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ABSTRACT

Compared longitudinally were effects of biological risk and social influences on the physical, psychomotoric, cognitive-linguistic, disability, adjustment, and academic domains of 1,008 children at eight stages between 3 and 6 1/2 years of age. Over 20 tests such as physical measurements and the Preschool Attainment Record (PAR) were used. Some of the results showed that in the physical domain perinatal risk affected criterion performance then disappeared by 44 months; that in the psychomotor domain no perinatal risk data were present after 36 months, although social class effects were evident from 36 months on; that in the cognitive domain perinatal risk influenced scores of tests such as the PAR communication measure at 36 months then disappeared, whereas social class effects were significant; that high verbal attainment emerged early, established a trend by 4 years of age, and correlated with maternal permissiveness, high educational level, and favored (white rather than black)status; and that low verbal attainment established more slowly and correlated with opposite findings. The results had implications for intervention before 3 years of age and identification of potential for school success or failure. Results of findings on seven disability states of 810 children, 4 years of age, indicated no or low incidence of hearing and visual impairment for both low and high perinatal risk groups, and higher incidence of speech and behavior disorders, and experiential deprivation in the high risk group than the unexpectedly high incidence in the low risk group. (MC)

THE NATURAL HISTORY OF 1008 INFANTS IN THE READINESS YEARS

A Final Report
to the
National Institute of Education

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PART ONE

EARLY DEVELOPMENT

In recent years there has been a revival of interest in young children. To some the earliest years represent an opportunity to intervene in the cycle of deprivation; to others young children represent a vital stage in the cognitive development of the species (Tizard, 1970). To another group the early years present an opportunity to study and identify the origins of learning problems. For all points of view the common point of reference is the presence of a body of empirical knowledge on the course of early growth. The St. Louis Baby Study is an attempt to understand the processes of cognitive and physical maturation from birth into the school years. The studies have emerged from a rational commitment more than a decade ago to conduct a prospective longitudinal inquiry covering the preschool years. The program is broadly conceived in the hope of shedding light on both focal and peripheral matters. The basic theme of the inquiry is acquisition of materials which will contribute to an understanding of achievement in middle childhood. More particularly, it is an attempt to build a body of knowledge of use in explaining the cognitive skills particularly relevant to classroom experiences.

The nexus of biological familial and social influences on growth presents some challenges to inquiry. The methodology of child study in the very young is invariably a process of individual case studies. Family cooperation requires that data collection be conducted under careful supervision. The interrelation of these premises is delicate, leading to serious commitments by all concerned. The appropriate information is quite diverse, with biological data being needed. This concern for the biological domain, in addition to seeing relevance in behavioral data, arises from a conservative position on the role of environment in early childhood and a critical position on the adequacy of current formulations of nature and nurture. Too often what is not clearly environment is rashly construed as heredity (Mittler, 1969). More reasonably one can posit an external environment, man-made events impinging on the growing child, together with a biological environment of prenatal and postnatal nutrition. The biological order in gestation is open to influence for good and ill by the external environment. Conversely, human environments are mediated in their effects by the presence of physiological realities.

The preceding remarks are little more than restatements of the obvious. Yet, they precipitate a series of unanswered questions about the relative influence of the several vectors of change. The extent to which human influences affect cognitive status in the presence of biological influences is a preoccupying question. A further elaboration, the extent to which such influences rise and fall in salience, is equally unclear. Our age has based public planning for the education of the young on a predilection for environmentalism. It seems only reasonable to inquire into the magnitude of effects and the relevant covariants to environmental manipulation. To do so is to seek optimal use of environmental strategies for helping young children. Recently, Shulman (1970) has called for reconstruction of strategies for advancing the efficiency of educational planning. One of his exhortations is that decisions be based on comprehensive pictures of development in the school-age years. The writer has extended that ideological position in 1973 (Jordan, 1973b), asserting that development should be the theme of education.

The inquiries reported in this document take their place alongside a number of attempts to understand the characteristics of children by means of study over an extended period of time. At the moment, there are several investigations under way, each of which is attempting to understand the growth of children in terms of past, present, and future. In 1969 the Office of Economic Opportunity sponsored an Educational Testing Services (ETS) study of growth in the preschool years. The goal of the study was to understand how the preschool years contribute to the cognitive attainment in poor children entering school. The project gathered data in several settings, rural and urban, and in eastern, midwestern and southern regions of the United States. Unfortunately, the ETS study was drastically cut back in 1970. In the United Kingdom Tizard (1966) began study of a large population of children living on the Isle of Wight. Tizard's 1970 (Rutter, Tizard, and Whitmore) report has revealed a number of interesting findings in twenty-two hundred children at ages nine and ten, for the most part. One major finding is that the connection between cognitive retardation and low social class is not confined to large urban slums. The problem can arise in small towns as well as large. Tizard and associates have shown that the situational antecedents to childhood problems can be quite circumscribed; child delinquency and emotional disorders are related to broken homes. Intellectual retardation and underachievement are related to social class. The incidence of disability states in this well-favored population is remarkably high. Using four categories, *intellectual retardation, educational backwardness, psychiatric disorder*, and *physical handicap*, Tizard and associates identified problems in one child out of six; and one quarter of the handicapped had two problems. These figures may be usefully contrasted with those given in Table 80.

The preceding studies have in common the fact that they are recent and were intended to produce significant educational and psychological data over a period of time. Two rather different studies had their origins well over a decade ago. In the late 1950's the National Institutes of Health began the Collaborative Perinatal Study (Berendes, 1966), an analysis of the outcomes of 50,000 pregnancies. According to Fox (1971) the useable cohort is somewhat more than 35,000 cases, and there are two thousand variables available for analysis. The study conducted on a largely decentralized basis, has persisted in the face of many problems. It has produced a number of useful accounts of biological growth (Chung and Myrianthopoulos, 1969). A British investigation with similar intentions was launched about the same time. The National Child Development Study began with identification of 17,000 deliveries. In 1967 Kellmer Pringle, Butler, and Davie reported the developmental status of 11,000 of the children at age seven. A more recent report by Davie, Butler & Goldstein (1972) has examined the status of the children at age eleven, and status at age fifteen is the subject of a 1974 report.

Another British study, The National Survey of Health and Development, started even sooner. In 1946 the Population Investigation Committee began study of five thousand families who had babies delivered in one week in the month of March. Studies by Douglas (1967), and Douglas and Ross (1964), and Ross and Simpson (1971), have reported the development of the children up to adolescence. The subjects born in 1946 are, of course, young adults at the time of writing.

It can be seen that there are several quite active studies of children using large populations and following them over time. In this regard they are similar to studies begun in previous generations. Perhaps Terman's work (Oden, 1968) stands as the classic, following gifted children for several decades. Similarly, the Berkley Growth Study, now in its fourth decade (Eichorn, 1969) has studied several groups of individuals up to the present time. Such studies should not be confused with "follow-up" studies, investigations in which subjects of completed studies are investigated once more. In such studies cooperation of subjects is often fortuitous and the opportunity for distortions in results due to sampling problems is considerable.

