the lowest social class position with less neuropathy apparent at the working class level. Unfortunately, inadequate data are present with the blacks to test the distribution across all social class levels.

The differences in neurological integrity between ethnic groups is strong and consistent regardless of the presence of various controls, including a rough control for socioeconomic status.

E. Additional Data Analyses

In addition, a variety of other data are available which, while less closely related to the central research hypotheses, are pertinent to a broad range of factors known to be associated with neurological integrity. The most important data is briefly reviewed below.

1. The Spanish American Sub-Sample

It would be of interest to specify the frequency and pattern of cases of CNS damage or dysfunction in ethnic groups other than blacks or whites. Unfortunately, the sample of children obtained preclude a definitive analysis because of the failure to obtain many such children during the course of drawing random samples from various schools in the Grand Rapids area (Table 3.1). The demographic data reviewed earlier indicate that the great majority of the non-white population in Grand Rapids are represented by blacks. The second largest minority in the city is represented by Spanish American families.
There is some data available concerning Spanish American children, but it is very limited due to the small sample size (N=30) which is represented by a set of families whose children attended four different inner city schools surrounding the central business district. Because of the small sample size, it will be necessary to approach the data cautiously. Clearly, at best the data reported below represent nothing more or less than trends which will have to be cross validated with new and larger samples of children before much confidence can be placed in the results.

Nineteen out of thirty (63%) of the Spanish American families returned their questionnaires. Proportionately more of the Spanish American families (74%) are concentrated in Class V as compared with both black (62%) and white families (18%). This would suggest that the frequency of CNS pathology should be somewhat higher in Spanish American children as compared with black children, and considerably higher relative to white children. For the most part, this is exactly what is observed. Sixty-four percent of the Spanish American children exhibited CNS pathology as compared with 56 percent of the black children and 22 percent of the white children. These prevalence figures are based on the total sample of data available for all three ethnic groups (360 whites, 117 blacks, and 30 Spanish American Ss) regardless of social class position and the questionnaire data.

Moreover, in the case of both minority groups the frequency
of serious CNS pathology exceeds the frequency of minimal CNS damage or dysfunction, in contrast to the whites where the reverse observation is noted. In the case of the white sub-sample, 12 percent of the children tested exhibit minimal CNS pathology and 10 percent indicate more serious neuropathology. In the black sub-sample, 16 percent of the children appear to be characterized by minimal CNS pathology, and 40 percent of the children are more seriously impaired. Finally, in the case of the Spanish American sub-sample, 27 percent of the children are minimally impaired and 37% are seriously neurologically handicapped.

It should also be observed that in both minority groups cases of neurological damage or dysfunction are highly concentrated in the lowest social class position. In black children, for example, 67 percent of all cases of CNS pathology are observed in Class V, and in the Spanish American sub-sample of children 75 percent of such cases are concentrated in Class V. In whites, only 30% of the cases of CNS dysfunction are noted in Class V (Table 3.6). In white children, in contrast to minority group children, cases of CNS pathology are more evenly spread over the entire range of social class positions. Although fully 70 percent of all cases of neurological damage or dysfunction in whites are concentrated in the lowest two social class positions, it is clear that in both minority groups the concentration of neurological disorders in the lower region of the stratification system is consider-
ably more marked.

In many respects, the two minority groups are similar to one another in terms of both the prevalence and pattern of neurological pathology, and both differ markedly from the white sub-sample. This is also apparent when one compares inter-ethnic group mean Bender Gestalt score differences. The one-way ANOVA represented in Table 3.9, which compared black and white children in terms of Bender Gestalt performance parameters, also encompassed a small sample (N=18) of Spanish American children. The mean BG score for the latter is computed to be 4.0 (as compared with a mean of 4.2 for the entire sample of Spanish American Ss), and the standard deviation is 2.6. Analyzing the pattern of statistically significant differences with the two-tailed t test, it is apparent that the mean of 2.5 for the white sample differs at the .01 level from the means of both black and Spanish American Ss (4.5 and 4.0 respectively). The mean BG scores of the children in the two minority groups do not differ significantly from one another. It is of interest to observe that in a seriously disadvantaged caucasian group of children (represented by the Spanish American sub-sample), the prevalence of CNS pathology is as high (or somewhat higher) than in the case of blacks. Contrary to some of the earlier mentioned data inferences, this may suggest that the basic problem breaks down to social class (or poverty) factors that may vary in their seriousness from one ethnic group to another. On the other hand, there may be reason to assume that part of the differential
is a function of ethnically-based genotypic factors (perhaps in interaction with various environmental constraints).

2. Correlation and Regression Analyses

Aside from analysis of variance techniques, designed to exemplify the basic relationships specified in the two central research hypotheses, the data analysis entailed a 42 variable intercorrelation matrix (representing all of the bi-variate relationships of interest), the use of partial correlation techniques in selected cases to illuminate certain specific relationships, and a set of step-wise multiple regression analyses. The highlights of this data analysis are reported below.

The intercorrelation matrix involved the correlation of various BG test performance parameters with all of the different categories of data represented in the parental questionnaire and also with some academic achievement data provided by the personnel at the Center for Educational Studies. Most of the observed correlations are less than .40. An exception to this generalization is the intercorrelation of the two SES component scores (the occupational and educational rating) with each other and with the composite SES rating at the present time, when the child was born, in the mother's family when she was a small child, and with the maternal educational rating at the time of the child's birth. The correlations observed range from a low of .36 to a high of .97. Most of them are .60 or higher. Some of the remaining correlations more pertinent to the central research hypotheses are specified below.
Various modes of data analysis, many of which have already been indicated, suggest that the effects of ethnicity on BG scores are greater than are the effects of social class position. This is apparent if one inspects the various frequency distributions involving the relationship of neurological status to ethnicity and social class position. It is also suggested by the observation that in various ANOVA analyses the magnitude of the F values representing ethnicity typically exceed the F values corresponding to social class effects. Further, as indicated earlier in the case of the two-way ANOVA design involving the simultaneous effects of both class and ethnicity, only the main effects of ethnicity emerged at a statistically significant level.

Finally, the same inference is suggested by the observation that the correlation of ethnicity with the raw BG score is .33 in contrast to a correlation of .25 with the present social class position of the major breadwinner and .28 with the social class position characterizing the child's family at birth. However, as suggested above in connection with the analysis of the Spanish American data, there is reason to assume that class effects may be of substantial importance in various ethnic groups and that the two sources of variance overlap to some degree. In fact, the correlation of ethnicity with the present SES rating is .41 and with the SES rating prevailing in the household at the time of the child's birth it is .37.

When the effects of family size and SES level at the time of
the child's birth are partialled out, the correlation of ethnicity with
the raw BG score drops to .25. When the effects of family size and
ethnicity are partialled out, the correlation of the BG score with the
SES level prevailing in the household when the child was born
decreased to .17.

The series of step-wise multiple regression (R) analyses was
run in order to determine the extent to which BG scores could be pre-
dicted given data pertaining to various categories of demographic,
personal, and medical information. The results were instructive.
Combining present social class position with ethnicity in a regression
equation to predict raw BG scores, an R of .36 is observed. Utilizing
the social class position of the major breadwinner at the time of the
child's birth, the R value is increased slightly to .37 (which explains
only about 14 percent of the variance in the dependent variable).
Utilizing a large number of variables in a series of step-wise regres-
sion analyses--including family size, the ordinal position of the child,
handedness, maternal age at birth, pregnancy or birth complications,
esthnicity, the present social class position of the family, the social
class position of the family approximately nine or ten years ago when
the child was born, and the social class position prevailing in the
mother's family when she was a small child--the various R values
obtained ranged from .29 to .38. Obviously, a simple regression
equation--containing only the variables of ethnicity and social class

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position--predicts nearly as well as a set of considerably more complex equations involving a host of variables.

3. BG Scores and Academic Achievement

As indicated earlier, staff personnel at the Center for Educational Studies were able to provide some objective educational assessment data for a portion (N=318) of the sample of children tested with the BG. This allows for some determination of the extent to which neurological status, as measured by the BG, is related to academic achievement, as measured by the State of Michigan Assessment Test (SMAT). The data analysis reported below pertains to a portion of achievement data available which, in addition to individual scores on the SMAT, included group assessment data involving the Stanford Achievement Test.

The SMAT is composed of four subtests--Vocabulary, Reading, Mechanics of Written English, and Math--and also gives rise to a general or composite achievement score. The test is administered annually to all fourth and seventh grade children in the regular classroom in the public school system. Test results are reported in terms of standard scores (with a mean of 50 and a standard deviation of 10), raw scores (number correct and number wrong), and percentiles. In the sample of children tested with the BG, the fifth graders (N=148) had been tested with the SMAT during the previous year (1970-71). The fourth grade children (N=170) were tested at approximately the
same time that the BG data was gathered (during the school year 1971-72).

The correlation matrix specified below (Table 3.10), indicates the relationship between all of the SMAT sub-tests, the BG, and the demographic variables of ethnicity and social class position measured at three points in time.

TABLE 3.10--Intercorrelation matrix involving the BG, ethnicity, SES level, and academic achievement

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<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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<td>---</td>
<td>.33</td>
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<td>.35</td>
<td>.49</td>
<td>.42</td>
<td>.42</td>
<td>---</td>
</tr>
</tbody>
</table>

Identification of Variables:
1. BG Raw Score (Errors) 7. Ethnic Group
2. Vocabulary Test (Errors) 8. Present SES Level
3. Reading Test (Errors) 9. SES Level at Time of Child's Birth
4. Written English Test (Errors) 10. Mother's SES Level During Her Childhood
5. Math (Errors)
6. Composite Achievement (Standard Scores)

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The correlation of the BG with the various SMAT sub-tests and with the measure of composite achievement range from .22 to -.37. It is significant that the demographic variables--especially ethnicity and SES level measured at the present time and at the time of the child's birth--correlate higher with the various measures of achievement (especially with the composite achievement score) than does the BG. The various sub-tests of the SMAT are highly intercorrelated with one another, and all of them correlate highly with the composite achievement score. In general, however, this is less true of the Vocabulary sub-test, which is less closely related to any of the measures of academic achievement. It is also clear in Table 3.10 that the present SES level prevailing in the family is highly correlated with the SES level characterizing the home at the time of the child's birth. Neither of these estimates of SES, however, are strongly related to the SES level prevailing in the mother's home when she was a child.

There is a relationship between neurological status and academic achievement. For purposes of this analysis, the data available for both black and white Ss on the measure of composite (general) academic achievement was utilized. Academic underachievement was defined as a level of performance on the composite measure which fell at or below the 25th percentile. Data were available for 253 white Ss and 76 black Ss (N=329). The results are indicated below in Table 3.11.
TABLE 3.11--Neurological status and academic underachievement

<table>
<thead>
<tr>
<th>Neurological Status</th>
<th>Academic Underachievement</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whites</td>
<td>Absolute No.</td>
<td>Percentage</td>
</tr>
<tr>
<td>Superior Neurological Integrity</td>
<td>6</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Normal Neurological Integrity</td>
<td>14</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Neurological Immaturity</td>
<td>13</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Minimal CNS Pathology</td>
<td>13</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Serious CNS Pathology</td>
<td>7</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

The data analysis indicates that the prevalence of academic underachievement, as defined above, clearly varies by ethnic group membership. Fifty three of the white children are academic underachievers, and 46 of the black children are similarly classified. That is, whereas only 20 percent of the white Ss exhibit evidence of academic underachievement, fully 60 percent of the black children do so. In both ethnic groups the majority of the academic underachievers exhibit evidence of some neurological problem (either neurological immaturity, minimal CNS pathology, or severe CNS pathology). Neurological status appears to be more closely related to academic underachievement in the case of blacks as compared to
whites. Fifty nine percent of the underachieving black children exhibit either a mild or a serious neurological handicap, whereas only 38 percent of the white Ss are neurologically impaired. Further, in blacks most of the cases of CNS pathology are of the severe variety. In whites, however, minimal CNS pathology is more prevalent. If we include the neurological immaturity category with the minimal and severe cases of CNS pathology, neurological problems appear to be associated with 63 percent of the cases of underachievement in white Ss and with 70 percent of the cases of underachievement in the black children.

Insufficient data were available (N=12) in the case of the Spanish American children to run a comparable analysis. It is notable, however, that 7 out of 10 (70%) of the low achieving children evidence some CNS pathology (5 of them severe and 2 minimal). One S exhibited neurological immaturity, one was neurologically normal, and one appeared to be neurologically superior. Only two Spanish American children out of twelve appear not to be characterized by underachievement.

4. BG Performance and Other Variables

Maternal education proved to be significantly related to BG test performance in white children. In the central analysis, involving a one-way ANOVA, the white sample of women (N=275), was divided into a high education group—representing women who had
obtained from one to four years of college (N=87)---and a medium education group---represented by women who had completed the tenth through the twelfth grades of school (N=188). The mean BG scores for these two groups were 1.7 and 2.3 respectively, and the difference was significant at the .05 level. In a second one-way ANOVA design, a small group of low education women (N=17)---those who had completed nine or less years of formal education---was added. The children representing this group of women produced a mean BG error score of 3.1, although this was not significantly different from the observed means in the case of the high and medium education groups. The evidence suggests rather clearly that the lower the level of maternal education, one measure of SES, the lower the level of neurological integrity on the part of these women's children.

According to several authors (Myers and Hammill 1969; Lerner 1971), various symptoms of minimal brain damage or dysfunction are considerably more prevalent in males than in females. The obtained data, however, will not support this. Sex differences on the BG are not apparent in the case of either black or white children. Further, they fail to emerge in a one-way ANOVA involving a combined sample of white and non-white children (the non-whites involving both black and Spanish American Ss). Finally, there is no evidence of sex differences in a two-way ANOVA designed to specify the contributions of ethnicity, sex, and the interaction of
the two. Only the main effects for ethnicity reach statistical significance (F=71). The F value for sex (0.9) and the interaction of sex and ethnicity (F=.5) fail to even approximate significance. Sex differences involving visual-motor functioning clearly are not apparent, an observation consistent with data reported in the Koppitz (1964) test manual.

The time required to execute the BG was significantly related to error frequency in the case of whites, blacks, and a combined sample (0.01). In all cases, children completing the BG rapidly (4 minutes or less) produced more errors than children requiring an average (4 to 7 minutes) amount of time or a considerably longer period of time (7 minutes or longer).

Left handed black and white children produce more errors on the BG than do right handed children— an observation consistent with Orton's (1928) theory of cerebral dominance (Myers and Hammill 1969)— although the differences fail to reach statistical significance at conventional levels. Inconsistent differences are noted when the data for handedness and BG errors are analyzed by social class position in the case of whites and a combined white and non-white sample.