In recent years studies of lesser magnitude than the U. S. and U. K. studies of very large populations have appeared. They are based on recognition of the value of developmental data in studies of cognitive development. In Scotland, Drillien's program of study has examined the effects of prematurity on the growth of children from birth into the elementary school years (Drillien, 1963, 1964, 1968, 1969). The Washington University studies on anoxia (Graham, et al., 1962; Ernhart, Graham, and Thurston, 1960; Corah, 1965) have maintained a theme of concern for the effects of perinatal oxygen deprivation. Jordan's St. Louis Baby Study (Jordan, 1971a) is an attempt to relate social and biological data to sequential stages of development in the preschool and elementary school years. A group of one thousand infants, and the subject of this report, has been followed for several years. Finally, it is helpful to consider a fourth study of medium size. For the past several years a group of scientists in Baltimore (Hardy, 1966) have been studying the effects of an epidemic of rubella on a cohort. This work is interesting because of the cyclic nature of rubella and the probability of the problem recurring in the next few years.

In addition to programmatic inquiries there has been a growing series of studies directed at studying the connection between stages of development. Versacci's (1966) dissertation related a series of paranatal factors to reading skills for two hundred children in the fifth grade. Similarly, Balow's (1969) work has examined the educational outcomes of development in children originally enrolled in the Collaborative Perinatal Study. Phase I of the Early Developmental Adversity Program (Jordan, 1964) found an educationally significant relationship between paranatal data and educational data in elementary school children. Similarly, Edwards (1966) was able to relate birthweight and Apgar scores describing five physiological traits at birth to mental and motor performance at age four. In perhaps the most extensive study of early developmental stages Bell, Weller, and Waldrop (1971) have found that high intensity behavior in infancy is related to low intensity of behavior at nursery school age.

An aspect of these studies is their explicit orientation to the value of data from the earliest stages of development. Further, there emerges an interest in the study of characteristics without the kind of manipulation of events stereotyped as the only kind of worthwhile research. The relationship of this trend to naturalistic research is not clear. In part the machinery of Government interest in early development provided an impetus to study of children in the preschool period. That progress had antecedents in the work of Pasamanick and Knobloch (1960) and others (Anderson, 1955) who had identified a number of illuminating elements in child development. In most cases findings emerged from nonmanipulative inquiries, investigations in which nature rather than science assigned experiences to children.

A highly related aspect of the interest in correlating child development at various stages between infancy and adolescence has been the implicit use of large populations. Some of the more important influences on child development are quite rare, for example, the toxemias. Investigators have monitored large populations with two particular considerations in mind. First, the identification of rare conditions, and second, preservation of samples of adequate size over periods of time. From these two observations other insights into strategy may be elucidated. First, relatively little work exists to guide investigators in the selection of conceptual models for studying populations of children (Blum, 1962; Heinrich, 1964; Schaie, 1965). Second, equally scarce have been statistical models for evaluating data in a fashion fully responsive to the passage of time as a critical dimension (Gottman, McFall, and Barnett, 1969; Werts and Linn, 1970; Murray, Wiley, and Wolfe, 1971). Third, few investigations have emerged to assist with crucial problems of manipulating phenomena in diverse realms, e.g., neurological data as predictors, and educational data as criteria. All too often rigorous data in the investigator's own domain is related to less than best data in another domain. Fourth, the procedural aspects of developing data in different realms and at different times (Hoffman, 1969) have been rarely discussed (Huessy, 1967).

From the preceding observations it can be seen that the context for connecting development of children at different stages consists of a varied assortment of procedures, ideas, and analyses. The alternatives tend to present themselves to investigators in the order of problems about (1) procedure and data gathering, (2) formal experimental design, and (3) statistical manipulation. In fact, this is an unfortunate arrangement; all three topics are reciprocal in their implications, and the nexus they form may be glimpsed in the commentaries of Kodlin & Thompson (1958); Thomas, et al., (1960), and Schaie and Strother (1968). For the purposes of this discussion it is helpful to begin with (1) formal experimental design, considering next (2) statistical manipulation, and then (3) procedures and data gathering.

(1) Experimental design: There are three general approaches to the study of children's development over a period of time. The first and most appealing is the *retrospective* approach, which has been analyzed elsewhere (Jordan, 1967, 1971). The basic strategy is identification of a group of individuals with a characteristic of particular salience, e.g., mongolism (Ingalls, Babbott, and Philbrook, 1957; Chen, 1969), behavior problems (Wolff, 1967) and cerebral palsy (Eastman, et al., 1962). The previous histories of the probands are traced and the cause of their condition is thereby discovered. Procedurally, reconstruction of events between the early state, *ad hoc*, becomes a very uncertain enterprise. Wenar (1963) and Neligan and Prudham (1969) have demonstrated that mothers' memories of early development are selective, and generally unreliable in cases of abnormal development. At a more basic level the retrospective inquiry starts with dependent variables and then searches for independent variables. The probability is high that a Type I error will occur. In that process a correct hypothesis of no difference will be rejected (Bailey, 1958). Yarrow (1970), Jordan (1967), and Klemmetti and Saxen (1967) have shown that outcomes of retrospective technique are not the same as those reached prospectively. Despite its problems the retrospective approach to studying human characteristics over time is attractive and individuals still propose to conduct them (Silver, 1970). The economics of money, time, and energy it profers are very appealing (Jones, 1967). Taulse and Headman

(1969) have suggested that the use of multiple contrast groups can increase the probability of avoiding errors when making conclusions from retrospective data.

The second type of design is the *prospective* study. In such quasi-experimental designs (Campbell and Stanley, 1966) probands are identified by means of the independent variable and followed, together with contrast cases, through a period of natural time in a series of dependent samples (Thomas, et al., 1960; Baltes, 1968). Drillien's studies of Scottish premature babies have yielded a picture of development from birth to school age (Drillien, 1964, 1969, 1970). Moore's (1967, 1968) investigation has reported development in a group of London boys and girls up to age eight years. The program from which this report emerges has examined two birth cohorts (Jordan, 1964). The second cohort, one thousand babies, has been examined at intervals of six months for several years. The advantages of the approach are considerable. Questions may be refined with the passage of time, and data of a sort not necessarily available in existing records or through testing on a single occasion may be generated. The hazards are formidable. Gross outlays of money, energy, and time are called for. The entire enterprise may be compromised before completion by a variety of events. Sample shrinkage may be unmanageable and fiscal crises unavoidable. Very large prospective studies are particularly susceptible to such hazards, the ETS 1969 and Collaborative studies referred to previously being prime examples. Nevertheless, prospective studies are undertaken from time to time, despite the hazards (Butcher, 1970).

A third approach is to view the span of development, that is, time as a dimension manageable by simultaneous and independent sampling at various ages or strata (Baltes, 1968). The technique is appealing when contact with a population cannot be sustained through natural time. Cederblad's (1968) demonstration of intellectual decline in Sudanese children was possible because she studied children from ages seven to fifteen years simultaneously. Disadvantages lie in the need to have all questions formulated before data gathering. In addition, subjects born at different times may not have the same developmental baseline (Schaie and Strother, 1968). That is, they may have been exposed to highly dissimilar and transient experiences such as epidemics and social disturbances. Baltes and Nesselroade (1970), and Hilton and Patrick (1970) have recently offered highly technical criticisms of this approach.