Maternal age, ordinal position, and family size were not significantly related to BG test performance in the case of whites or non-whites. The effects of religion (Protestantism vs. Catholicism)
were insignificant in the case of a sample of white working class children (N=111).

Reported complications of pregnancy, labor and delivery in whites were not significantly related to BG test performance, although the observed differences were in the expected direction. The mean BG score was 2.5 in a group of white children whose mothers reported complications (N=50), and 2.1 in a group whose mothers did not report complications (N=243). A similar one-way ANOVA was obtained with a second group composed of both whites and non-whites (blacks and Spanish American Ss) with similar results. A mean BG score of 3.0 is observed in the case of women reported complication (N=66). The error frequency drops to 2.6 in women who fail to report such complications (N=314). The observed F value of 1.44 is not significant. However, there is reason to assume that there is a difference between the "true" prevalence of pregnancy and birth complications and "reported" complications and, hence, a strong possibility that complications have been under-reported in the case of disadvantaged women (Mechanic 1968). Perhaps for this reason the observed data is not consistent with considerable medical evidence which involves the recording of various complications by qualified medical personnel at the time of the child's birth. The data should therefore be approached with extreme caution.
5. Summary

In summary, the additional data analysis indicate a number of points. To begin with, the frequency of CNS pathology in Spanish American Ss appears to be as high as the frequency observed in the case of black children. In both minority groups the prevalence of CNS damage or dysfunction considerably exceeds the prevalence level observed in white children of roughly comparable SES level. Further, the frequency of severe CNS pathology is greater than the frequency of minimal pathology in the case of both black and Spanish American children. In whites, the opposite pattern of severity is observed.

An intercorrelation matrix specifying the relationship of several variables was obtained, and a series of step-wise multiple regression equations were calculated. It is apparent that knowledge of various demographic, personal, and medical items of information can be utilized to predict BG scores with only moderate accuracy.

The evidence indicates that efforts to predict the level of academic achievement with the BG in specific (individual) cases is seriously limited, although prediction at the group level is considerably better. At the individual level, the BG is most likely to make its central contribution within the context of a battery of predictive devices rather than in isolation (DeHirsch, Jansky, and Langford, 1966). All of the component sub-test scores of the SMAT are highly

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intercorrelated and related to the composite achievement score (perhaps indicating the presence of a general factor that is highly related to all of the component sub-test scores), although this appears to be less true of the Vocabulary sub-test. Neurological status appears to be related to the level of academic achievement in both black and white children.

Sex differences in visual-motor functional status fail to emerge, contrary to suggestions in the technical literature. Maternal education is highly related to children's performance on the BG. A variety of other variables—including handedness, maternal age, ordinal position, family size, and reported complications of pregnancy, labor and delivery—are not significantly related to BG performance. Time required to execute the BG figures, however, did reach statistical significance.
CHAPTER IV

DISCUSSION

Theoretical Considerations

The original hypotheses are well-supported by the obtained data. Cases of neurological pathology vary according to ethnic group membership, and they are highly concentrated in the socially disadvantaged sectors of the population. This fact may be of some theoretical significance.

It may be assumed that the ecological distribution of CNS pathology--representing a significant social problem in its own right--is intimately related with a host of other social problems including some forms of academic underachievement, mental retardation, serious psychopathology (such as sociopathy and schizophrenia), and perhaps conventional crime and delinquency. The interpretation of the causal factors behind the distribution, however, is considerably more ambiguous.

A. Some Competing Considerations

There are several competing theoretical explanations that may, at least in part, account for the reported distribution of CNS pathology. These include certain cultural factors, examiner effects, chance, and
errors of measurement.

1. Cultural Factors

The field of anthropology has exhibited a long-standing interest in perceptual phenomena. The anthropological interest was apparent by the turn of the century with the work of W. H. R. Rivers, whose studies involved the Murray Islanders, a Papuan group in New Guinea, various groups of English subjects, and a group of subjects residing in the Nilgiri Hills of southern India (Segall, Campbell and Herskovits 1966; Langness and Gladwin 1972). The studies conducted by Rivers dealt with a wide variety of perceptual data, including color perception and inter-cultural susceptibility to optical illusions.

The anthropological perspective assumes that certain individual (psychological) processes, among them perception, are critically dependent upon various sociocultural events or processes including the level of technology, symbolic or linguistic factors, social change, various ecological factors, and inter-culturally transmitted values, beliefs, customs, attitudes, and "world views" (Hallowell 1951; Tyler 1969; Cole and Bruner 1971). Basically, perception is in large part assumed to be a function of differential socialization in the family, in the peer group, or in the society at large. This process is assumed to occur at both the inter- and intra-generational levels. Perception is largely a learned process which is contingent on the shared experiences of individuals in a group context, and it therefore varies as a
function of cultural learning or acquisition, expectation, set, style and experience. Hallowell (1951, p. 167) concludes that:

... the overt behavior and the meaningful content of the experience of the human being is demonstrably related to the traditional cultural attributes of a group, to the socially transmitted culture patterns that distinguish one society from another. What becomes perceptually significant to the eingestellt human organism cannot be considered apart from a continuum that views the human individual as an adjusting organism, motivated, goal-directed, and psychologically structured as a functioning unit in a socio-cultural system.

Hallowell's research and experience among the Ojibwa Indians strongly suggests that the perception of women as sexual or non-sexual objects, the group beliefs in non-material or "spiritual" entities, the perception of animals and food, and the perception of cannibal giants or monsters--the widigo--all appear to result from differential socialization and cultural imperative which are intrinsic to that process. He argues that perception is related to personality formation and to a whole complex of personal needs which, in turn, selectively influence it. Finally, echoing a Durkheimian point of view, Hallowell maintains that perception is functional at both the individual and group levels and that it contributes to group solidarity.

Glick's (1964) research and his associated methodology, which he refers to as ethnoscience, indicate that cultural forces--particularly linguistic factors--determine the perception of categories and relationships. His studies were carried out among the Gimi of the eastern highlands of New Guinea. Glick's (1967) work represents an attempt

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to strike a balance between ethnology and ethnosience—between the cultural concept of "universal categories" and the "new ethnography" which has argued that ethnographic categories must of necessity be derived indigenously and that they must reflect the categories of the people studied without distortion. An interesting example of Glick's methodology is represented by the recent medical anthropological research reported by Horacio Fabrega (Fabrega 1972; Fabrega and Manning 1973). Glick's concepts and research is a logical extension of Conklin's (1955) earlier work. Conklin observes that color perception—in terms of Western perceptual categories—is far from a universal concept. In certain languages, such as that of the Hanunóo on Mindoro Island in the Philippines, there are in many cases no unitary terminological equivalents. His research demonstrates that what many Western observers regard as "color confusion" or a subtle perceptual problem results, in fact, from "... an inadequate knowledge of the internal structure of a color system and from a failure to distinguish sharply between sensory reception on the one hand and perceptual categorization on the other (Conklin 1955, p. 343)." Conklin's conclusions, in turn, are consistent with those of Vern F. Ray (1952), who has published an excellent methodological article dealing with the cross cultural study of human color perception. Ray (1952, p. 258) maintains that:

... the color patterning of man's visual world is not based upon psychological, physiological, or anatomical factors.
There is no such thing as a "natural" division of the spectrum. Each culture has taken the spectral continuum and has divided it into units on a quite arbitrary basis . . . . No color system derives from physiological limitations; no color system exploits fully the physiological sensitivity of the human being.

According to Beaglehole (1957), one of the central functions of culture is that it provides the members of a given sociocultural order with a set of workable ready-made solutions designed to cope with certain problems typically confronted by people during the course of their lives. These solutions are usually adaptive. At times, however, they may be maladaptive, particularly during phases of rapid social change. Within this theoretical framework, Beaglehole argues that the level and form of Aitataki thinking tends to be perceptual, rather than "abstract, " and that it more or less "fits" with the life styles and the range of problems encountered by South Pacific peoples (such as the Aitataki) at this time. Interestingly enough, he suggests that the Aitataki perceptual styles may differ significantly from those observed in Western societies.

Herskovits (1958) maintains that the concept of "cultural relativity" is applicable not only to the inter-cultural study of values, beliefs, ethics, and various patterns of behavior, but also to specific subcultural or enculturative experiences which shape or mold perceptual phenomena. Kluckhohn (1964) indicates that cultural relativity embodies the principle of contextualism. Basically, the concept is that any given item of thought, feeling, or behavior must initially be evaluated or
judged relative to its position in the unique structure of the cultural order in which it is enmeshed and in accordance with the particular value system prevailing in that culture. Carried to extremes, of course, the concept implies that cross cultural comparative assessment is difficult, if not impossible. However, the concept is rarely carried to such conceptual extremes.

Perhaps the most important review of the relevant literature and recent empirical study in this area is the inter-disciplinary research project of Segall, Campbell and Herskovits (1966). Their review of the literature, and the empirical data they provide, indicates rather strong support for the general theoretical proposition that cross cultural differences in perception exist in such varied areas as the perception of physiognomic differences, language and auditory perception, color perception, the perception of photographs, depth perception, susceptibility to optical illusions, and various other related perceptual phenomena.

It must be recognized that the anthropological approach to the area of perception is considerably more global than the approach traditionally represented by experimental psychologists. It is clear that there is no definition of perception that is entirely satisfactory to all social and biological scientists. Perhaps the most inclusive definition of perception conceives of it as a complex psychological or cognitive process, with past or present sensory data at its core, which involves
the recognition, discrimination, and interpretation of various classes of internal and external stimulation which are articulated with various affective and motivational states, value and attitudinal phenomena, and certain categories of past experience (Boring 1957; English and English 1958; Hallowell 1951).

Approaching the area from an anthropological perspective, it might be argued that acquired or learned perceptual-motor styles or modes of performance, culturally-based in large measure, account for the reported differences between ethnic groups and social classes on the Bender Gestalt. That is, the empirical differences reported earlier in Chapter III do not result simply from inter-class or ethnic group differences in neurological integrity, but reflect in part the operation of experiential or sociocultural learning processes. Problems such as these are known to complicate the interpretation of certain personality or projective tests such as the Rorschach Ink Blot Test (Riessman, Cohen, and Pearl 1964). For example, Joseph and Murray (1951) employed the Bender Gestalt, among other instruments, in their study of 200 Saipan Island children. The test protocols were independently analyzed by the original author of the test, Dr. Lauretta Bender, who observed a number of serious distortions and concluded the following (Joseph and Murray 1951, p. 142):

In clinical studies among adult Americans, these evidences of fluidity, plasticity, and especially of disorientation on the background have been found characteristically in so-called confusional states. These have been described by Schilder
as being manifested by "perplexity which is the correlate of inadequate comprehension of the environment with the additional symptom of dissatisfaction with the inadequacy. In our culture these states occur characteristically in all forms of intoxication and occasionally with organic disease of the brain or in the functional psychoses. In the Saipanese, Gestalt patterns corresponding to those found in confusional states appear to represent norms.

Langness and Gladwin (1972), however, observe that the empirical data may reflect socioculturally-based differences in perceptual organization—not necessarily a toxic condition, psychoticism, CNS pathology or any other deviation common to comparable parameters of test performance in Western societies. Unfortunately the text fails to specify independent evidence related to neurological status or the various environmental factors—such as nutritional history, health factors, and medical care—which may be expected to affect neurological integrity in cross cultural samples (Wallace 1972). It is abundantly clear that the various conceptual issues involved cannot be clarified or resolved unless and until neurological status is controlled and the experiential or sociocultural factors systematically varied and vice versa. It must be recognized that there is considerable public health data indicating that various conditions that may be related to neonatal neurological status (Kawi and Pasamanick 1959)—including maternal and infant mortality, perinatal mortality, prematurity, and pregnancy outcome—vary through time and regionally between and within non-industrial and industrial societies (Mechanic 1968; Demographic Yearbook 1969; Birch and Gussow 1970; Naeye, Blanc, and Paul 1973).
In all probability, these temporal and spatial differences in rates of physical pathology are a complex function of a set of interrelated social forces which vary through time including nutritional factors, collective levels of formal education, the state of scientific medical and industrial technology, and a host of sociocultural factors related to ethnicity and social class position which, directly or indirectly, affect maternal or neonatal health status, medical care, living conditions, and childrearing practices. The social class and inter-ethnic group differences observed in industrialized nations are, in all probability, similar to those observed at the international level and, in essence, reflect the operation of the same constellation of interacting environmental factors responsible for neurological differentiation referred to repeatedly throughout the course of this dissertation.

Aside from the distinct possibility that experiential or cultural variables may be determining factors affecting the performance of children on such techniques as the Bender Gestalt--regardless of or in addition to neurological status--a related argument is that the standardization of the Bender Gestalt, like other educational and psychological tests, is culturally biased in that it is based partly, if not exclusively, on uncontrolled factors involving ethnicity and socioeconomic status and is oriented toward white, middle class expectations and standards of performance (Anastasia 1969; Hurley 1969; Williams 1970a; Williams 1970b; Jorgensen 1973). If these various factors are not
sufficiently controlled for, there is a definite possibility of inappropriate labeling or mis-diagnosis as demonstrated by Jane R. Mercer (1973) in her recent study of mentally retarded children.

It is probably true that the standardization of the Bender Gestalt, not to mention other assessment devices, could be improved. It must be recognized, however, that the Bender Gestalt has been subjected to continued scientific study since its inception over three decades ago, and there is strong general consensus that the technique is sensitive to neurological status in the case of both children and adults (Tolor and Schulberg 1963; Koppitz 1964)---an observation documented in detail in Chapter II. Further, it is true that sociocultural learning experiences can differentially influence various forms of perception (Segall, Campbell and Herskovits 1966). However, there is no conclusive empirical evidence that the specific types of perceptual-motor processes measured by the Bender Gestalt simply reflect culturally-based learning experiences and not neurological status. The types of scorable errors observed in the case of presumably neurologically-impaired children---rotations, figural distortions, perseveration, angulation difficulties, and so forth---are known to be statistically significant indicators of brain damage or dysfunction. It may reasonably be presumed that, in fact, they are indicators of something other than neurological status---such as emotional maladjustment, fatigue, motivational phenomena, set, expectation or cultural learning---but at
the present time clear empirical data supporting such inferences are not available. From all indications, the most parsimonious interpretation concerning the reasons why a given child behaves on the Bender Gestalt as if he or she were neurologically handicapped is, in fact, that such a child is characterized by some neurological disorder.