(2) Statistical considerations: One of the realities of child behavior is that it is complex, arising from multiple causes, and occasionally, without cause or purpose. A description of behavioral status, accordingly, rests on a mass of information drawn from many sources. The basic information may, in turn, be manipulable in other forms as measures are segmented and combined, e.g., dichotomized and used to create cell contingencies. Analysis of variance has proved to be a powerful tool for analysis of data; however, a more flexible

technique for studying large amounts of data in numerous independent categories is multiple linear regression. Introduced by Bottenberg and Ward (1963) the technique has been elaborated by a series of commentaries (Cohen, 1968, 1969; Darlington, 1968; Kelly, Beggs, and McNeil, 1969). A statistical requirement met by the technique is the need to manipulate many variables simultaneously. A further advantage is that non-linear relationships among independent variables may be explored (Jordan, 1971g). A basic justification for use of linear models to study developmental data has been presented by Werts and Linn (1970), while Cohen's (1968) commentary points to the wider applicability of the multilinear approach. An example of applying multiple regression to developmental data may be found in Wilson, Parmelee and Huggins' (1963) analysis of low birth weight, and in Blatt and Garfunkel's (1969) analysis of intelligence test scores of poor children.

(3) Data gathering: To some extent the options for considering data have been considered in the immediately preceding sections on design and statistics. However, those observations touched on information as formal data, and left unconsidered the strategies for gathering information and using it.

In research on development the process of gathering information too often begins with searching clinical records (Burt, 1968; Spitzer and Cohen, 1968). Two problems which immediately appear are first, the value of information in records. The expression "file drawer" research is invidious, and with reason. However good case records may be, they were generated for specific purposes and to answer specific questions. It is unlikely that they can help answer all inquiries. Second, an orientation to clinical records tends to modify questions into propositions which are answerable with the data on hand. It follows that information which is available may take priority over the intellectual substance of a question; the result is first-rate data for second-rate questions.

Virtually all styles of inquiry contain the option to gather data from subjects. Common to all is the need to gather the best data. With captive populations such as students continuous access to subjects is feasible. With non-captive populations, that is people who volunteer or move to another city, acquisition of data is more difficult. Personal interviews and individual testing may be possible, but use of mailed questionnaires and telephone calls may also be needed (Droege, 1971). Hochstims's (1967) analysis suggests that the three methods are practically interchangeable in terms of validity and utility. Less manageable is the matter of public attitudes. Testing of all kinds is viewed with suspicion in some quarters. Entire segments of the population may decline to cooperate in periods of social unrest and strife. At a more sustained level a lack of interest on the part of parents and suspicions of possible interference are encountered (Moore, Hindley, and Faulkner, 1954). Such attitudes can lead to withdrawal of cooperation and an end to data gathering. A sampling bias is easily produced since withdrawing subjects are often quite different from those who continue to provide information. Equally, people who agreed initially to cooperate may be very different from those who declined at the time a study population is formed (Baltes, 1971).

Ecological Aspects of Development

To some extent consideration of child development in the contexts of nativism and the family can be considered traditional and tidy. While key concepts are related to other concepts they tend to be not unmanageable. On the other hand appreciation of child development tends to become more diffuse and uncertain when the matter is pursued in the larger context of society. To some extent the ambiguity is due to complexity; however, it is also due to haziness in some of the concepts. The matter is well illustrated in the matters of race, social class, and poverty, a nidus whose consideration while popular tends to be clouded.

There are a few subjects as likely to evoke a loss of objectivity in both the man in the street and the social scientist as the topics race and ethnicity. At one end there arises a perception that race is biology, pure and simple, while at the other a tendency to collapse all differences into "culture" is equally misleading. People can be markedly different in ways that are obvious, such as color, and in ways which are more clear to themselves, such as speaking a minority language. In such cases the differences, self-perceived and perceived by others, tend to be associated with differences in performance measured against a conventional standard (Dreger and Miller, 1960; Jensen, 1961; Rieber and Womack, 1968). In the United States the most common form is the academic performance of black children, a condition in which low attainment is commonly encountered. However, the earliest years of such children tend not to reveal basic differences. Cross cultural study indicates that children of wholly black ancestry, urban Bantu infants, tend to be ahead rather than behind urban white children (Griffiths, 1969; Liddicoats, 1969). Black immigrants in Britain are typically a year retarded in language development (Seidel, 1967) and do poorly on standardized tests (Payne, 1969). The social antecedents to these findings are not surprising. Hood et al. (1970) found that one year-olds in the London inner district of Paddington lived under conditions of considerable family adversity. Their parents were originally rural in background, for the most part. The children lived in crowded conditions averaging 3.3 persons per room. Pless and Hood (1967) have shown that black West Indian immigrants tend to experience unstable marriages. Oppé's (1964) analysis showed widespread anemia and rickets in the same population; Stroud (1964) has reported a high incidence of West Indian children among burn cases. Maternal prenatal health tends to be poor (Hood et al., 1970), although there is an interesting lowered incidence of pre-eclamptic toxemia, according to Barron and Vessey (1968).

The situation of West Indian blacks and Pakistani immigrants is the same. Their social and educational maladaptation in cities such as the industrial city of Bradford, Yorkshire, is clear. In many respects the condition of Pakistanis in Bradford is like that of Irish immigrants in the same city one hundred years earlier. Richardson (1968) has shown that among the Irish nineteenth century rates of illiteracy, infant mortality, tuberculosis, drunkenness, and crime were very high. Today, the same group shows these traits no longer, occupying essentially the same social strata as the general population of Yorkshire towns, that is, working class (Jackson and Marsden, 1966). Biology does not change, suggesting social factors as the probable mechanism. In the case of non-anglo immigrants in Britain the social factors probably have special effects unlike those in North America. Mittler and Ward (1971) have concluded that negative social factors have an earlier and stronger effect on child development in Britain, a finding the writer's experience is inclined to confirm.

In the United States it is the case that social factors operate to the detriment of blacks, primarily. Robinson (1967) has reported that negro women account for 11.3% of live births, but 17.4% of fetal deaths. The preponderance of lower social class membership affects the health of black women and their babies. Hendricks (1967) has reported that reproductive accidents decline among black women as social class level rises. Scottish data provided by Baird and Illsley (1953), and Drillien (1968) demonstrate that low social class membership increases the incidence of true prematures and small-for-date infants. Even so, Naylor and Myrianthopoulos (1967) were led to believe that white babies may be heavier than black babies for unknown reasons.

In recent years Jensen's (1969) remarks have raised once more perennial questions about the basis of observed differences between ethnic groups. The matter seems no better comprehended than in previous considerations. Light and Smith (1969) have found a *social allocation* model of influences on intelligence to be useful. In their analysis they accepted Jensen's proportions of IQ variability. The social allocation model, which uses differential social experiences as a hypothetical source of variability, explained a substantial proportion of IQ variance. A common flaw is the reductionist error of labelling all processes which are not responses elicited by environment as heredity. A more profitable alternative is to consider them *native* tendencies, vectors of developmental behavior which may or may not be completely autonomous. By that label the relatively obscure processes of prenatal growth may be treated with respect. That is, the early processes of growth involving genetic materials may be acknowledged; the environmental-hereditary basis of those processes then emerges as a question of substance rather than disappearing in the swift and erroneous conclusion that genetic mechanisms are immune to environmental influences. Prenatal growth retardation cannot be defined as genetic although it occurs in the absence of the normal range of environmental influences. The uterine environment provides hazards to development as well as constituting the optimal site. The placenta (Gruenwald, 1963) is a biological support to life, but it is also environmental. The effects of late-pregnancy growth failure (Warkany, Monroe, and Sutherland, 1960; Dignam, 1967) are seen in mental retardation post-natally. Equally opaque are the effects of early pregnancy complications in the form or viruses (Monif, Hardy and Sever, 1966; Gitnick, Fuccillo and Sever, 1968) although the effects are clear several years after delivery (*N.Y. Times*, 1969). An increasing body of information in the school years (Lytton, 1968) points to the contribution of biological factors to learning disorders in children. The relationship, as explored by McNeill and Wiegerink (1971) tends to be generalized, although the antecedent factors to children's problems are becoming clearer (Rossi, 1964).

Biological Aspects of Development

To some extent learning problems are predictable in the preschool years. Neligan and Prudham (1969) have shown that ages for walking and talking in sentences are useful prediction of cognitive ability at school entry age. At an earlier age anoxia associated with delivery tends to produce lower cognitive attainment in subsequent years (Graham et al., 1962; Ernhart et al., 1963).

Measures of blood oxygenation are not automatic indices of trauma in the case of anoxia (Caldwell et al., 1957). A broader picture of early damage is available through use of Apgar's (Apgar, 1953; Apgar and James, 1962) system for evaluating the physiological state of infants. Five physiological signs rated in the first few minutes of life post partum yield a score of ten for babies in optimal condition. Scores of six or less are usually indicative of a clinically poor state (Gleiss and Holderburg, 1963; Klatskin, McGarry and Steward, 1966; Shipe, Vandenburg and Brooke Williams, 1968). Apgar (1958) has reported a mortality rate of 15% in babies with scores of two or less.

Low birthweight has emerged as a significant indicator of development in children. Eaves (1970) identified depressed scores on the Griffiths scale of intelligence at eighteen months. At four years, however, the effects were less clear, a finding corroborated by Babson and Kangas (1969), and to a lesser extent in a recent British study (*Report*..., 1971). At seven and eight years of age normal intelligence was the rule for just over one thousand prematures studied by McDonald (1967); however, she found an abnormal incidence of low intelligence. At eight to ten years of age Wiener et al., (1968) found that intelligence test performance was generally satisfactory, although the Bender-Gestalt test revealed some differences. Lubchenco et al., (1963) analyzed development at age ten of a group of babies under 1500 gm. Two thirds were found to have neuropsychiatric problems associated with their small birthweight. Drillien's

(1969) prematures under 2,000 gm. showed tendencies to disturbed behavior and lowered academic competence. Of course, prematurity does not operate in a cultural vacuum. A variety of studies (Drillien, 1963; Wor , 1963; Wiener, Rider, and Oppel, 1963) have related prematurity to development by means of social class. The effect is largely to depress levels of attainment. This is particularly the case among the smallest premature infants whose postnatal course is adversely affected by growing up in lower social class homes. In recent years birthweight above the optimum, which Rantakallio (1968) has put at 3200-4700 gm. for deliveries in the fortieth week of gestation, leads to adverse effects. Babson, Henderson, and Clark (1969) have found an above average incidence of low intelligence in children with birthweights above 4250 gm. Large babies were more like small babies than average size babies in the distribution of Binet IQ's at age four years. It seems likely that the relationship between birthweight and development is curvilinear (Jordan, 1969); low birthweight leads to poor cognitive attainment in a disproportionate number of children, average birthweights leading to no effects, and high birthweights depressing performance once more.

It is probable that we will see an alternative to birthweight as a measure of neonatal development. In theory, gestational age is more accurate, but it is not always easy to calculate. Recent French research suggests that it may be possible to establish gestational age by studying reflexes and muscle tone, and Italian research (Petrussa, 1971) suggests there are developmental indices of gestational age. Weight has proved useful, however, and will probably continue to be employed on pragmatic grounds.

A broad picture of perinatal status and its meaning for subsequent growth has been provided by Jordan (1971b). A series of categorically defined abnormal states were related to growth in the first two years of life. Multiple complications prove most likely to affect physical and cognitive development.

Family Aspects of Development

A part of the complex of growth is the matter of nurture. Life style is altered by extreme income limitations; concern for the future and the corresponding broader notion of a rationally controlled way of life is not possible when the press of circumstance is felt immediately. The result is a life style oriented to the moment, with the demands of the future being remote. Patterns of nutrition are radically altered by poverty, with poor food selection and unwise expenditure of money as the chief causes. The effects of malnutrition are particularly critical among the very young, where irreversible damage may be produced. Winick and Rosso (1969) have reported significant brain weight reduction and protein supply in Chilean children succumbing to malnourishment. Rosenbaum et al., (1969) have reported that proteinuria among pregnant women produced lowered intelligence at age four years in fifty-three children. At a less critical level poor eating patterns such as missing breakfast have an obvious effect on the responsiveness of children; their powers of concentration are reduced and they are less capable of sustained interest.

Another of poverty's effects on children is the simple matter of inadequate clothing. Wet, cold feet, together with a degree of malnourishment can lead to poor school work among even the brighest children. North (1970) has reported that eighty percent of the health problems discovered in Headstart children were not previously known or treated.

Within the last year there has arisen a degree of attention to a problem which illustrates the interaction of social and biological problems. Metal poisoning is on the rise (Hicks, 1970; Lyons, 1970; Chisolm, 1970; Becker, 1970). Plumbism, lead poisoning, is particularly attracting attention since it is a danger to many children. Chisolm (1970) has estimated that ten to twenty-five percent of children who live in older, deteriorated housing are susceptible, with two to five percent probably showing "...manifestations compatible with intoxication" (p. 598). The research program which is the topic of this proposal has discovered several cases of apparently toxic levels of plumbism in the 1966 birth cohort at age three.

Still another byproduct of poverty is its effects on the structure of the family. Poor black and Puerto Rican families have been characterized as matriarchies. Their instability and poor nurturance compound the effects of other problems. Bandler (Pavenstedt, 1967) has drawn a picture of families in which children's needs are less important than parents' needs, and in which parents' roles have not become stabilized. Maternal health is often not good in poor families. Children suffer in several ways. First, they are born to mothers who tend to conceive earlier, a finding documented in England (Fitzherbert, 1967), Scotland (Baird and Illsley, 1953), and in the United States by the writer. As a group they have a higher incidence of pregnancy complications and premature births (Fairweather and Illsley, 1960). As issue of lower class mothers, their biological adversity is compounded by social adversity (Wortis et al., 1963; Drillien, 1970; Jordan, 1972).

Lower class mothers tend to act in consistent ways, with results that are not always beneficial. Hess and Shipman (1965) have listed the ways in which four year old children of lower class mothers are affected by maternal life style. They state that such children tend to respond to status rather than to logical strategies when coping with problems; they are compliant and non-reflective, and see matters in a greatly fore-shortened time perspective. Summarizing five major longitudinal studies Rees and Palmer (1971) emphasize the role of parents' occupational and educational level in the attainment of children on standardized tests of intellectual development.