2. Examiner Effects, Chance, and Errors of Measurement

This study involved individual testing by a white examiner interacting with socially disadvantaged black and Spanish American children and white children of variable socioeconomic status. With a host of inter-cultural differences existing between the examiner and the children he tested, perhaps coupled with certain expectancies on the part of the former relative to the latter which, subtly or not too subtly, may have conditioned the results obtained (Rosenthal and Jacobson 1968), there is reason to raise serious methodological questions. There is considerable evidence that various examiner, examinee, and situational influences may operate to systematically affect test results in the case of projective techniques, intelligence tests, and objective group tests (Anastasi 1968). Based on an extensive review of the literature, Anastasi (1968, p. 574) concludes with this observation:

The examples cited in this section illustrate the wide diversity of test-related factors that may affect test scores. In the majority of well-administered testing programs, the influence of these factors is negligible for practical purposes. Nevertheless, the skilled examiner is constantly on guard to detect the possible operation of such factors and to minimize their
influence. When circumstances do not permit the control of these conditions, the conclusions drawn from test performance should be qualified.

Settler (1973) has recently published a review article dealing with racial experimenter affects. Some of the evidence is contradictory. In some cases, the direction of the influence is positive and in others it is negative depending upon the task demands inherent in the situation, the age of the subject, and various other factors. It is clearly apparent that considerably more research is required to resolve some of the more critical issues facing the field. Generally speaking, however, the bulk of the evidence indicates that the race of the experimenter or examiner may systematically influence the performance characteristics of black children of variable age, as well as adults, when they are tested with a variety of perceptual-motor, cognitive, and decision-making tasks. Age appears to be a central variable mediating the observed effects in many of the studies. Unfortunately, there is little, if any, empirical evidence bearing on the question of examiner or situational influences on the Bender Gestalt. Nevertheless, an appropriate research design should demonstrate more sensitivity to the potential effects of these variables, perhaps by systemically varying situational and examiner characteristics with various attributes of large groups of examinees in order to ascertain experimentally the nature of such influences, if any, on Bender Gestalt performance parameters. There is reason to assume that these effects account for
some portion of the variance in the research results reported in this paper, although it is doubtful if their impact is statistically significant.

Chance and various other factors leading to measuremental error may also have contributed to the observed results to some unknown degree. However, in view of the fact that the empirical results reported have been replicated or cross validated by the writer several times—and in view of their logical consistency with a host of medical, psychological, sociological, and educational theory and data—it is unlikely that any of these factors have strongly influenced the results.

In addition to these various factors, it is necessary to consider the impact of genetic and environmental forces as determining factors behind neurological integrity.

B. Genetic Factors

Genetic factors undoubtedly affect both the structure and the function of the central nervous system and, hence, all of the varied cognitive and behavioral phenomena which are directly or indirectly related to neurological integrity (Sinnott, Dunn, and Dobzhansky 1958; Robinson and Robinson 1965; Guilford 1967; Glass 1968; Rosenthal 1970; Cancro 1971; Windchester 1971). It is a plausible assumption that in the case of man neurological status has been shaped through a long and continuous process of biological and cultural evolution (Handler 1970; Volpe 1970). There simply can be no doubt that genetic factors have played a critically important role in this progressive,
ongoing process (Woodburne 1967; Downs and Bleibtrue 1969). Perhaps therefore our theoretical concerns should begin with Dobzhansky's (1972, p. 530) dictum:

All bodily structures and functions, without exception, are products of heredity realized in some sequence of environments. So also are all forms of behavior, also without exception. Nothing can arise in any organism unless its potentiality is within the realm of possibilities of the genetic endowment. Lest I sound to you an extreme hereditarian, I hasten to add that the potentialities that are realized in a given sequence of environments are, especially in man, only a tiny fraction of the individual's total potentialities. If an individual with the same genotype would develop and be brought up in some different environment, he might develop quite differently.

There is data indicating that neurological integrity is directly conditioned by genotypic factors (Jensen, 1969; Humphreys 1971; Wender 1971). There is also evidence that neurological status is indirectly affected by genetic factors that influence obstetrical competence or pregnancy outcome. In some cases inheritance may affect neonatal birthweight and it may contribute to a host of complications of pregnancy, labor and delivery (Joffe 1969; Udry, Morris, Bauman, and Chase 1971). From a more general theoretical point of view, therefore, it might be maintained that genetic factors directly affect the neurological substrate of behavior or do so indirectly via their influence on maternal health or obstetrical competence, and that in all cases the genetic effect(s) interact with a host of environmental variables.
C. Environmental Factors

As suggested earlier, there is substantial evidence that the prevalence of CNS damage or dysfunction is determined by a broad spectrum of environmentally-based variables—most of which appear to be functionally related to reduced socioeconomic status and minority group membership—including unsanitary living conditions, poor housing, selective exposure to sources of food, air, and water pollution, high susceptibility to physical and mental pathology, rather extreme conditions of undernutrition and malnutrition, divergent childrearing practices and patterns of socialization, inadequate pre- and post-natal child care, pathogenic conditions of environmental stimulation, and perhaps certain value, attitudinal, and behavioral patterns on the part of socially disadvantaged females which are conducive to the induction of complications of pregnancy, labor and delivery (Scott, Illsley, and Biles 1956; Susser and Watson 1962; Birch 1967; Mechanic 1968; Drillien 1970; Ehrlich and Ehrlich 1970; Klein, Habicht, and Yarbrough 1971; Lengthening Shadows 1971).

Further, it seems apparent that several other more broad ranging social forces—including certain underlying demographic dynamics such as unchecked population expansion, large scale migration, and urbanization (population concentration)—may be intimately related to the ecological distribution of neurological pathology in that these forces may exert a strong influence on such factors as the
quality of living conditions, economic development, educational opportunities, the quality of race or ethnic group relations prevailing at the community level, the poverty-affluence continuum, the extent of environmental deterioration or pollution, the cost and availability of medical care, the level of ambient stimulation, nutritional factors, and the spread of sickness, illness or disease (Calhoun 1962; Taeuber 1964; Davis 1966; Duhl 1967; Disch 1970; Horton and Leslie 1970; Rosen 1971; Lambert and Heston 1972). Finally, it should be recognized that the ecological distribution of CNS damage or dysfunction is, in part, the product of a rather general set of social, political, and economic forces such as the status of inter-ethnic group relationships and the collective attitudes toward the poor and minority group members--one dimension of which involves racism or ethnocentricism--the power relations between various groups in the society at large, differential "life chances" characterizing various segments of the population, and economic cycles of employment and unemployment or patterned economic activity involving the prevailing wage levels and the presence or absence of various "fringe benefits" such as general medical and health, sickness, and accident insurance (Harrington 1962; Montague 1963; Svalastoga 1964; Clark 1965; Taeuber and Taeuber 1965; Lewis 1966; Segal 1966; Killian 1968; Moynihan 1969; Cohen 1970; Matza 1971; Bluestone 1972; Thomas and Sillen 1972).
D. A Theoretical Model

A specific theoretical system is proposed to encompass these varied observations. The system is interdisciplinary in nature and explicitly recognizes the primacy of social forces and their interaction with other biological and environmental factors. The theoretical scheme specified is designed to conceptualize the problems in terms of a series of biological, psychological, educational, sociological and anthropological variables. The model employed implies a determinative or causal chain of interlocking events or processes and is composed of a series of interrelated propositions which form a true system "... in the sense that determinate relations of interdependence exist within the complex of empirical phenomena (Parsons and Shils 1951, p. 5)." It is assumed that the empirical events represented by the theoretical propositions are causally linked in a series of antecedent and consequent conditions. One causal event is assumed to activate another which, in turn, triggers another, and so forth throughout the entire system. The interlocked chain of events specified is therefore assumed to be largely self-perpetual in operation unless and until it is modified in some fashion. It should be carefully observed, however, that by and large the data supporting the model is based on correlated relationships, a factor which should necessarily preclude the kind of causal inferences mentioned above until more definitive research data, hopefully of an experimental nature, are available.
At the present time it should be regarded as nothing more or less than a tentative conceptual scheme, the final utility and/or status of which is still quite uncertain.

The basic set of interrelated theoretical propositions--designed to account for the patterned distribution of CNS pathology across social class and ethnic group lines--is presented below:

A. Inter-class and inter-ethnic group value, attitudinal, behavioral, and experiential differentials on the part of the parental generation which are conducive to the induction of CNS pathology on the part of the filial generation. The events and processes in question may occur during the prenatal, the perinatal, or the postnatal phases of neurological development (a sociocultural variable).

B. The consequent induction of CNS pathology (a biological variable).

C. The emergence of perceptual-motor problems, psycholinguistic disabilities, intellectual deficits, affective and behavioral problems, and various other phenomena symptomatic of the underlying neurological deficit (a psychological variable).

D. The eventual onset of various kinds of academic "learning disabilities," such as reading problems, related to the neurological symptomatology (an educational variable).

E. Consequent academic underachievement (an educational variable).

F. The determination of reduced socioeconomic status consequent upon academic underachievement--largely by means of occupational determination, in the case of the male, and by means of marital selection, in the case of the female (a sociological variable).

G. The final induction of an emotional-motivational set, state, frame of mind, or "life style"--consequent upon progressive, continuous, or ongoing socialization in a given region or
sector of the social (class) structure or a specific ethnic group--conducive to the development of the values, the attitudes, the behavior, and the experiences associated with Factor A (a social psychological variable).

Diagrammatically, the theoretical model is presented below in Figure 4.1.

**FIGURE 4.1 Theoretical Model**

![Diagram of the theoretical model]

The form of the theoretical scheme is general, although its content is specific to the field of interest. It is possible to expand or contract the system simply by inserting new terms or by eliminating old ones. It will account for differential behavior between various socio-economic strata and/or ethnic groups, and it may be appropriate for the conceptualization of both emotional and physical "normalcy" and "abnormalcy." It is of course entirely arbitrary where one initiates the task of explanation in such a system. However, since the model is cross-generational--that is, since it relates events in the parental generation to
other events in the filial generation—it is convenient to begin the
explanation with Factor A, which refers to values, attitudes, behavior,
and experiences on the part of the parental generation which are
assumed to be conducive to the actual induction of CNS damage or
dysfunction in their children. Thereafter all of the succeeding terms
refer to the filial generation. It is at point B that the break between
the generations occurs. The set of interrelated propositions refer to
a complex of events and processes, beginning in the prenatal period,
which differentially influence neurological status and, directly or
indirectly, the behavior and long-range adjustment of the organism
throughout the life cycle with further effects extending into the succeed-
ing generation. There is a good deal of empirical data supporting the
theoretical model.

1. Factors A and B

Much of the data reviewed earlier pertains to Factor A in the
theoretical model. The variables of interest refer to such factors as
the utilization of obstetrical services during the prenatal period, the
general importance of maternal health during pregnancy, the necessity
for an adequate diet, the utilization of pediatric services during the
postnatal phase of development, and in general the provision of an
environment which is conducive to positive physical and mental health.
Essentially it is assumed that there is such a thing as differential
levels of obstetrical competence on the part of women, differential
tendencies to secure or utilize obstetrical or general medical services at various points in the pregnancy cycle, inter-class or ethnic group dietary differentials, and, during the postnatal period, differential capacities to secure adequate pediatric services, nutrition, and so forth. The indicators of such a state of affairs are thought to vary considerably. They might be reflected in such dependent variables as general physical health, past history of miscarriage or neonatal deaths, number of prenatal contacts with professional medical personnel, attitudes toward work, rest, recreation, and health as indicated by the type of employment pursued, length of time worked during the period of pregnancy, recreational preferences, beliefs concerning the importance of rest and adequate medical care, patterns of drug, nicotine, and alcoholic consumption, and so forth. It is also assumed that there are differential tendencies to seek or avoid medical services in conjunction with self-contracted disease or illness during the period of pregnancy, and perhaps even in the awareness that one has contracted such a condition. Behavior such as this may be a function of subcultural socialization experiences, differences in general intelligence, motivation, or emotional adjustment. However, all of the problems do not result from volitional or idiosyncratic factors. In many cases they are a product of differential social forces conditioning employment, education and health care (Ryan 1971). The quality and the quantity of medical care, for example, is in many respects a reflection of the
negative beliefs or attitudes medical personnel hold toward the poor and minority group members. These, in turn, are functionally related to similar beliefs and attitudes inherent in the social order at large (Killian 1968). For these and a variety of other reasons, various segments of the population are assumed to be a differential risk for incurring a neurologically-based disorder.

Factor A in the theoretical model is assumed to be etiologically related to Factor B. CNS pathology is conceptualized as a psychobiological condition which results from the impact of various environmental forces which differentially influence neurological status. Factor B refers to a biological consequent which is, in many cases, a function of various environmental antecedent conditions. The environmental factors in question may alter neurological integrity during the prenatal, the perinatal, or the postnatal phases of development--and they may do so repeatedly through time leading to a greater or lesser cumulative neurological deficit. The bulk of the obtained empirical data, reported in Chapter III, represents a testing of propositions A and B. The observation that neurological status, as indexed by Bender Gestalt performance parameters, varies from one social class and ethnic group to another is regarded as one (certainly not the only) demonstration of the validity of the theoretical propositions in question.
2. **Factor C**

Factor C is linked to Factor B as symptom is linked to disease. The various perceptual-motor, psycholinguistic, intellectual, and behavioral phenomena referred to are assumed to be symptomatic indicators of underlying CNS impairment, as indicated earlier in Chapter II (Anderson 1963; Birch 1964; Paine 1965; Clements 1966; Guilford 1967; Werry 1968; Wender 1971). Robinson and Robinson (1965, p. 264) summarize the essential relationships, and simultaneously indicate the heterogeneity involved in groups of children characterized by CNS pathology, in these terms:

There is ample documentation of the devastating results of interference with the normal development of the central nervous system in at least a large proportion of damaged children. The deficit appears with greatest regularity in general intelligence, perceptual organization, and the effective inhibition of impulses, but we are impressed again and again by the tremendous differences between brain-injured children . . . . A major conclusion to be drawn from these studies is that brain injury can result in a bewildering array of behavioral symptoms, no one of which is common to all children. The variety of symptoms is not surprising when one considers the immense diversity in the nature, site, timing, extent, and source of lesions in the central nervous system; rather, it is somewhat surprising that any similarities emerge at all.

There is considerable evidence that CNS pathology—involveing a mild or a serious neuroanatomical and/or a neurophysiological deficit—induces disturbances in the various spheres of sensation, perception, motor control, language function, and cognition. The proposition that perceptual-motor problems are symptomatic of brain
damage or dysfunction is based on a good deal of clinical, educational, and experimental consensus (Battersby 1956; Kephart 1960; Diller and Birch 1964; Johnson and Myklebust 1967; Chalfant and Scheffelin 1969; Lerner 1971). Birch and Lefford (1964, p. 46), for example, argue that:

Many investigations as well as clinical evaluations have clearly indicated that disturbed perceptual or perceptual-motor functioning frequently accompanies central nervous system damage.