The age at which the range of hypothetical influences impinge on child growth in the first four years is the subject of a series of reports by the writer, (Jordan, 1971e, Jordan and Spaner, 1971) and is extended in the substance of this document, which studies growth at ages three to six. Being very young does not preclude infants from responding to opportunities. Moffitt's (1971) babies were quite capable of subtle discrimination of speech sounds at age six months. Work on infants conducted by Hansen (1971) in Norway shows that qualitative deprivation in the form of institutional rearing continues to present a picture of delayed development. The findings are consistent with those presented three decades ago in the Iowa studies on differential effects of institutional living. In such cases the absence of warm, sustained relationships and stimulation retard human development. On the other hand, the presence of stimulation is not always beneficial; it depends on the nature of the stimulation and on its style. Klaus and Gray (1968) have shown that there is no shortage of stimulation in poor homes; the difficulty is that it is on the order of noise rather than signal, i.e., it is not constructive stimulation. Finally, poverty's heritage of disorganization leads to patterns of neglect. It is clear from a large amount of research (Aserlind, 1963; Bing, 1963; Marge, 1967; Honzek, 1967) that a home which is child-centered and stimulating plays a vital role in helping young children reach their potentials for cognitive attainment and language skills. The earlier children are exposed to benign stimulation and develop a sophisticated life-style, the better the course of their cognitive growth (McFie and Thompson, (1971).

Social class differences in levels of child development are well known. The term itself is not without ambiguities, but it tends to consistency. Most techniques for measuring SES level incorporate the level of education and the occupation of the breadwinner. In some contexts, particularly those where social class is unusually significant, an old name and family connections may lead to under-assessment of life-style. The reverse can occur, and there are families known to social agencies as multiproblem families. For such groups, for example the North Point families described by Pavenstedt (1967), social mobility often means a downward drift, to the detriment of the children. It seems to be the case that the social class level of families influences young children largely in the negative, (Jordan, 1971e) producing inhibitions in attainment. Such overt influences are not always present in the first year of life (Jordan and Spaner, 1970), but they seem to be clearly established by the end of the preschool years. To some extent social class influences operate more powerfully than ethnic group. Stodolsky and Lesser's (1967) research shows that differences in social class level persist within a variety of ethnic groups, Chinese, Negro, etc. Freeberg and Payne (1967) believe that social class differences tend to express themselves through parental language stimulation. In addition to parental language behavior social class differences are exhibited in styles of control exerted over children. Authoritarian patterns of interaction with children tend to be inhibiting. Jordan's (1970) research and that of Ernhart and Loevinger (1969) shows that authoritarianism is quite related to social class; as social class level rises authoritarianism declines, providing a less inhibiting atmosphere for childrens' explorations of the world.

From the preceding discussion it can be seen that study of child development in the preschool years suggests that answers may be available to questions about the course of growth. When children are afflicted with learning problems the value of tracing patterns of growth is increased. A full picture of the antecedents to disability status provides a basis for understanding strengths and weaknesses which children show. Equally significant is the opportunity to relate intervention strategies to differential patterns of growth. Jordan and Spaner (1970) have shown that development at age one year is not particularly influenced by ecological data. At two years Spaner (1970) has shown that environmental variables have a modest role in cognitive attainment. At age three Palmer (1970) has shown that social class is not as great an influence on development as is commonly believed. Yet, it is well known that Headstart youngsters, e.g. kindergarten age children, differ in cognitive attainment, physical state, and academic readiness (North, 1970). Only data covering the full spectrum of preschool growth offers an opportunity to grasp how (e.g.) environmental influences exert their control on developing children. Implicit in this observation is the idea that the process of differentiation among preschoolers leads to various patterns of aptitude. It does so by eliciting different cognitive styles from cultural contexts (Stodolsky and Lesser, 1967) and also by elaborating biological propensities. In the latter instance sensory problems leading to special class placement may be increased, and minor problems of central dysfunction (Haring, 1969) may be elaborated.

In the case of emerging patterns of strength and weakness for learning the matter of time applies. Some children will appear to fall behind or move ahead in development earlier and later than others. Study of the full span of early development can identify the patterns of attainment for various groups of children. To some extent the St. Louis Baby Study inquiries are doing this. The writer (Jordan, 1971) has developed a picture of growth in several groups of children from birth to age six years (1972-3). The realtive points of difference in patterns of growth show the way in which forms of physical and cognitive growth advance and decline over time. Presumably a picture of development in several special populations through the full span from birth to school age would indicate the point in time at which inflections in growth curves would emerge. Intervention strategies could then be timed rationally; that is, treatments could be initiated at several different points in time as different groups of children, biological states, social groups, etc., begin to exhibit the deviations towards which special education programs are directed.

The substance of this report is a contribution to that end. In this document evidence is presented on the comparative influence of biological risk and the social circumstances of life at ages three to six. The influence of these elements on six aspects of development are presented and discussed. In addition, a set of observations based on a statistical description of preschool children, their homes, and social circumstances. A third and final item is an appraisal of the nature and extent of disability states, together with an analysis of correlated and antecedent factors.

PART TWO

PROCEDURES

Introduction

The procedures of the investigation arise from the larger context of longitudinal study and the data of this report are continuous with preceding studies. Over a decade ago the writer began studies of the role of early biological and social data on the learning styles and capacities of elementary school children. More recently, a study cohort of 1008 newborns was established in 1966 after several years of prior analyses of issues and procedures. They have been described elsewhere (Jordan, 1963, 1964, 1967, 1971), and are discussed in Part Two, Early Development. The 1966 cohort was constituted as a non-random sample of births, in order to make sure that a substantial amount of biological *risk* cases could be assembled (see Table 1).

Insert Table 1 about here

Study of the issues of this report, but at an earlier age, have been reported elsewhere (Jordan, 1971b).

Procedures

For each of eight ages, 36 - 78 months after delivery, a criterion series of measures was established, *first*, by domains of child development, and *second*, by means of specific and appropriate measures within domains. Training procedures were established to bring caseworkers to a criterion level of competence and consistency within formalized procedures. Practice testing drew on children in private preschool agencies who represented the range of social characteristics in the cohort. Simultaneously, a process of searching addresses began, and all addresses in the study population were subjected to validation. This aspect of study is important; the 1966 cohort is a non-captive population, and negotiations with subjects' families are complex and repetitive. For example, about fifty percent of the black families studied in the summer of 1971 changed their addresses. The waves of urban migration are generally not this intense, but the summer 1971 experience illustrates how difficult and taxing the procedural aspect of longitudinal study can be. In virtually all instances the summer 1971 black migrants moved a short distance. The dynamics of research among lower class black and white families begin with acceptance of the fact that migration is frequent, and is often undertaken to suppress knowledge of families' whereabouts.

After practice-testing and preliminary tracing were completed caseworkers began the process of final tracing and making appointments. In addition, selection of examiners for out-of-town cases began. In some cases children were tested by examiners who had seen them in their homes on several previous occasions. In other instances examiners met families for the first time, due to changes of caseworkers. We have developed a pool of experienced examiners in urban centers, largely in the United States, but overseas in a few cases, in the course of a dozen testing periods. Tests were administered in homes, with test administration monitored by supervisors and by means of weekly staff conferences. Test results were monitored for completeness of detail, and prepared for data processing. At the time of writing the research program has accumulated two hundred and fifty items of information on the 1966 cohort; the information is available on magnetic tape and is stored in a 370/165 computer, together with standard statistical analytic packages.

Subjects

The children examined in this report are the traced, cooperative portion of the 1966 cohort at either one of two half year anniversaries of birth. The 1966 cohort of 1008 infants was not random, but contrived, in order to guarantee selected perinatal risk cases. Accordingly, the 1966 cohort of 1008 was fifty percent biological risk, and fifty percent non-risk, i.e. the next *seriatim* case in the same hospital* and meeting the criterion series given in Table 1. The criterion series is noteworthy because it is categorical; that is, risk status is not completely defined by degree of insult. Current factors which are either in the child or in the mother were employed. Some were very clearly related to insult, e.g. low Apgar (Apgar, 1953; Apgar and James, 1962; Apgar et al., 1958) or low birthweight (Drillien, 1963, 1964, 1968, 1969, 1970; McDonald, 1967). Others were contextual, i.e. being born to a very young woman, or to a woman at the end of the childbearing period. Still other factors were predisposing, as in the case of issue born to women with a history of pre-eclamptic toxemia.

Use of a categorical predictor series is a rational choice over degree of insult as an index of *risk*; there are two reasons. One is the need to test hypotheses which incorporate both mild and severe risk since consequences of severe risk are relatively well grasped. The second arises from the decade-long purposes of the investigation, which transcend the confines of a given stage of preschool development, looking to relate early development with and without biosocial *risk* to school status. In this connection it is

*Five hospitals used in 1966 to obtain a range of social class and race.

likely that the optimal value of *risk* data for educational purposes will arise from development of a set of *educational risk* factors. They should be discrete rather than continuous variables, which can be related at some future date to indices of school readiness and, hopefully, school achievement. In that context early developmental data need to be manipulated as relatively discrete items of information in order to be of use in planning instruction.

The number of subjects in prospective study is a topic whose complexity is generally underestimated. The 1966 cohort contained 1008 subjects, and the subjects of this study are the available subjects at eight study periods. The general stereotype is that the number of subjects in a prospective study declines in proportion to the passage of time. In the case of the 1966 cohort the picture is not that simple. The explanations are as follows. Prospective longitudinal study, by definition, covers a span of time. Within the period there may be rises and falls in availability of probands. One source of reduction is the death of children. There have been about a dozen deaths in the 1966 cohort, most due to accidents, and occuring in lower class children, black for the most part. Another source of variability in study populations followed for a period of years is public opinion. Prospective longitudinal research is affected by the socio-political state of affairs. Dr. Martin Luther King's death drastically reduced cooperation in black families. Since that time there has been a restoration of emotional tone and, further, there has been a rise in popular interest in child study. An additional element is that there is a critical number of study contacts between caseworkers and families which, once reached, facilitates subsequent contacts. A rise in the competence of research staff at tracing elusive but rarely uncooperative families occurs. This is a matter of skill at interviewing neighbors, developing cooperative relationships with community agencies, and establishing a sense of trust in a network of third-parties, relatives for the most part. Another point is the variation in patterns of mobility. Distance in the form of moves over long distances has not generally been a source of attrition. There are currently about seventy families living in various parts of the country. The few abroad no longer provide data. Some families have remained at a distance, and have been tested in their own homes by local examiners, typically graduate students. Others have returned to the community on visits and have been tested in the metropolitan area. Generally, long-distance moves have been made by middle-class employees of large corporations. These people tend to volunteer new addresses and to keep in close touch.

The result of all these influences has been to refute the stereotype of prospective longitudinal study as a process of cohort attrition, with consequent sampling distortions. Table 2 shows that the number of cases examined has been quite substantial, even at the last study period. Actually, there has been a rise in the number of four-year olds tested, when compared with the three-year olds. The four and five year olds-eighty to eighty three percent of the birth cohort-is actually slightly higher when expressed as a proportion of live, cooperative cases. However, the numbers in Table 2 use the

Insert Table 2 about here

birth cohort (N = 1008) since that figure is more fundamental. A minor reason is that any other smaller, more recent figure, e.g. the number of cases at six months, would be invalid. There is the occasional experience that a child is found after several years who has not been seen since birth; such children were traced at ages 54 and 66 months (For an extended review of the procedural aspects of longitudinal study see Jordan, 1971f).

The procedural aspects of tracing and testing are considerable. The 78 month data in this report constituted the 13th contact with the population, and there have been nearly sixty five hundred data-taking sessions with individual children (N=6462).

At thirty-six months, the first data-taking period of this report, a reorganization of the cohort by experimental factor groupings was undertaken in order to increase the proportion of workers applied to the target population for tracing and testing. Cases were reviewed by factor groupings, Controls and *risk* cases, and assigned according to the size of the predictor status groups to winter or summer testing populations. Table 3 shows the assignment of the large groups, Controls and Factor III cases, to both testing groups on the basis of a random assignment. Factor II cases were few, and they were assigned entirely to the winter testing group. Factor IV cases were assigned entirely to the summer group.

Insert Table 3 about here

It is now appropriate to consider the *risk* factor groups in Table 1 which are, in fact, the independent variable of this investigation*. The first experimental category, Factor I, *risk*, covers the gestational states of *risk*. Some of them are manifestly biological aberrations while others reflect predisposition to reproductive inefficiency. The second category is complications of delivery, Factor II. In this group are disorders of presentation and expulsion of the fetus. Factor III describes adverse perinatal states in the infant. Factor IV is the presence of multiple *risk*, i.e. aggregates of Factor I, II, or III. In the 1966 birth cohort at six months most Factor IV cases were combinations of Factors I and III combinations of prenatal complications with attendant complications in the child. Almost as many were instances of delivery and child complications.

*It is helpful to point out that a series of studies using a different, larger predictor model has been conducted parallel to the studies reported here and in Jordan (1971c), and Jordan and Spaner (1974).

The control cases were the aggregate of next cooperating cases, *seriatim*, in the hospitals where experimental cases were delivered. Knowledge of the risk status of probands is not included in the information given to caseworkers since it might well provide a source of examiner bias when testing. An additional safeguard against distorted test results was the matching of examiner and child by race (Sattler, 1970).

Tests

The domains of development used from thirty-six to seventy-eight months of age with cohorts T_6 to T_{13} are summarized in Table 4.

Physical Domain: Height in inches, weight in pounds, and head circumference in centimetres were obtained by direct measurement of the children under standardized procedures. Measurement was recorded to the nearest quarter of an inch or pound, and to the half centimetre.

Psychomotor Domain: Two subtests of the *Preschool Attainment Record* (Doll, 1966) (PAR) were employed. They were the PAR *Ambulation, Manipulation* sections which when summed yield a third, *Physical* score. The Ernhart (Graham et al., 1960) *Copy Forms Test* was employed in order to assess psychomotor proficiency. The test consists of eighteen pictures composed of line drawings ranging in complexity from straight lines to geometric figures. Hand and eye preference were assessed by simple tasks to establish degree of lateral dominance.

Cognitive-Linguistic Domain: Measures employed were the PAR *Communication* subtest and the Peabody Picture Vocabulary Test, Form A & B (Dunn, 1965). *The Boehm Test of Basic Concepts* (Boehm, 1969) and Caldwell's (1970) *Preschool Inventory* were administered. The latter consists of four subtests, (1) *Personal-Social Responsiveness*, (2) *Associative Vocabulary*, (3) *Concept Activation-Numerical*, and (4) *Concept Activation-Sensory*. Two subtests of the Illinois Test of Psycholinguistic Abilities (Kirk and McCarthy, 1969) *Auditory Association*, and *Digit Span*, were employed. The WPPSI *Vocabulary* subtest and Wepman's (1958) Auditory Discrimination Test were also employed.