Consistent with the conclusions of Birch and Lefford (1964), Newell C. Kephart (1968, p. 147) observes that:

One of the major symptoms attributed to the brain-injured child is a perceptual-motor handicap. Although not all children falling within the general category of brain-injured display this symptom, it seems apparent that large numbers of them do.

The bulk of the literature clearly suggests that the major factor behind perceptual-motor malfunction is a neurological disorder (Birch 1964). The fundamental concept is that certain regions of the central nervous system control sensory input, integration, and motoric output. CNS damage or dysfunction, regardless of etiology, may adversely affect these processes. While there is general agreement concerning this point, it should not be assumed that perceptual-motor problems are inevitably symptomatic of CNS pathology (Natchez, 1968; Ames 1969). Frostig and Horne (1964) for example argue that perceptual-motor problems may result from emotional maladjustment or developmental lags. There is also reason to assume that cultural learning is a factor to consider (Segall, Campbell, and Herskovits 1966).
There is data linking CNS pathology with other symptomatic indicators such as psycholinguistic problems, intellectual deficits, and various other categories of behavioral, affective, or cognitive phenomena (Chaney and Kephart 1968; Werry 1968; Humphreys 1971; Wender 1971). If we regard the nervous system as a complex information processing mechanism, then it might be argued that neurological impairment disrupts this mechanism by differentially affecting information input, integration, storage, retrieval, output or any combination of these processes (Thompson 1967; Sabatino 1968; Weiner 1968; Travis 1970). Ralph Reitan and his co-workers have contributed much empirical evidence related to the selective nature of neurological deficits and their effects on psychological functioning, especially general intelligence and a host of perceptual-motor skills (Reitan 1968; Reitan and Fitzhugh 1971). Palkes and Stewart (1972) have recently reported that hyperactive (and perhaps neurologically handicapped) children exhibit more intellectual deficits than do non-hyperactive controls—an observation consistent with the report of Kaspar, Millichap, Backus, Child, and Schulman (1971). It should be clearly recognized, however, that as Eisenberg (1964, p. 65) has observed:

The intellectual defects found following brain damage vary widely—from highly circumscribed deficit in some children to generalized depression of intelligence in others.

It is apparent that there is considerable evidence that CNS
pathology gives rise to a broad band of cognitive, affective, and behavioral phenomena. Many of the resulting deficits appear to be related to the process of academic achievement (Myers and Hammill 1969). Assuming that CNS pathology is a major causal factor determining inter-class and ethnic group differentials in general intelligence (IQ) and academic achievement, it may be assumed or inferred that these global differences result from a host of impaired perceptual-motor, linguistic, cognitive, and behavioral capacities or functions. This selective impairment is a function of a variety of factors including the locus and extent of the underlying neurological lesion, the static or progressive character of the lesion, the mode of injury, the developmental stage of the organism at the time the lesion was sustained and, in all probability, the social (environmental) context surrounding the child (Eisenberg 1964; Yates 1966; Willerman 1972). CNS pathology may affect any and all sensory-motor modalities. Various visual-motor abilities, auditory perceptual skills, tactile and chemical sensibility, psycholinguistic skills, kinaesthesia, immediate visual and auditory memory, sequencing or integrative skills, and so forth may be adversely affected (Chalfant and Scheffelin 1969; Lerner 1971). Sensory thresholds may be altered. Reflex characteristics may be affected. Inter-sensory integration may be influenced. Rates of information processing may be altered, and various cognitive processes may be distorted (Clements 1966; Myers and Hammill 1969). In
summary, the nature and the extent of symptomatic phenomena manifested by neurologically handicapped children is complex and highly variable.

3. **Factor D**

There is rather general agreement that academic underachievement--or the various forms of "specific learning disability"--are frequently related to perceptual-motor problems which, in turn, are often symptomatic of an underlying structural (anatomical) and/or functional (physiological) neurological deficit (Orton 1928; DeHirsch 1952; Silver 1961; Kirk and Bateman 1962; Frierson and Barbe 1967; Kaluger and Kolson 1969; Myers and Hammill 1969; Valett 1969).

Weiner (1968, p. 250) states the case in these terms:

> The usual view of the language arts or communication area embraces hearing and listening, speaking, reading, writing, and spelling. More elaborate achievements in spoken and written language depend upon their acquisition. But underpinning these foundations are even more primary processes; accurate and stable auditory, visual, tactile, and kinesthetic functions of reception, perception, association, integration and retention, and dependable motor, visual-motor, and vocal coordinations. Difficulty with any of these processes constitutes potential impediment to achievement in more complex school tasks, not only in the language arts per se, but also in many aspects of the school program. Most serious and damaging are the obstructions to effective social interaction with parents and peers.

Certain disorders of reading are known to be associated with brain damage (Natchez 1968; Kawi and Pasamanick 1959; Jastak 1965). It is certainly possible to conceive of some specific learning disabilities,
such as reading problems, to be the direct result of neurological pathology. In other cases, however, the learning difficulties may result from a perceptual-motor problem which, in turn, is a resultant of a neurological deficit. And in some cases the learning problem is a result of emotional-motivational forces, cultural factors, or differential socialization processes (Natchez, 1968). Rabinovitch and Ingram's (1962) diagnostic distinction between primary reading retardation—essentially of biological origin—and secondary reading retardation—resulting from emotional maladjustment, limited educational opportunities, and so forth—is pertinent. Finally, it should be recalled that perceptual-motor problems may involve any sensory modality and lead to various kinds of learning problems other than reading disabilities.

Kappelman, Kaplan, and Canter (1969) have recently reported that CNS pathology was the primary etiological factor behind the learning disabilities exhibited by approximately 55 percent of a sample of inner city children. Their results are consistent with the reports of several other investigators (Cohen, 1969; Hurley, 1969; Farnham and Diggory, 1970; Grothberg, 1970). It should be explicitly recognized, however, that there is not universal agreement with the proposition that neurological factors are primary determinants of academic learning difficulties (Mann, 1971). For example, Zach and Kaufman (1972, p. 40) have recently argued that the concept of a perceptual deficit, presumably based upon underlying neurological factors, may impede rather

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than enhance our understanding of educational problems:

On the basis of the available data, we believe that we must caution educators against haste in designating children as perceptually handicapped. That some children have perceptual problems which handicap their school achievement, there is little doubt. How these children are identified, how their problem is defined, and how they are trained to become successful learners, however, is still unclear. To speak about perceptual deficit may be misleading since all children do perceive. The critical task for education is to delineate how children perceive, what they perceive, and through what sensory channels they process information.

Clearly, academic learning disabilities are not inevitably the product of perceptual-motor problems associated with a neurological disorder. In many cases, differential academic achievement is a function of emotional-motivational processes, cultural forces, variable socialization processes, differential life styles associated with reduced levels of socioeconomic status or minority group membership, self-fulfilling prophecies, opportunity structures, and so forth (Trow 1966; Passow 1967; Bell and Stub 1968; Bouma and Hoffman 1968; Rosenthal and Jacobson 1968; Clark 1969; Gordon 1970). Many factors determine the level of academic achievement or learning capacity--only one of which is neurological status.

4. **Factor E**

The various specific learning disabilities--particularly reading problems--are assumed to eventuate in generalized academic under-achievement if they are uncorrected (De Hirsch, Jansky and Langford 1966; Natchez 1968). Factor E in the theoretical scheme is therefore
assumed to be functionally related to Factor D. It is apparent, for example, that reading skills are critically important for continued academic success beyond the elementary level (Kaluger and Kolson 1969). Reading achievement is a learned skill which is very heavily drawn upon by most other academic, as well as many non-academic, areas. Since the mastery of this particular skill is central to general academic success, it is apparent that reading problems may in many cases lead to generalized academic underachievement. To some extent, this same point might be made with reference to the eventual outcome of other specialized learning problems.

Generalized academic underachievement has both societal and individual consequences of a rather serious nature (Trow 1966, Clark 1969; Horton and Leslie 1970). Early (1969, p. 3) refers to many of the problems involved in these terms:

... Many children who do not achieve their full potential in school have perceptual problems ... Teachers and other educators are showing increasing concern for children who have learning problems. Concern is warranted, and most welcome. A highly developed society is making increased demands upon its members. Those who cannot meet the demands, who cannot keep up, are finding that hardly any place exists for them in the bright, brave world which is mushrooming into being before our eyes. Generally speaking, children who do well in school will be able, as adults, to meet the demands of this complex world, but those who do poorly will not be able to keep up later. The school experience becomes an ever more important factor in equipping children for functioning in the world. Since school achievement is such a crucial matter, every method for helping the slow learner should be explored thoroughly.
The societal consequences stem from the interrelatedness of institutions, which are organically bound together, and the merging of educational and societal interests (Gross 1959; Clark 1964; Jastak and Jastak 1965). It is apparent, for example, that such factors as economic development and national defense—both of which are to some degree dependent upon scientific input—are seriously threatened by widespread generalized academic underachievement. The individual correlates of underachievement may involve such factors as the inhibition of upward social mobility, increased susceptibility to certain forms of "deviant behavior"—such as juvenile delinquency and conventional crime—and the induction of various forms of emotional and social maladjustment (Hathaway, Reynolds, and Monachesi 1969a; Hathaway, Reynolds, and Monachesi 1969b; Kahn 1969; Tarnopol 1970; Wender 1971).

Cases of academic underachievement, like other social problems, are not randomly distributed in the population at large, but rather are highly concentrated in the socially disadvantaged groups (Trow 1966; Hellmuth 1969; Grotberg 1970; Hellmuth 1970). According to Zacharias (1968, p. 30):

By all known criteria, the majority of urban and rural slum schools are failures. In neighborhood after neighborhood across the country, more than half of each age group fails to complete high school, and 5 percent or fewer go on to some form of higher education. In many schools the average measured IQ is under 85, and it drops steadily as the children grow older. Adolescents depart from these schools ill-prepared to lead a satisfying, useful life or to participate
successfully in the community.

It will be recalled (Chapter III) that there is data available for the Grand Rapids area consistent with this general proposition. As indicated earlier, there is a strong relationship at the group level between neurological status and the level of academic achievement observed in fourth and fifth grade children. Those schools characterized by a high prevalence of CNS pathology were also the schools exhibiting the lowest level of academic achievement. It will also be recalled, however, that the accuracy of prediction decreased markedly at the individual level, and it was consequently suggested that a more comprehensive assessment program was called for in order to improve prediction in individual cases.

5. Factor F

Generalized academic underachievement frequently eventuates in reduced socioeconomic status. Factor F in the theoretical model is often a consequence of Factor E. The linkage of academic achievement, occupational determination and socioeconomic status is well-known by sociologists (Hollingshead and Redlich 1958; Hughes 1959; Svalastoga 1964; Blau and Duncan 1967; Ecklund 1971; Jencks, Smith, Acland, Bane, Cohen, Gintis, Heyns and Michelson 1972). According to Clark (1964, p. 739):

Wherever formally differentiated agencies of education exist, their general social function of training the young for adult roles entails also some part in the assignment of status to
individuals and groups. This part grows as education connects more closely to the economy. Education's mediation between the demand and supply of workers entails an expanding mediation in the assignment of social position and status from one generation to the next.

Functionally, the social structure appears to automatically and impersonally sift and sort individuals, or aggregations of individuals, through time and to deposit them in a hierarchically arranged stratification system which is predicated upon academic achievement. It is also often argued that status differentiation is functional for any given social system, and (at least implicitly) that any processes contributing to such differentiation are also functional (Davis and Moore 1945). H. Warren Dunham (1964, p. 32) summarizes the process in this manner:

Every human society, as well as animal societies, has been found to have some type of stratification structure. This structure has the function of distributing persons in any given society into several differential status positions. The principle governing such a distribution will vary between societies and may be based on birth, achievement, personality, education, influence on something else. This structure functions to locate every member of the society in a hierarchical arrangement. In an open, democratic society that rewards individual achievement to a high degree, the central process becomes personal competition, both legitimate and illegitimate, and the chief selective agency becomes the educational system. It would be expected that under such a system the genetically defective, the physically handicapped, the chronically sick, the rebels, the criminals, the vice-ridden and persons with unacceptable personality traits would experience difficulty in fitting into the hierarchy, except at the lowest status positions.

It is for this reason that it was earlier suggested that a high prevalence of CNS pathology concentrated in the minority groups and the socially disadvantaged sectors of the population was in some respects socially

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functional (Amante, Margules, Hartman, Storey, and Weeber 1970). Perhaps as Thomas Szasz (1967; 1969) has repeatedly suggested relative to "mental illness," we inadvertently manufacture physical pathology because it is economically, politically, and socially functional for us. It must be acknowledged, however, that perhaps a more suitable explanation of the process may be obtained through conflict theory (Bottomore 1968; Collins 1971).

Traditionally, the basic determinant of socioeconomic status has been occupation (Hughes 1959; Svalastoga 1964). It is apparent, however, that education is a central determinant of occupational attainment. For the most part this is true for males. The female typically achieves her social status through marriage (Elder 1969). Nevertheless, education is not entirely irrelevant for the female. Some empirical research bearing on these points has recently been reported by Hathaway and his co-workers. Relative to the male high school dropout after 10 years, they report that he is generally characterized by lower socioeconomic status, tends to be downwardly mobile, has a larger family size, and exhibits higher rates of criminality (Hathaway, Reynolds, and Monachesi 1969a). The female dropout tends to marry a man of lower socioeconomic status, is characterized by higher divorce and separation rates, has a larger family size, is downwardly mobile if she derives from a lower class family and is generally less upwardly mobile compared to non-dropouts (Hathaway, Reynolds, and Monachesi 1969b).
We should also bear in mind the fact that there is a good deal of sociological evidence indicating that homogamous marriages are the rule—that is, people of similar ethnic group and social status tend frequently to marry one another (Zelditch 1964; Eshleman 1969).

6. **Factor G**

The final element in the theoretical scheme, Factor G, is assumed to be a product of Factor F. That is, membership in a given social class is assumed to involve differential socialization processes which eventuate in differential behavior. This is also true of membership in a given ethnic group, as indicated earlier in Chapter II. The basic dynamics of the socialization process and its possible relationship to the theoretical system are highlighted in numerous sociological works (Parsons 1959; Wilson 1966; Clausen 1968; Johnson 1968; Smith 1969).

Socialization—a form of collective or social learning—is a progressive, ongoing process which eventuates in the determination of human behavior in accordance with certain implicit or explicit expectations. Socialization involves the group transmission of sociocultural content from one generation to the next. The process is assumed to vary from social class to social class and between the various ethnic groups. Clausen (1968, p. 3-4) has recently reviewed the major definitions of the process:

... Socialization entails a continuing interaction between the individual and those who seek to influence him, an interaction that undergoes many phases and changes. For Elkin
... it is "the process by which someone learns the ways of a given society or social group well enough so that he can function within it." For Child ... socialization is "the whole process by which an individual born with behavioral potential- 

ities of enormously wide range is led to develop actual behavior which is confined within a much narrower range—the range of what is customary and acceptable for him according to the standards of his group." Both Elkin and Child put the stress on learning by the individual. Aberle ... however, puts the stress on the social apparatus which influences the individual's learning and defines for him the range of what is acceptable: "Socialization consists of those patterns of action or aspects of action which inculcate in individuals the skills (including knowledge), motives and attitudes necessary for the performance of present or anticipated roles ... .

Presumably, socialization entails all of those largely unknown experiences which predispose the individual toward differential behavior relative to the utilization of medical services, variations in diet, attitudes toward pre- and post-natal child care, and so forth. This process may give rise to certain values, attitudes and behavioral patterns which, in some cases, eventuate in the induction of CNS damage or dysfunction on the part of children. At this point we have reached Factor A in the theoretical model—and a very vicious cycle of events has been closed.

7. Some Deductions and Implications

CNS damage or dysfunction is the result of a constellation of interacting factors, and it occurs in an infinite series of gradations. The distribution is assumed to vary through time and across space as a result of the interaction of host and environmental factors. Based on

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the theory and the data presented above, it is a reasonable inference that the ecological distribution of neurological pathology, empirically specified, is not random. The evidence indicates that cases of CNS pathology are highly concentrated in certain regions of the metropolitan complex--specifically, in the ghetto--to the relative exclusion of other areas, such as suburbia and perhaps the rural hinterland. The prevalence of brain damage or dysfunction appears to be highest in the central city region, reduced in the suburban zone, and of questionable magnitude in the rural-urban fringe. More generally, the distribution is assumed to be a product of reduced socioeconomic status and ethnic group membership. The prevalence of CNS damage or dysfunction appears to be extremely high in certain sectors of the population--particularly in the black subculture--and in those blighted regions of the community where poverty is a way of life. This follows directly from environmentally-based pathogenicity--that is, from a comparable distribution of various pathogenic conditions including high rates of physical and mental sickness on the part of poor pregnant women and newborn children, malnutrition and undernutrition, inadequate medical care, pathological conditions of environmental stimulation and so forth. Such differential pathogenicity appears to predispose large segments of the population toward lower levels of neurological integrity.

It is particularly important to observe that there is considerable
sociological evidence indicating that individuals, or aggregations of individuals, of variable socioeconomic status and ethnic group membership differ in terms of mental and physical health, life expectancy, and patterns of morbidity and mortality (Faris and Dunham 1939; Hollingshead and Redlich 1958; Susser and Watson 1962; Mechanic 1968; Kosa, Antonovsky, and Zola 1969; Shiloh and Selavan 1973).

Relative to the ecological distribution of CNS damage or dysfunction, social class and ethnic group factors appear to critically affect the probability of maternal, fetal, or neonatal malnutrition and undernutrition, susceptibility to disease, the ability to secure adequate obstetrical or pediatric care, and the likelihood that infants will be subjected to pathogenic conditions of ambient stimulation or to polluted or unsanitary living conditions which are conducive to poor health in general and neurological pathology in particular (Birch and Gussow 1970). These variables, in turn, appear to be related to various environmental parameters, situational factors, life styles or behavioral patterns endemic to the poor, and to prejudice and discrimination in the larger social order relative to educational and occupational opportunities, living conditions, and the quality and quantity of medical care (Mechanic 1968; Kosa, Antonovsky, and Zola 1969). Saxon Graham (1964, pp. 313-314) has stated some of the theoretical propositions related to this sociobiological perspective:

For the purpose of this discussion, we will define disease as a tissue change to a morbid state brought about by some
endogenous or exogenous biochemical or biophysical agent. Most often, the tissue change is the last in a series of events or factors, many of which are social, that put the host in contact with the pathogenic agent. . . . The categories of factors leading to disease usually are membership in a social group engaging in a pathogenic behavior pattern, consequent exposure to a vector or carrier of the agent, and the agent itself which brings about the tissue change. Whether or not a disease is clinically evident may depend greatly upon host characteristics, inherited or acquired.

Presumably, therefore, cases of CNS pathology in children are the end product of a chain of interrelated events or processes which ultimately lead to the recognition and treatment of the disorder. In part, the condition is a function of membership in a given social or ethnic group which, in turn, entails a specific behavioral pattern or set of circumstances which place the host in contact with the pathogen. For this reason, membership in a given ethnic group or social class position is related to the probability of risk for neurologically-based disorders. While it is assumed that some sociological characteristic(s) of the groups in question is the central factor(s) accounting for the relationship of CNS damage or dysfunction to ethnicity and social class position, it must be recognized that genetic factors may also be involved (Robinson and Robinson 1965; Jensen 1972).

In short, we might regard the ecological distribution of neurological pathology as a dependent variable which is functionally related to a set of independent variables. These independent variables are a group of social forces which, for the most part, appear to be coterminous with social class position and/or ethnicity and which are linked to
the pathogenic conditions referred to above.

The theory specified is longitudinal in nature. The data presented in Chapter III will support such a theory, but perhaps the only way it can be effectively tested is to draw a large and representative sample of cases during the prenatal period and to carefully trace their development and adjustment for several decades through birth and childhood and into adulthood and the succeeding generation.

E. The Nature-Nurture Controversy

Social forces appear to be the primary determinants behind the ecological distribution of CNS damage or dysfunction (Hurley 1969; Jordan 1971). These forces lead to a sequence of events which eventuate in the selective impairment of large segments of our population, they determine a prevalence and incidence level of CNS pathology that appears to fluctuate in a discernible pattern through time and across space, they are related to the conditions that prevent or perpetuate the disorder, and they appear to critically affect the manner in which the condition is diagnosed, treated, or otherwise handled. However, social forces are not the only variables to consider.

In order to properly comprehend this entire set of events, it is necessary to recognize that it is intimately tied to the so-called "nature-nurture" controversy (Boring 1957; Cancro 1971) and its logically related derivatives such as the "nativist-empiricist"
controversy (Gibson 1969; Deutsch and Schumer 1970). The main
participants in this continuing dialogue have been, and still are,
bio logists, psycholo gists, and socio logists. The controversy centers
around the respective contributions made to thought, feeling, and
behavior—-not to mention certain parameters of biological structure
and function—-by two divergent sets of variables which are, on the one
hand, fundamentally biological (and largely genetic) in nature and, on
the other hand, environmental (Rose 1973). The genetic variables
are of course intrinsic to the organism, and the environmental vari-
ables are extrinsic. It may be reasonably assumed that some portion
of the variance in all thought, all feeling, and all action is a complex
function of genetic variables, environmental variables, or some com-
110) conceptualizes the problems in these terms:

Social facts at large cannot be explained by biology alone
or by sociology alone. There is no individually or socially
important human behavior independent of culture; there is
no human behavior independent of genes. All complex human
behavior is a vector outcome of variable human genotypes
interacting in a variable non-human environment with var-
iable social and cultural things and events.

Obviously, this is a synthetic interpretation. It should be carefully
contrasted with extreme or antithetic interpretations of the "either-
or" format alluded to above. We should clearly recognize, therefore,
that it is not entirely appropriate to conceptualize the environmental-
genetic issues in such simple dichotomous terminology. Social or
environmental forces may induce biological changes and vice versa. (Wallace 1972). At the most general theoretical level, therefore, it is imperative to recognize that the ecological distribution of CNS damage or dysfunction is a product of the interaction of a host of genetic and environmental variables.

It may certainly be assumed, however, that the relative magnitude or the importance of the environmental or genetic effects is variable. In the case of certain disorders involving CNS pathology, such as mongolism and phenylketonuria (PKU), the genetic factor has historically been of critical importance (Hardy 1965; Robinson and Robinson 1965; Baumeister 1967). In spite of the genetic etiology, however, in the case of some such disorders--specifically PKU--the phenotypic expression of the underlying genotype may be environmentally manipulated by means of dietary control. The important point to observe is that from all indications the frequency of such genetically determined instances of brain pathology is distinctly limited relative to the total number of cases of CNS damage or dysfunction--the great majority of which appear to be the result of a host of environmental variables impinging upon the organism during the prenatal, the perinatal, and the postnatal periods of development (Birch 1964; Yacorzynski 1965; Siegel 1967; Birch 1968). Therefore, at the present time it is assumed that a basically environmental theoretical scheme designed to conceptualize the events behind the epidemiological distribution of CNS pathology

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is entirely appropriate.

What the present theoretical scheme attempts to demonstrate, among other things, is that certain variables—which are largely socio-cultural in nature—actually alter the physiochemical intra-uterine environment in such a manner as to induce CNS pathology on the part of the conceptus during the embryonic and/or fetal developmental stages, largely independent of the genotype. For example, extreme conditions of malnutrition during the pre-or post-natal stages of development may induce severe CNS damage or dysfunction regardless of the fact that the underlying genotype may predispose toward average, or even superior, neurological development. If general intelligence (IQ) is thereafter seriously depressed, or if the various other symptomatic indicators of CNS pathology emerge, the major factor to consider is obviously not the genetic variable per se, but the genetic factor interacting with the environmental variable (malnutrition). Further, as suggested by this particular example, of the two components encompassed by the interaction term, the environmental factor is clearly the more critical. However, it must be recognized that susceptibility to the effects of malnutrition may, in part, be genetically conditioned.

F. CNS Pathology and Other Social Problems

It was earlier suggested that the ecological distribution of CNS
damage or dysfunction, representing what appears to be a serious social problem in its own right, may be related to various other social problems (aside from academic learning disabilities). The most important of these appear to be mental retardation, behavioral problems and serious forms of psychopathology--especially sociopathy and the schizophrenias—and, perhaps to a less marked degree, conventional crime and juvenile delinquency.

1. Mental Retardation

Mental retardation refers to a condition of subnormal intellectual functioning or intellectual arrest at some point below Piaget's level of formal (symbolic or abstract) thought (Robinson and Robinson 1965; Kolstoe 1972). This disorder always occurs at some point during the developmental cycle (prior to chronological age 18), and it is always associated with maladaptive (social) behavior. Mental retardation is often regarded as symptomatic of a serious underlying neurological disorder (Benoit 1957; Benoit 1959; Pasamanick and Knobloch 1961; Robinson and Robinson 1965; Kolstoe 1972). E. Paul Benoit (1959, p. 561), drawing on D. O. Hebb's (1949) neurological theory of human behavior, defines mental retardation in these terms:

Mental retardation may be viewed as a deficit of intellectual function resulting from varied intrapersonal and/or extrapersonal determinants, but having as a common proximate cause a diminished efficiency of the nervous system (beginning with an impaired irritability and further involving a lowered capacity for impulse transmission and for developing primitive and integrating cell chains through interfacilitating
interneuronal connections), thus entailing a lessened general capacity for growth in perceptual and conceptual integration and consequently in environmental adjustment.

Academic learning problems vary along a measurable continuum of severity ranging from the very mild to the very severe. From this point of view, it might be argued that mental retardation is an extreme form of academic underachievement. Mentally retarded children have very serious learning disabilities--so serious, in fact, that in most cases they cannot be expected to succeed in conventional academic environments (Coleman 1964; Heiser and Wolman 1965; Baumeister 1967).

There is not universal consensus regarding the etiology of mental retardation (Mercer 1973). In particular, there is strong controversy concerning the presumed organic (neurological) deficit characterizing mentally retarded individuals. For example, according to Phillips (1967), Zigler (1967), and Albee (1970) approximately 75 percent to 85 percent of the mentally retarded exhibit no demonstrable organic pathology. The reference here is to the so-called "cultural-familial" group of retardates--most of whom are concentrated in the disadvantaged segments of the population (Young 1969; Hurley 1969; Wortis 1970a, LaPouse and Weitzner 1970). Their problems are assumed to result from a broad range of environmental, cultural, social, psychological and genetic factors. However, this position is not entirely defensible. The observation probably results more from the
psychometric deficiencies of the conventional (medical) neurodiagnostic
techniques, or the diagnostic impressions derived from such instru-
ments, than from the characteristics of mentally retarded individuals
(Kennedy and Ramirez 1964; Clements 1966; Small 1973). A consider-
ably more reasonable position is that mental retardation is, in fact,
symptomatic of serious neuropathy (Pasamanick and Knobloch 1961;
Ellis 1963; Luria 1963; Maher 1963; Young 1969). General intelligence
is clearly related to neurological status (Robinson and Robinson 1965;

It is well-known that prenatal and perinatal factors may induce
CNS pathology which, in turn, leads to various forms and degrees of
mental deficiency (Heiser and Wolman 1965; Koch 1967; Birch,
Richardson, Baird, Horobin, and Illsley 1970; Koch and Dobson 1971).
Since many of these complicating medical conditions are associated
with lower class socio-economic status--involving such factors as
unsanitary living conditions, malnutrition, high rates of physical
disease or sickness, inadequate medical care, pathogenic conditions
of environmental stimulation, and environmental deterioration--cases
of mental retardation are not randomly distributed (Koppitz 1964).
Like various other forms of social pathology, mental deficiency is
highly concentrated in minority groups and in the lower social classes
(Anastasi 1958; Jensen 1969; Birch, Richardson, Baird, Horbin, and

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(1970b) observes the following:

No matter how we define intelligence, it is obvious that mental deficiency can be, and often is, impaired by bad health and by defects or malfunction of the thinking apparatus. Since the poor are especially liable both to the hazards of ill health and the inadequacies of medical services, it is not surprising that biological factors contribute to the occurrence of mental retardation among the lower classes. There is also a certain amount of social drift of the biologically inferior toward the lower strata. But in large populations, as in individual cases, it is difficult to isolate and measure the biological factors in the matrix of psycho-social circumstances.

2. Behavioral Problems and Emotional Maladjustment

Neurologically handicapped children exhibit a multiplicity of behavioral or affective disturbances (Eisenberg 1964; Philips 1967; Chess 1968; Graham, Chir, and Rutter 1968; Menalascino 1969; Weiss and Kaufman 1971). It is always difficult, however, to clearly determine if the child's problem is a function of the underlying lesion, a result of the environmental or social conditions the child confronts, or an interaction of the two.