Disability Domain: A *Disability Screening Instrument* was devised to identify problems. Test scores were used as objective bases for recording information, together with occasional instances of abnormality observed during interviews.

Achievement Domain: The *reading* subtest of the *Wide Range Achievement Test* (Jastak, Bijou, & Jastak, 1965) was employed.

Adjustment Domain: The Spaner & Jordan (1971) *Child Behavior Inventory* was used.

Three procedural points may be noted about testing. The Preschool Attainment Record is basically a Vineland-like structured interview. In the present investigation every effort was made to turn inquiry items into performance items. For example, inquiry into *hopping* was pursued by having the children hop. This procedure was applied to several items. Another point arises from the Ernhart Copy Forms. Scoring this test is a delicate task, and raises serious problems of reliability; scoring was performed by one person*. All tests were administered close to the relevant anniversary of birth, but not necessarily on the exact day. At ages three to seven birthdays can be quite exciting, and visits by examiners may be both unwise and unwelcome. The average delay in testing was only two or three days, while testing preceded the anniversary slightly in a number of cases. Three, out of town testers were recruited from universities and local school systems. By child age six years this had become a stable, nation-wide group of examiners.

Insert Table 4 about here

The criterion measures just described are summarized in Table 4, by study group and by domain. This table also lists the number of cases tested at each study period. One measure which remains to be described is the social class score. The occupation, level of education, and income source of the head of the household was scored in the manner developed by McGuire and White (1955). In this system a theoretical range of scores exists from 14 - 84. The scores are so arranged that a low McGuire and White score means *high* SES level. This fact should be kept in mind because a number of correlation coefficients in Tables 59, 61, 66, 68, 70, 72 and 74 show *negative* associations. The negative signs reflect the McGuire and White scoring system, not the relationship between the constructs under consideration. The mean McGuire and White scores and standard deviations are presented in Table 7; review of those data over the postnatal period of development is presented in Part Four, RESULTS. For the purpose of reviewing procedures it is helpful to consider the mean SES scores and their significance. The grand mean for all subjects at all periods is 55.42. A child with a mean social class score of 55 is lower middle class, blue collar in social level. Such a child and family are described later.

Hypotheses

The hypotheses of the study are essentially null propositions that four categories of early developmental risk and social class are significant influences on child growth as measured in three domains at four ages. The hypothesis of significant influence is examined in a context of children with and without perinatal risk status using the thirty-two measures of attainment given in Table 4.

The statistical model employed was multiple linear regression (Bottenberg and Ward, 1963; Kelly et al., 1969; Cohen, 1969). A regression equation is developed in order to predict a criterion. A critical element is deleted or collapsed and the resulting equation is designated as an alternate or restricted model. The full model is compared with the alternate model, and a F-value is com-

*I wish to express my thanks to Mrs. Ellen Brasunas, Senior Research Assistant, who scored all Copy Form responses under the direction of Dr. Claire Ernhart.

puted for the loss of predictive efficiency traceable to the altered vector. The basic model may be illustrated as:

$$Y_{1-60} = a_o u + a_1 x_1 + a_2 x_2 \ . \ . \ . \ a_n x_n + e$$

where Y_{1-n} = criteria of continuous or discrete data

u = a unit vector which when multiplied by the weight a_o yields the regression constant

$a_1 x_2 \ldots a_n$ = partial regression weights arrived at by multiple linear regression techniques and calculated to minimize the error sums of squares of prediction (Σe^2)

$x_1 x_2 \ldots x_n$ = variables in continuous or discrete form

e = error in predicting a criterion

The basic regression models are presented in tables in the next section The variations seen represent variations of two kinds. First, is the use of two vectors representing experimental status Factor I, *prenatal complications,* and Factor III, *neonatal complications,* at cohort ages (e.g.) 36 months and 48 months. These two experimental factors were replaced at 42 months and 54 months by the experimental risk categories Factor II, *delivery complications,* Factor III, *neonatal risk,* and Factor IV, *multiple complications.* The second form of change was the introduction of vectors representing testing delay from 48 months to 78 months. It is important to note that the hypothetical effects are discussed within regression models which contain a maximum of eight predictive vectors. The critical vectors are the four perinatal risk vectors, the control status vector, and the social class vector. In the case of the experimental vectors all subjects are classified as members of one status group and non-members of all other status groups. Comparisons consist of deleting critical vectors, e.g. social class or test delay in order to test effects, and of collapsing membership vectors, in the case of risk status. All models are linear, since methodological studies by the investigator have shown that nonlinear regression models add little to prediction of early developmental criteria (Jordan, 1971g). Attention is also called to the fact that the statistical significance of regression models is provided against a theoretical value of zero in all cases. The regression models employed as basic or *full* models are listed in all Tables as model one. In virtually all instances statistical significance from zero is clearly established, despite the limitations imposed on the information in the regression models by the use of mutually exclusive membership status categories.

PART THREE

RESULTS

Introduction

The data presented and discussed in this report are numerous and extensive, emerging from several domains of child growth at several stages of development. The principle of organization which underlies the material to be presented is developmental; materials from the several stages of child attainment will be presented consecutively. The same arrangement applies to the Inferential Analysis and Discussion sections of this report.

Descriptive Findings

Sampling

A practical and theoretical question in longitudinal studies is the extent to which sampling error creeps in with the passage of time (Baltes, 1971). In the present investigation data were taken on six occasions at intervals of six months. The total span of development reported began at age 36 months and lasted to age 78 months. The child study periods are, however, labelled in the larger context of data taking which began at birth and continues at criterion age 60 months at the time of writing. The data-taking periods of the investigation reported here are labelled $(T_6)....(T_{13})$, and cover the period of contractual funding. At each of the criterion ages the possibility of distortions arises due to subjects dropping out, being untraceable at any or all ages, or being untestable due to family and health crises.

The materials in Tables 5, 6, and 7 are presented in order to

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Insert Tables 5, 6, and 7 about here

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discuss the validity of the filial cohorts $T_{(6)} . . . T_{(13)}$. The materials in the tables describe the pattern of weight, height, and McGuire and White social scores from birth to the end of the period covered by this report, ages thirty-six to seventy eight months. They may be used as a basis for checking the possibility of subcohorts at criterion ages (T_n) being very different from the original birth cohort. Of the two physical measures grouped by predictor groups weight is the more significant for development. The third element, social class score is also an important predictor; shifts in SES composition of the study subjects - *probands* - over a period of five and a half years and eleven study periods would be a serious source of sampling error, though not an unexpected one.

Weight

Weights of the thirteen study groups (T_1... T_{13}) are shown in Table 5. It can be seen that all groups of subjects, controls and four experimental groups, started life with excellent mean birth weights. The means given for Factor III and IV groups are lower due to the presence of infants with and without additional problems who weighed less than five and a half pounds. The ranges for Factor III and IV groups are wide, and at the bottom end extend down to include infants with birth weights of approximately two pounds; this is a clearly high risk group, as recent British research (*Report* ..., 1971) has once more indicated. Comparison of subjects at 36, 42, 48 ... 78 months indicates that for each study group the pattern of original weight at birth and weight increments *ad hoc* has been mutually consistent, and consistent with the $T_{(1)}$ birth cohort in these characteristics. In examining the tables touching on weight increment for the control cases at birth and in the study periods of this report it should be kept in mind that some experimental groups are unreported as a consequence of the 36 month (T_6) decision to split the study population for purposes of tracing. The pattern of height increments shows essentially the same pattern as weight, leading to the conclusion that the physical characteristics of the filial cohorts (T_6 ... T_{13}) are essentially comparable to each other, and to the original birth cohort (T_1) from which they are drawn.