It is frequently maintained that the child's problems disrupt the micro- or macro-social structures—such as the family, the school, or the neighborhood—in which he/she is enmeshed (Freedman, Helme, Havel, Eustis, Riley, and Langford 1968). Kelman (1964, p. 79), commenting on family dynamics, observes the following:

In essence, professional opinion asserts that these children constitute an actual or potential threat to the family unit; specifically, their demands for care and management are said to disrupt family routines, sharpen existing or create
new strains in family relationships and roles, restrict extra-
familial social contacts, and threaten family morale.

However, it is at least as reasonable to assume that in part the
emotional and/or behavioral problems in the case of the neurologically
impaired child are inadvertently produced as a result of the external
controls or pressures placed on the child in the home, in the neighbor-
hood, and in the school as a consequence of his or her neurological
symptomatology which may involve such factors as hyperactivity, brief
attention span, impulsivity, limited frustration tolerance, aggressiveness,
perceptual-motor problems, various intellectual deficits, and
academic learning disabilities. For the most part, this symptomatology
is negatively valued and is perceived as "socially undesirable."
The presence of such symptomatology may alter childrearing practices
in frankly maladaptive ways by eliciting a parental orientation which is
too punitive or too permissive or perhaps an inconsistent pattern of
reinforcement and punishment. It may generate a good deal of peer
group conflict and possibly rejection. Academically, it may interfere
with the learning process and thereby induce strong negative self-ful-
filling prophecies on the part of teachers. Further, it may generate
inappropriate disciplinary measures or a kind of academic permissive-
ness or hopelessness which has maladaptive consequences for the
child's education. The child characterized by such symptomatology
may encounter serious interpersonal complications, he may alter his
self concept in a negative direction as a result of repeated failure
experiences, he may develop rather extreme "authority problems," and a variety of maladaptive coping techniques such as attack and withdrawal may emerge. It is therefore apparent that a very vicious cycle of interacting events may be activated by the presence of the child's symptomatology. In addition to these problems, parents, siblings, peers, teachers, and others may vary significantly in the levels of tolerance for "deviant behavior," a factor which may critically alter the relationship or interpersonal outcome.

There is mounting evidence that the long-range prognosis is not favorable for this group of children. Many of them move in the directions of sociopathy and schizophrenia with advancing age (Werry 1968; Wender 1971). While it appears to be true that hyperactivity and some of the associated symptomatology diminishes with age, the various forms of psychopathology persist or change their form through time. They do not necessarily disappear.

Biologically or constitutional factors of one kind or another have consistently been implicated in the genesis of various forms of psychoticism, including schizophrenia in the case of children, adolescents, and adults (Arieti 1959; Wolman 1965; Buss 1966; Bender 1969; Rimland 1969; Rosenbaum 1970). Neurological pathology is often cited as the central etiological factor in childhood schizophrenia (Robinson and Robinson 1965, p. 232):

Positive neurologic findings in the form of electroencephalo-graph (EEG) records . . . seizures . . . and "soft" neurologic

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signs . . . have also been reported in many but not all schizophrenic children. It is known, too, that some organic diseases of the central nervous system produce symptoms closely akin to childhood schizophrenia. Perhaps even more telling is the fact that the behavioral descriptions of the brain-damaged child and the autistic child show a suspiciously high degree of similarity.

Paul Meehl (1962) argues that schizophrenia is a neurological disorder of genetic origin. It may be suggested, however, that while it may be true that schizophrenia is a neurological disorder, its source is not primarily genetic, but environmental (and largely pre- or peri-natal).

For example, complications of pregnancy, labor, and delivery—the bulk of which appear to result from environmental factors—are clearly related to schizophrenia and various other forms of psychopathology (Pasamanick and Knobloch 1961; Bender 1969; Mednick 1970; Mednick 1971; Mednick, Mura, Schulsinger, and Mednick 1971). Mednick's results indicate that 70 percent of the children characterized by such psychiatric disorders are the products of medically complicated pregnancies or births—involving such factors as prematurity, placental or umbilical cord problems, anoxia, multiple births, malpresentations, and prolonged labor—many of which could have led to subcortical (hippocampal) damage leading, in turn, to autonomic nervous system pathology and various forms of disordered behavior. He further suggests the very tenable hypothesis that obstetrical complications may interact with genetic vulnerability to produce the various schizophrenic conditions. Clearly, prenatal and perinatal factors appear to be
etiological significant determinants of the schizophrenic syndrome.

Goldfarb's summary statement is pertinent at this point (quoted in Mussen, Conger, and Kagan 1969, p. 54):

Accumulated data from prenatal and perinatal developmental courses, neurological histories and examinations, electroencephalographic and systematic studies of neurological functions, perception and cognition provide rather indisputable evidence of impairment of the central nervous system. The disorders and the integration of the neurological functions often occur very early in infancy and are thus first expressed in terms of sensory, perceptual, motor and postural deviations, and later in terms of the more complex cognitive and social failures and protective adjustments which are most usually viewed as the essential attributes of schizophrenic children.

Goldfarb's position is in essential agreement with the conclusions of Robinson and Robinson (1965), Ornitz (1969), and Hingtgen and Bryson (1972, p. 41) who have recently published a comprehensive review of childhood schizophrenia and other psychotic conditions:

Despite the variety of diagnostic classification systems, actual descriptions of symptomatology appear remarkably similar for all forms of childhood psychoses. There is increasing evidence that the great majority of psychotic children demonstrate moderate or severe intellectual retardation, serious communication deficits, gross disturbances of perceptual processes, and various types of neurobiological dysfunction.

There is growing evidence that the perceptual, cognitive, affective, and behavioral symptomatology of schizophrenia is a product of subcortical neuronal malfunction involving differential membrane permeability which leads to regulatory failures involving the accumulation or loss of certain vital biochemical substances which, in turn,
may affect such neuronal characteristics as the discharge, propagation, and transmission of the neural impulse across the synaptic junction, the relative and absolute refractory periods, threshold values, and so forth (Gottlieb, Frohman, and Beckett 1969; Heath 1970; Roizin 1970; Rose 1973). In all probability, neuronal malfunction quantitatively or qualitatively affects information processing characteristics.

Finally, it should also be observed that a variety of investigators have recently argued that several forms of nutritional disease—especially vitamin deficiency in one form or another—are causally related to CNS pathology and certain associated phenomena including academic learning disabilities and various forms of "mental illness," especially sociopathy and schizophrenia (Bell 1958; Cheraskin, Ringsdorf, and Clark 1968; Cott 1971; Hawkins and Pauling 1973). This is the controversial area of "orthomolecular psychiatry," which Linus Pauling (1968, p. 265) defines as:

... the treatment of mental disease by the provision of the optimum molecular environment for the mind, especially the optimum concentrations of substances normally present in the human body. An example is the treatment of phenylketonuric children by the use of a diet containing a smaller than normal amount of the amino acid phenylalanine.

The general tenor of this literature rather clearly suggests that in many cases we are not dealing with some irreversible neuroanatomical (structural) deficit induced by malnutrition at a critical phase of development, but rather with a reversible biochemical or neurophysiological...
(functional) change which is determined by a specific nutritional deficiency—a "reversible biochemical lesion"—which, if unchecked, may lead to various pathological outcomes. The claims of these various investigators have not yet been well substantiated by empirical research, but the data is suggestive.

3. Juvenile Delinquency and Conventional Crime

There have been repeated attempts throughout the history of criminology to link crime, and other forms of non-conformity, with underlying biological variables (Cavan 1962; Eysenck 1964; Mannheim 1965; Schur 1969; Cortés and Gatti, 1972). Most of these attempts have been unsuccessful but they nonetheless persist. The highlights of this general movement have involved Lombroso's physical stigmata, Hooten's anthropological extension of Lombroso's mode of thought, phrenology, somatotyping and, more recently, the XYY syndrome (Mannheim 1965; Balkan 1968; Montague 1968; Schur 1969; Hall and Lindzey 1970). Frequently, the reference has been to a presumed neurological deficit. There is no doubt that crime and juvenile delinquency are largely social phenomena—but the possibility of contributory biological factors cannot be conclusively ruled out. It is possible to document these varied assertions more definitely at this point in history.

There is growing evidence that CNS damage or dysfunction is associated with juvenile delinquency and conventional crime and/or certain personality disorders, such as sociopathy, which are logically
consistent with antisocial behavior (Tunley 1962; Hertzig and Birch
1968; Kahn 1969; Graham 1971; Wender 1971; Brutten, Richardson, and
Mangel 1973). There is reason to assume that these relationships are,
in part, conditioned by the collective development of a sociopathic per-
sonality structure, which involves a set of orientations and behavioral
patterns which are consistent with non-conformity (Cameron 1963; Buss
1966). Rates of sociopathy, like schizophrenia, are negatively corre-
lated with social class position (Dohrewend and Dohrewend 1969).
Further, personality problems such as sociopathy are known to be quite
prevalent in populations of juvenile delinquents and adult criminals, con-
ventional and white collar (Hathaway and Monachesi 1953; Lanyon 1968;
Schur 1969). In this connection, it is interesting to observe that there
is some rather suggestive evidence that CNS pathology--as measured
by EEG abnormalities--is quite prevalent within sociopathic populations
(Mensch 1965; Buss 1966; Graham 1971; Hackett 1971). Similarly,
Tarnopol (1970), employing various psychometric procedures, has
recently reported data which is suggestive of very high rates of CNS
pathology among populations of minority group ghetto subjects who had
dropped out of school and engaged in various degrees and forms of
delinquency. It is also apparent that there is some similarity of
symptomatology in the case of the neurologically handicapped child
and the adolescent or adult sociopath (Marks and Seeman 1963;
Gilberstadt and Duker 1965; Wender 1971). For example, low stress

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or frustration tolerance, impulsivity, aggressiveness, hyperactivity
or hypomanic behavior, and problems in learning are common to both
in many cases. Perhaps sociopathy is the adolescent or adult analogue
of childhood CNS pathology. Finally, we should clearly recognize that
in some cases sociopathy may be related to more serious forms of
psychopathology (Garmezy 1971, pp. 110-111):

> Data drawn from a number of recent genetic studies of
> schizophrenia have suggested that there exists a spectrum
> of schizophrenia in which pathologic outcomes appear to
> cohere around schizophrenia, sociopathic personality and
> impulse disorders; tending to fall outside the spectrum are
> the depressions and anxiety neurosis.

In summary, it is apparent that various forms of deviant behav-
ior--behavior that violates the institutionalized expectations of the
community at large (Cohen 1959)--are frequently correlated and, in
some cases, may be related to neurological status.

G. Final Considerations

The empirical data presented in Chapter III, in conjunction with
the literature review, rather clearly suggest that the prevalence of
CNS pathology in children is considerably more extreme than tradi-
tion would lead us to expect. The reasons for this are conceptualized
in terms of the proposed theoretical model. In the most fundamental
sense, poverty and discrimination are assumed to be the major factors
which produce the distribution. We should carefully note, however,
that these factors probably do not inevitably produce such results.
For example, Mechanic (1968) cites data indicating that poor Jewish immigrants to America had the lowest rates of infant mortality of any group studied, including the native population, in spite of poverty. As Pasamanick and Knobloch (1961) have observed, the poverty-associated factors that induce high rates of infant mortality are also the factors that in all probability partially contribute to the epidemiological distribution of brain pathology. It will be critically important to specify such "exceptions" in the future in order to strengthen the theoretical model. At this point, however, there are more immediate problems to contend with. Two of the most important of these include the potential racist implications and the possibility of prevention.

1. Racism

There is no doubt that the data presented here will be controversial from a social point of view. The findings will be extremely attractive to the individual inclined toward racism, and this will not only be undesirable but perhaps also dangerous (Pasamanick 1971). We might begin with the observation that while race itself is a biological concept (Montague 1963; Gottesman 1968a; Baker 1974), racism is a sociological concept (Lessa 1964). The confounding of these two concepts has led to very unfortunate consequences. Unfortunately, racism is logically compatible with genetic formulations. In such a case biological inheritance, or "protoplasmic continuity," may then be regarded as the underlying vehicle determining the supposedly inherent

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inferiority of one race relative to another. It is more difficult to support such notions environmentally simply because few if any psychological or cultural attributes are truly immutable or inherent in the same sense that genetically determined characteristics are.

Racist notions of various sorts are socially constructed for a variety of reasons, usually in order to justify the systematic exploitation or domination of one group of people by another (Thomas and Sillen 1972). Racism is intrinsically value-laden. For the most part there are no scientific data to support racist presuppositions. If it is argued that in fact there are such data, it is nearly always possible to demonstrate that the data referred to are conceptually and methodologically limited, and sometimes critically so. For example, the well-known interracial differences in terms of general intelligence, conventionally measured, may be conceptualized genetically (Jensen 1969; Eysenck 1971) or environmentally (Klineberg 1951).

These various points become particularly salient when one considers the nature of the data reported in Chapter III and recalls the extensive empirical data indicating that neurological integrity is a central determinant of general intelligence. Jensen (1972, pp. 104 and 159), of course, maintains that for the most part neurological integrity is a function of genetic inheritance:

Since intelligence is basically dependent on the structural and biochemical properties of the brain, it should not be surprising that differences in intellectual capacity are partly
the result of genetic factors which conform to the same principles involved in the inheritance of physical characteristics... Races are more technically viewed by geneticists as populations having different distributions of gene frequencies. These genetic differences are manifested in virtually every anatomical, physiological, and biochemical comparison one can make between representative samples of identifiable racial group... There is no reason to suppose that the brain should be exempt from this generalization.

What Jensen fails to seriously consider, however, is the well-established fact that neurological status also results from the operation of a great variety of environmentally-based factors—which also vary between and within ethnic groups and social classes—which may either enhance or destroy neurological integrity including health status, drug agents of various kinds, nutritional variables, the quality and quantity of sensory stimulation, accident, and so forth. It is essential to recognize that in many cases environmental factors such as these may seriously compromise neurological integrity—regardless of genetic inheritance.

There is another point to consider relative to the rationale behind racism, and that is that it is simply illogical. It is well-known epidemiologically that a variety of behavioral aberrations or physical disease conditions vary as a function of age, sex, social class position, ethnic group membership, occupation, and so forth. These various behavioral disorders or disease conditions presumably fluctuate or vary as a function of certain well-defined, or at least potentially
definable, causal agents such as stress, socialization, air pollutants of various sorts, infectious or viral agents in certain environmental loci, and so forth. They do not necessarily vary according to the prevailing social mores, whatever those may represent at a given point in social space and time. Behavioral aberrations and disease conditions are not necessarily explained or altered in any manner by labelling processes that eventuate in the social designation of "inferiority" or "superiority." Rather, they are altered by the relentless and systematic search for the causal factors behind the disorder, and the ultimate elimination of those factors.

2. Prevention

It is the writer's central contention that prevention is the most important factor to consider at this point in time. There is reason to assume that the problems in question may become more prevalent in the future if proper steps are not taken to counteract them (Birch and Gussow 1970). The concepts of preventive psychiatry specified by Gerald Caplan (1964; 1968, p. 11) are highly pertinent to this general discussion:

One public health preventive model that I have found useful is that which divides the field into three levels: Primary prevention, which encompasses measures to reduce incidence—the rate of new cases over a certain time period; secondary prevention, which denotes measures to reduce prevalence—the rate of new and old cases at a point in time; and tertiary prevention, which focuses on lowering the rate of residual defect in the population of former patients.
Caplan's model of prevention is broad enough to encompass measures designed both to prevent the problems from emerging and for controlling them if they do occur or increase. Conceptually, it advocates the systematic elimination of the causal factors behind a given condition or disorder. The model is relevant and applicable to the problems centering around the ecological distribution of CNS damage or dysfunction. Primary and secondary prevention are in general considered to be superior to tertiary prevention, but we believe that preventive efforts should move along all three fronts simultaneously or successively in the case of most disorders. Relative to the range of problems in question, Schechter, Tousseng, Sternlof, and Pollack (1972, p. 143) conclude with this observation:

We wish to underline the great number and variety of prenatal, perinatal, and postnatal factors which have been related to neurological, intellectual, emotional, and behavioral disturbances later in life. At the present state of our knowledge we know how to prevent or alleviate many of these factors, while others are still totally beyond our control. More should be done to make sure that what is known is applied in the case of all expectant mothers and their newborn babies. Prevention is at all times superior to rehabilitation after the damage has already occurred. The research done so far stresses particularly the importance of adequate maternal medical care during the pregnancy and of adequate medical attention to the infant during the first weeks of life.

Prevention may be approached individually or collectively. At the individual level this will involve the gradual acquisition of an awareness and appreciation of the importance of the multitude of known environmental factors which adversely affect pregnancy outcome and/
or child development. These must be avoided or eliminated at all costs. If for any reason this proves to be impossible, it then becomes imperative to discover means of minimizing their noxious effects.

Collectively, prevention will involve other efforts. It may be possible to enhance pregnancy outcome or child development by means of community organizational efforts designed to assist local populations both in an attempt to alert them to the presence of high risk conditions and methods by means of which they may be eliminated or their effects minimized and to simultaneously indicate the relevant directions to consider in an effort to positively influence maternal and child health.

In order to prevent obstetrical complications, and the various physical and social psychological conditions related to them, certain broad-ranging structural and functional changes in the sociocultural, political, economic, and educational spheres are clearly called for (Adler 1968; Douglass 1971). At the minimum, these would include the following:

1. Societal control of certain demographic dynamics or conditions involving unchecked population growth and concentration with their inevitable consequent competition for adequate living space, nutrition, health facilities or services, and so forth.

2. The elimination or control of environmental deterioration involving sources of food, air, water, and soil pollution.

3. The elimination or control of pathogenic conditions of environmental stimulation involving sensory restriction and sensory bombardment.

4. The elimination or control of poverty and all of its correlated effects that adversely affect health and development.
5. Changes in "out group" socialization (learning) processes within the dominant culture involving collective attitudes and behavioral responses toward the minority groups and the socially disadvantaged. The reference here, of course, is to ethnocentrism--one variant of which is white racism.

6. Changes in certain "in group" socialization processes occurring within the minority groups and the socially disadvantaged portions of the population involving various cognitive and behavioral patterns which appear to be maladaptive as far as health and development are concerned.

7. Changes in the formal and informal organization of the medical care system and methods of financing and delivering medical care. It is imperative that all segments of the population secure adequate preventive, diagnostic, and treatment services consistent with positive physical and mental health.

8. The opportunity to secure a meaningful education which not only equips individuals to function effectively in the sociocultural, political, and economic orders, but also sensitizes them to health risks and various methods by means of which they may enhance their state of physical and emotional health (and that of their offspring) at all stages of development.

9. The systematic manipulation of the mass media--and especially television and radio--in order to regularly alert the population of the potential adverse effects on pregnancy outcome and child development of a wide variety of factors such as inadequate prenatal and postnatal child care, poor nutrition, the importance of maternal health (both emotional and physical) during pregnancy, the risk associated with maternal age and parity relative to pregnancy outcome, smoking during the period of gestation, the hazards of unprescribed drugs (legally and illegally obtained) during pregnancy, and so forth.

10. The opportunity to secure meaningful employment which is consistent with long-term security and the objectives of positive physical and emotional health.

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11. A full range of tertiary preventive services designed to rehabilitate any individual, or group of individuals, unfortunately afflicted with specific physical or psychological disorders which limit or impede health and/or development.

In short, prevention is the responsibility of society at large, various components of the total population, and individuals making up specific sub-groups representing the disadvantaged and those who are potentially capable of helping them overcome their problems. Strong central (federal) government control will be necessary to bring about the multiplicity of changes that appear to be called for in the political, economic, health, communications, and educational sectors of society in order to make prevention a reality.

The interrelated set of factors indicated above suggests some of the directions to consider relative to prevention approached from a collective or social point of view. Prevention is always a very desirable objective, but in many cases it is beyond the capabilities or resources of any given individual or small group of individuals. Nevertheless, individual awareness and understanding of the various determinants of health and pathology can be of substantial importance if effectively acted upon.

The prevention of obstetrical complications, and their various correlated pathological outcomes, is absolutely essential for adequate individual and social development. Perhaps, then, it is true—-as William James (1890), Sigmund Freud (1920), and Otto Rank (1929)
have suggested--that man's most dangerous journey in life involves the descent down the intrauterine birth canal at the periphery of two worlds, the internal and the external.
APPENDICES
Appendix A

Letter to Principals

To:

From: Dominic Amante
Clinical Psychologist, MA

Re: Research Project on Perceptual-Motor Handicaps

Your school has been selected as the site of a research project which may have some important educational implications. Briefly, we are screening children for the presence of perceptual-motor handicaps which, in many cases, are closely related to certain academic learning disabilities such as reading problems.

The study will involve the individual testing of 4th and 5th year children by a qualified clinical psychologist during regular school hours. A random sample of such children will be selected with the help of the Office of Testing and Evaluation and the Center For Educational Studies (CES). Since the children will be tested individually, it will be necessary to provide a quiet, well-illuminated and well-ventilated space (such as a vacant office or classroom).

Prior to the actual testing, I will contact you and deliver a set of large manila envelopes with the names of the children to be tested on the outside. Each envelope will contain a cover letter to the parents, a questionnaire for the parents to complete, and a self-addressed, stamped envelope to mail the questionnaire directly back.
to CES. You are requested to give the manila envelopes to the teachers to distribute to the children in class before they go home for the afternoon. Hopefully, the teacher will encourage the children to have their parents return the forms as soon as possible. If by chance some of the children return the completed questionnaires to the teachers, he/she should simply hold them until I arrive or turn them in to the office. If any parent contacts the school to request that their child not be tested, I should be notified when I arrive. Past experience has indicated that this is rare, but if it happens, the child will not be tested.

Shortly after the questionnaires are received at CES, I will come to the school to test the randomly selected children. The testing will be brief, requiring no more than 5 to 8 minutes per child. If possible, I should meet with the teacher immediately prior to the testing to answer any questions he/she may have. Then two children will be removed from class to be tested. As one child completes the test, he/she will immediately be returned to class with the request that the next scheduled child be sent for testing. It will not be necessary to specifically prepare the children for the testing except perhaps to mention to them the morning of the scheduled testing that a man will be coming to school that day to "play some interesting games" with some of them. Normal school routine can go on as usual and all of the children can probably be tested in one day. If some of the children are absent, I will return later to test them.
When testing is completed, a confidential report letter will be mailed to those parents who returned questionnaires. This letter will strongly encourage the parents to communicate the test results to the school in order to provide the teacher with some relevant feedback pertaining to the children in his/her classroom. In addition, a special report letter will be provided you which will specify the empirical results obtained (i.e., the scope and magnitude of the problems discovered), and a series of recommendations about the means by which such problems can be further diagnosed and treated at home and in school. Finally, if requested, I will return to the school after the research project is completed (very likely in the early winter) to confer with you, the teachers, or the staff as a whole.

I would appreciate it if you would explain the research project to your teachers of 4th and 5th year children. If there are any questions, please feel free to contact me at the Center For Educational Studies, 110 Ionia Ave., N. W., Grand Rapids (456-4780).
Appendix B
Introductory Letter to Parents

Dear Parents:

We are conducting a study of the drawing ability of children, and your child has been one of those selected. For purposes of this study, a qualified psychologist will come to the school and personally test your fourth or fifth grade child. Shortly thereafter, if you wish, you will be sent a private report letter which explains how he or she performed on this brief (5 minute) examination. This report may be of some interest and importance to you, the school, and the child's doctor. There is no charge for this examination.

If you wish to have this report, please take a few moments to complete the enclosed set of questions and return it directly to me in the self-addressed envelope. The questionnaire results of course will be held in strict confidentiality. If you prefer, I would be willing to talk to you on the phone or meet with you in your home before examining the child in order to help you complete the questions. In any case, please remember that our ability to help children with a variety of problems is dependent upon sound knowledge—which, in turn, is partly based on the accuracy of your answers to such questions.

Thank you very much for your time and consideration.

Yours truly,

Dominic Amante
Clinical Psychologist, MA

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Appendix C

Parental Questionnaire

Date

To be completed by the child's natural or legal mother if possible.

Please print. Circle or check the letter or the correct response alternative wherever appropriate.

1. Name of the child's parents ________________________________

2. Home Address: Number and Street _________________________
   City___________________________ State_________________ Zip Code_______

3. What is the name of your fourth or fifth grade child?___________

4. What is the name of the school he/she is presently attending?  
   ____________________________________________________________

5. Relationship of mother and child: Is she/he

   A. A natural (biological) child
   B. An adopted child
   C. A step-child
   D. A foster child
   E. Other (please explain) ________________________________

6. Who is presently the major breadwinner or source of financial support in the family?

   A. The father
   B. The mother
   C. Other (please explain) ________________________________

7. What is the exact occupational title or job position (or most recent position) of the major breadwinner? ____________________________
8. Briefly describe his/her job duties ___________________________

9. Education background of the major breadwinner (please circle the highest grade or year of school actually completed):
   A. Grade School: 1 2 3 4 5 6
   B. Junior High School: 7 8 9
   C. Senior High School: 10 11 12
   D. Does he/she have either a regular high school diploma, a GED certificate or other equivalent of a diploma (please underline or circle one) Yes______ No______

   E. Years of college, business school, or university training:
      1 2 3 4

   F. Years of graduate school training (or equivalent):
      1 2 3 4 5

   G. Name of college degree(s) earned and field of study_________
      __________________________ None __________________________

10. What is the religion of your family at the present time?

   A. Protestant
   B. Jewish
   C. Catholic
   D. None
   E. Other

11. Who was the major breadwinner or source of financial support in the family at the time the child was born?

   A. The father
   B. The mother
   C. Other (please explain) _______________________________
12. Was the major breadwinner actually working at that time?

   Yes____  No____  Full time____  or Part time____

13. What was the exact occupational title or job position (or most recent position of the major breadwinner) at that time?

   ________________________________________________________________

14. Brief description of his/her job duties_________________________

15. Educational background of the major breadwinner at that time:

   A. Grade School:  1  2  3  4  5  6
   B. Junior High School:  7  8  9
   C. Senior High School:  10  11  12
   D. Did she/he have either a regular high school diploma, a GED certificate or other equivalent of a diploma (please underline or circle one)  Yes____  No____
   E. Years of college, business school, or university training:
      1  2  3  4
   F. Years of graduate school training (or equivalent):
      1  2  3  4  5
   G. Name of college degree(s) earned and field of study________

16. How far had the natural mother gone in school at the time of the child's birth?  Years of school completed____  Degree(s) earned __________________________

17. Was the child's natural father actually living in the home at the time the child was born?  Yes____  No____  If not, please ______________________________
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explain (i.e., mother single at the time; divorced or separated; etc.) ________________________________

18. What was the birth position of this child? Was he/she the first born child, the second born, the third born, etc. ________

19. How many children were actually living in the home at the time this child was born? ________

20. Were there any problems or complications of pregnancy with this child? Yes___ No ___. If there were, please explain _____

21. Were there any problems or complications during the process of labor or birth? Yes___ No___. If there were, please explain ________________________________

22. What is the birth date of the child's natural mother? ________

23. In terms of your (the natural mother's family background, who was the major breadwinner in your family when you were a small child?

A. My father
B. My mother
C. Other (please explain) _______________________

24. What was the exact occupational title or job position (or most recent position) of the major breadwinner at that time? ______

25. Briefly describe his/her job duties ______________________________

26. Educational background of the major breadwinner in your family as a child (please circle the highest grade or year of school actually completed):
A. Grade School: 1 2 3 4 5 6

B. Junior High School: 7 8 9

C. Senior High School: 10 11 12

D. Did she/he have either a regular high school diploma, a GED certificate or other equivalent of a diploma (please underline or circle one). Yes___ No___

E. Years of college, business school, or university training:
   1 2 3 4

F. Years of graduate school training (or equivalent):
   1 2 3 4 5

G. Name of college degree(s) earned and field of study__________
   ____________________________None__________
Appendix D

First Follow-up Letter

Dear Parents:

Your child was recently tested by a psychologist during the course of a comprehensive community study which dealt with the prevalence of perceptual-motor problems. You may recall the introductory letter and questionnaire which was earlier distributed in conjunction with this research project.

We would like to encourage you to complete the questionnaire and to mail it into the Center For Educational Studies at 110 Ionia Ave., N.W., Grand Rapids, Michigan if you have not already done so. Bear in mind the fact that your responses to the questionnaire are strictly confidential. Shortly after the questionnaire is received I will look up your child's test record and send you directly a private report letter which relates to his or her performance in the area of perceptual-motor development. We believe that this information may be of substantial importance to you as a parent.

If you have misplaced the original questionnaire please contact the Secretary at the Center For Educational Studies (Phone Number is 456-4780). Leave your name and address and request that a new questionnaire be mailed to you.

Thank you again for your time and cooperation.

Yours truly,

Dominic Amante
Clinical Psychologist, MA
Appendix E
Second Follow-up Letter

Dear Parents:

Recently your child, along with several hundred other children, was randomly selected from a class list and briefly examined by a Clinical Psychologist in school. The Psychologist administered a short instrument to your child which measures visual-motor (eye-hand) functions, and the test used is known to be a relatively sensitive indicator of neurological dysfunction or brain damage (a physical problem). It would probably cost somewhere between $20 and $40 to have your child subjected to a comparable examination by a private practitioner.

This procedure led to the identification of several dozen children who unfortunately appear to be characterized by a mild or serious neurological handicap. Such problems usually make it difficult for a child to adequately learn in school, and they may be associated with a host of other symptomatic indicators such as hyperactivity, brief attention span, distractibility, speech problems, clumsiness, impulsivity, and so forth. These problems are largely of an involuntary nature, and the child (and most adults) do not even realize in fact that a problem exists. It is entirely possible to help a child overcome such problems once he or she has been successfully identified. This may involve the use of medication, specialized forms of education (such as
"perceptual training") and new techniques of home management. I should state the obvious: If these problems are not detected--and in some cases it is entirely possible that they will not be recognized--the child continues to experience difficulties and very likely will eventually drop out of school (because of the associated learning problems) and, as a result, live his/her life out in poverty or semi-poverty conditions.

We have offered you a chance to learn something about your child which may be of rather obvious importance to his or her future. In turn, we have requested that you take 10 or 15 minutes of your time to fill out a carefully designed questionnaire, which helps us understand some of the background factors associated with such problems. This, in turn, may of course help us to prevent such problems in the future.

At any rate, we believe that we have some vital information about your child which, as a parent, you should be aware of. At this point we are concluding the original research project and we will not contact you again. If you are interested in a report of your child's performance on the psychological examination, you are requested to complete the original questionnaire and to mail it in as soon as possible. If you have misplaced the questionnaire please contact the secretary at the Center For Educational Studies, 110 Ionia N.W., Grand Rapids, Michigan 49503 (Phone 456-4780). Leave your name and address and request that a new questionnaire be mailed to you.
Thank you very much for your time and consideration.

Yours truly,

Dominic Amante
Clinical Psychologist, MA
Dear Parents:

Your child was recently tested by a psychologist at school during the course of a community study. We would like to take this opportunity to report the results to you.

Your child was given a very brief psychological test in which he/she was required to draw or copy some designs. The ability to accurately copy such designs is one indication of the child's capacity to effectively use his eyes and hands together in a coordinated fashion. Failure to copy the designs in a reasonably satisfactory manner may indicate the presence of some problem in this area of development. Problems such as these may make it difficult for a child to properly learn to read or write in school. In many such cases the source of the difficulty is physical in nature and is the result of various health problems on the part of the child or his mother during the period of pregnancy or after birth. These problems may include various complications of pregnancy, labor, delivery, sickness, illness, or accident during early childhood, and so forth. You must bear in mind that the results of our testing or screening are very tentative and should be checked further if you have serious questions about his or
her performance in this area.

The results of the testing indicate the following:

1. Your child does ____ or does not ____ seem to have a problem in the coordinated use of his/her eyes and hands.

2. His/her performance in this area is ____ or is not ____ normal.

3. The problem in question, if present, appears to be mild ____ or serious ____.

If a problem is indicated, you would be well advised to have it checked further. You might also seriously consider informing the school of the child's ability in this area. In particular, the child's teacher should be aware of his/her eye-hand functioning. You might inform the school simply by turning this report letter over to them to add to your child's file.

Thank you again for your time and consideration.

Yours truly,

Dominic Amante  
Clinical Psychologist, MA
Appendix G

The Ethics of Social Scientific Research

Kelman (1972) observes that the increasing utilization of social scientific research, and its correlated relevance to both social decision and public policy, has led to a widespread concern about the ethical implications of such research activity. This concern is particularly acute in the case of research dealing with the socially disadvantaged—that is, with the poor and minority group members of the population.

All of the social sciences—including sociology (American Sociologist, 1968) and psychology (Casebook on Ethical Standards of Psychologist, 1967; American Psychologist, 1973; APA Monitor, 1973; Ethical Principles in the Conduct of Research With Human Participants, 1973)—have codes of ethics dealing with such varied issues as privacy and confidentiality, the protection of human research subjects, testing procedures, and so forth. It is tempting to conclude that the major concern is with the various ethical issues bound up with empirical research dealing with human subjects in various sectors of the social order. However, there may be other points to consider. Dorn and Long (1974), for example, have recently argued that the Code of Ethics of the American Sociological Association is in large measure an artifact of professional group activity. Their analysis suggests that the code is a formalized statement reflecting the concerns of the professional
sociological enterprise, the interests, values, and roles of individual sociologists, and a collective professional desire to effect a satisfactory compromise between ethical and scientific imperatives. More specifically, their central thesis is that the code is a function of professionalism and, at least in part, represents an interrelated set of norms or strategies designed to maintain or enhance the image of the discipline as a "value-free" scientific enterprise, to preserve status and facilitate upward social mobility, and to protect the discipline (or individual members of the discipline) from external threats and pressures capable of undermining or destroying private interests and professional autonomy.

It is ironic to observe that the very codes designed to protect human subjects often fail to do so and, directly or indirectly, encourage an approach to data gathering and data utilization that can be employed to rationalize or legitimize a highly stratified social order wherein the socially disadvantaged are systematically exploited by the existing elites (Becker and Horowitz 1972; Galliher 1973). Many of the problems center around what Kelman (1972, p. 991) refers to as a "power deficiency" characterizing the subjects of such research both in terms of their position within the social order and in the research situation proper:

In sum, the subjects in social research tend to be drawn disproportionately from the disadvantaged segments in the society, from the lower status positions in the organizations

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in which the research is carried out, and from the less affluent and powerful communities in the national and international systems. Their power deficiency within the social system places them at a disadvantage vis-à-vis the more powerful agencies that sponsor and conduct the research. It increases their vulnerability with respect both to their recruitment as subjects and to their treatment in the research situation.

Because of this marked power deficiency, the disadvantaged are at substantial risk of being exploited, subtly or not too subtly. In the typical case, the disadvantaged have neither the power to define the nature of the problem selected for study or the methodology or research strategy invoked to confront the problem. They have little or no control over the selection of research subjects. Nor do they have the expertise to interpret the obtained research data and to utilize it to their own advantage. These problems become particularly serious in the case of research programs involving the systematic study of social problems or deviant behavior, in which case there is a definite tendency to ascribe the problems revealed to the disadvantaged themselves or to characteristics or attributes inherent in the state of social disadvantage, rather than to the social or environmental conditions encompassing them (Valentine 1968; Ryan 1971). According to Kelman (1972, p. 1000), the problems have become so serious within some black communities that many blacks have developed a definite suspiciousness and fear of social scientific research:

They are afraid that responses of blacks (e.g., on children's achievement tests) may compare unfavorably with those of whites (because of biased instruments or for other reasons),
and that these findings may then be used to their group's disadvantage in the formulation of policy decisions. The basic concern here, actually, is with the product of the research and the social uses to which it is put . . . .

It is interesting to observe in this connection that one of the nation's leading medical researchers in perinatology--Dr. Benjamin Pasamanick (1971)--has reacted very strongly to the policy and ethical implications of a recently published research study (Amante, et al., 1970) dealing with the ecological distribution of CNS pathology in children. The study in question is similar in many respects to the research project represented in this dissertation.

There are limits to the extent to which the power deficiency of the socially disadvantaged can be minimized or eliminated, but Kelman recommends that social scientists make definite efforts to approximate these objectives within the framework of a model he refers to as "participatory research." Among other things, this model calls for the active involvement of the disadvantaged in all decision-making phases of research, for an increase in the sophistication of potential research subjects, and for the provision of countervailing power relative to the relationship of subject to investigator. A number of procedures are recommended to overcome the power deficiency of the socially disadvantaged including the exploration and utilization of various role-playing techniques, the treatment of all subjects or respondents as if they were elite interviewees, and the extension of action research designed to cope with some of the problems confronting the disadvantaged. He further
recommends the institutionalization of ethical concerns in the technical training of potential social scientists, the establishment of integrated committees representing both the research sponsors and the disadvantaged which would carefully review research proposals in terms of their implications for the socially disadvantaged, strict adherence to the ethical codes of conduct for researchers that have been adopted and utilized by various professional organizations, and procedural techniques or methods of accountability by means of which the disadvantaged can assert their power and cope with scientific investigators when they believe that their rights as human subjects have been violated or otherwise abused. All of these procedures are recommended as a means of coping with what appears to be an obvious ethnocentric bias in the design and conduct of much social scientific research and for countering the power deficiency of the disadvantaged when they are involved in such research. The model of participatory research is, in short, advocated as a means of overcoming the power deficiency of disadvantaged research subjects, for increasing their power over social scientific studies, over the questions or problems to which such research is directed, over the selection of subjects, over the methodology employed, and over the utilization to which the research findings will be put.

This dissertation may be seriously criticized at several points within the framework of ethical considerations indicated. For example,
the study does not even represent an approximation to the type of participatory research advocated by Kelman. Rather, an authoritarian, elitist approach to the area of study was taken. The investigator drew up the original research proposal without the consultation of parties representing the socially disadvantaged. This proposal was submitted to an interdisciplinary dissertation committee at Western Michigan University and approved at that level. Arrangements were then made with a research organization in Grand Rapids, Michigan--the Center for Educational Studies--to execute the study in the local public school system, again without benefit of consultation with individuals or groups representing the poor and minority group families involved in the study.

The children selected for study had no control over the decision to test or not to test them in school. Rather, they were simply expected to conform to the research design in its essential features by submitting to the testing when indicated. Further, in most cases their parents did not have any control over the process, in spite of the fact that all of the parents or guardians were alerted by letter of the projected testing. Prior to the actual study, it was decided to test all of the children randomly selected unless their parents explicitly requested that their child not be tested. This occurred very infrequently, and for this reason the great majority of children selected for study were tested as planned. It is probable that many of the parents may have preferred not to have their children tested, in spite of the fact that they did not
always make this apparent to either the investigator or to the school personnel. The research design utilized is insensitive to this possibility. In short, little concern is evidenced with either the needs or preferences of the children tested or with the parents or guardians of the children. Clearly, the children are tested for reasons that are of importance only to the investigator, the members of the dissertation committee, and to the sponsoring research agency. The parents did receive a report letter if they took time to complete a detailed questionnaire which was mailed into the Center For Educational Studies, but in many respects they were probably ill-equipped to deal with the report letter and its various implications. Generally speaking, the procedures followed are legally permissible, according to personnel at the Center For Educational Studies, but they are clearly questionable from an ethical point of view. It was assumed that some benefit could accrue from the study in that it represented an attempt to screen large numbers of children for what appears to be a serious problem, to alert their parents and the school personnel in an attempt to initiate a more comprehensive diagnostic assessment coupled with the relevant medical and educational intervention strategies designed to cope with the problems revealed. It is questionable, however, if these objectives were actually realized in the great majority of cases or if they are sufficient to offset the ethical problems indicated.

There is also the problem of stigma (Goffman 1963) attaching
to the diagnosis of CNS pathology or its symptomatic correlates. Rather than serving to initiate a positive diagnostic and treatment approach to the child, as initially envisioned, the parental and school reports may in some cases have led to an unfortunate tendency to unfavorably categorize the child (or the social group of people he/she represents) and to initiate a self-fulfilling prophecy (Rosenthal and Jacobson 1967).

As indicated earlier, Pasamanick (1971) felt that some of these problems or potential social consequences were so serious—particularly the possibility that racists could systematically distort the findings and utilize them to justify the continued exploitation and oppression of blacks—that he believed the original article (Amante, et al., 1970) should not have been published. This position was rejected by Amante (1971) in his rebuttal to Pasamanick, however, on the grounds that the failure to confront such social problems tended to perpetuate the status quo (which clearly appears to be unfavorable as far as the socially disadvantaged are concerned), because it would tend to retard the type of comprehensive preventive approach advocated in the original article, and because it conflicted strongly with a widespread set of scientific value standards calling for the relentless pursuit of truth or knowledge. It is interesting to observe in this connection that various other social scientists—such as Oscar Lewis (Winter 1971), Daniel Patrick Moynihan (Valentine 1968), and Arthur R. Jensen (Deutsch
have confronted similar (and in many respects considerably more serious) problems centering around their inter-ethnic group research. Hans J. Eysenck (1971) has recently addressed himself to many of the issues involved. The Preface to Jensen's (1972) recent text is a classic document dealing with these problems and with the various social and political repercussions such research may engender. Clearly, research with the socially disadvantaged is fraught with serious problems, both ethical and methodological.

There is one aspect of the present research project which appears to be particularly questionable from an ethical standpoint. The reference here is to the second follow-up letter which was sent to parents who had failed to return their questionnaires. This letter, written independently by the investigator without benefit of council from any of the dissertation committee members or the staff at the Center For Educational Studies, is abominable. Its tone is dogmatic and coercive. Further, it alludes to various potential outcomes of CNS pathology which are more in the nature of research hypotheses than well-established and universally agreed upon empirical facts. Fortunately, very few such letters were actually sent out, but that is beside the point. The tone of the letter itself is enough to warrant serious concern.

In view of the fact that very few second follow-up letters were sent to parents, and still fewer returned, a detailed statistical analysis of the questionnaire results and their relation to performance on the
Bender Gestalt is precluded. However, it must be acknowledged that coercive research approaches such as this may have an effect on various parameters of behavior or performance exhibited by the research subject(s), at least within an experimental situation (Adair 1972; Schapp 1972). Cox and Sipprelle (1971) have recently reported one such study involving the role of insight, defined as the verbal capacity to define the stimulus-response contingencies in operation, in the operant conditioning of heart rate (acceleration and deceleration) utilizing undergraduate students as research subjects (Ss). The Ss were required or coerced to participate in the experiment as part of the requirements for their course of study and were rewarded by an increase in their final grade. Actually, their report involves the results of several pilot studies. The combined data from three separate studies indicated that mean heart rate change increased significantly over trials for two of these groups. Group one was composed of volunteer Ss who were verbally reinforced, and group two was made up of Ss who were both verbally and monetarily reinforced. Their results indicated that a third (coerced) group verbally reinforced did not differ significantly from a noncontingent control group, neither of these groups indicating any learning or significant differences in mean heart rate. The authors conclude (Cox and Sipprelle 1972, p. 728):

It would appear that the practice of using coercion, however mild and disguised, to secure research subjects should come under scrutiny as a possible error in the design, conduct, and

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generality of research.
The available data, limited though they are, therefore suggest that some (if not all) coercive research practices should be avoided both on ethical grounds and for methodological reasons.

In summary, it seems clear that the present research project violated various ethical concerns at several points. A more appropriate design would take these various problems into consideration at the stage of the research proposal and discover a satisfactory method for coping with them, probably by means of attempting to approximate the model of "participatory research" advocated by Kelman (1972).
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