It is worth pointing out that the preceding statement is not entirely self-evident. At first consideration it is apparent that any filial cohort (T_n) far removed in time from birth (T_1) probably consists of those probands who were reported at an earlier study period. In fact, this is only partly true; the pattern in sampling from the birth cohort (T_1) has included previously reported cases but it has also included cases not reported at the prior dates. In some cases this represents a temporary lapse; however, the act of splitting the study group was highly beneficial, and led to tracing some probands not examined for several study periods. As an example, one child traced and studied at fifty-four months (T_9) had not been seen since birth. He was unavailable for study for seven study periods. This extreme case is given to illustrate the fact that changes due to increases as well as decreases in the number of accessible probands need to be considered in longitudinal study over extended periods of time.

McGuire and White (1955) social class scores at birth given in Table 7 show differential values for the independent variable groups. The control mean of 55.53 is illustrated by a white family living in a five room apartment. There are three children, and the father has a tenth grade education and works as a carpenter. The controls are, typically scattered around a lower middle class mean level. The birth Factor III and IV group means were very similar to the controls. The Factor II group has a lower social class level, represented by a *higher* McGuire and White social class score. The Factor I group birth SES level is still lower, and is about two-thirds of a standard deviation below the controls. This is not surprising since prenatal complications are commonly associated with lower social class membership (Baird and Illsley, 1953; Butler and Bonham, 1963; Fitzherbert, 1963; Drillien, 1968; Hood et al, 1970). Fluctuations in SES level for the filial cohorts $T_6 - T_{13}$ given in Table 7 may be compared with the birth cohort (T_1). It can be seen that the mean SES scores, ranges, and standard deviations of all five predictor groups are very similar. The degree of fluctuation which is at all significant is that encountered in the small Factor II group. The range of scores presented in Table 7 for the filial cohorts is not large. The maximum range is encountered at T_3 and T_5 study periods, with the T_5 group of only four cases being the more deviant. The finding is interesting but not pressing because the T_5 group is not the subject of analysis in this report.

In general, it can be said that the children studied at several intervals between birth (T_1) and age seventy eight months (T_{13}) reveal consistency in physical and social traits representing predictor variables. An initial discrepancy between factor groups at birth in social class level may be observed, but it is merely what can be expected in view of the documented association between perinatal risk and social circumstances.

Thirty-six Months

The T_6 cohort is that portion of the 1966 birth cohort examined three years after birth. It is delimited by the selection of particular subgroups described previously and by the number of the target population actually traced and examined, which was three hundred and eighty.

Birth Weight

The 1966 cohort included infants of low, average, and high birth weight. At birth control infants (T_1) had a mean weight of 7.32 lb. The T_6 mean birth weight was 7.28 lb., a difference of .04 lb. T_1 Factor I infants and T_6 Factor I infants had similar birthweights, 7.08 lb., and 7.24 lb. respectively. T_1 and T_6 Factor III infants also had similar birthweights, 6.75 lb. and 6.93 lb. The data are summarized in Tables 5, 8, and 9.

Insert Tables 8 and 9 about here

Birth Length

The average control baby in the 1966 cohort was 19.82 in. long. The T_6 controls averaged 19.88 in. T_6 Factor I's were 19.52 in. long, which is very close to the T_1 cohort's average length of 19.49 in. The Factor III cases in each cohort were similar also; the T_1 mean length for controls was 19.39 in., and that for T_6 Factor III infants was 19.63 in. Table 6 summarizes the data on length for the cohorts T_1 - T_6 while Table 8 summarizes the T_6 data.

Social Class Scores

The information in Table 8 includes McGuire and White (1955) social class scores. The theoretical range of values is from fourteen, representing the highest social class level, to eighty-four, representing the lowest social class levels. Scores fall as social level rises. For the T_1 - T_6 groups it can be seen in Table 7 that there have been differences in social class level. Control cases have been highest in SES level from the beginning (T_1), and have been essentially consistent to age three (T_6). The Factor I group of infants, those with an associated history of gestational disorders, were lowest in social class level at birth (T_1) and remained close to that point in all study groups to age three years (T_6). Their mean level, was approximately two-thirds of a standard deviation below the level of the controls, emerged from the connection between prenatal health in pregnant women and lower social class membership. The Factor III group, consisting of a heterogeneous group of neonatal problems, was closer to the controls in SES level at birth (T_1) and remained so thirty-six months later (T_6). The T_1 and T_6 means 51.56 and 51.85, are virtually identical numerically, and are identical, functionally speaking. In summary, the thirty-six month cohort, T_6, is identical to the larger birth cohort, T_1. Variation within the filial cohorts T_1 - T_6 was minor, and they maintained statistical consistency within major parameters of development.

Criteria

The significant characteristics of cohort T_6 are the measures of attainment at age three years given in Table 9. At thirty-six months the average height for three hundred and eighty babies was thirty-six inches. Their average weight was thirty-three and a half pounds. More interesting are the measures of functional attainment.

The grand mean score on the Peabody Picture Vocabulary Test (PPVT) was 25.60. At age thirty-six months this yielded a mental age of thirty-four months and an IQ of 95.

Factor III and Control mean scores and standard deviations on the PPVT were quite similar; however, the Factor I mean PPVT value were reduced by about one-third of a (Control) standard deviation. The control mean was 26.04, and the mean of the Factor I cases was 22.81, which yields an IQ of 90. However, the Factor I group also had the lowest SES level (i.e. *highest* McGuire and White score); Table 35 shows that there is a highly significant relationship between SES and PPVT scores, and that may explain the lower IQ scores. Mean values on the PAR *Physical* domain, which is the summed score for *Manipulation* and *Ambulation* subtests, were quite similar for control and both Factor groups of three year olds. Mean *Ambulation* and *Manipulation* scores were similar for all three groups. A third PAR subtest, *Communication*, produced similar mean scores for all three groups.

Forty-two Months

At forty-two months the total number of cases examined was three hundred and fifty-nine. Study of the T_7 cohort shows that the group of three hundred and fifty-nine children was representative of the larger birth cohort.

Birth Weight

The 1966 cohort included infants of high, average, and low birth weight. In birth cohort control infants (T_1) had a mean weight of 7.25 lb. and the T_7 control group had a mean birth weight of 7.30 lb. The difference of .05 lb. is trivial. T_1 and T_7 Factor II mean birth weights shown in Tables 5 and 10 are 7.08 lb., and 7.16 lb., which is also a very slight difference. T_1 and T_7 Factor III mean birth weights, 6.75 lb., and 6.65 lb. are very similar. Finally, T_1 and T_7 Factor IV mean birth weights are also very close, 6.37 lb., and 6.54 lb. Weight is, of course, a significant predictor of development, and the validity of the T_7 filial cohort in this regard is reassuring.

Insert Tables 10 and 10a about here

Birth Length

Equally valid are the T_7 cohort lengths for all groups of probands. Tables 6, 10, and 10a show the essential comparability of the T_1 lengths at birth and the birth lengths of the present cohort T_7, and the dependent cohorts T_2 - T_6.

Social Class

McGuire and White (1955) social class scores developed at birth are given in Table 7 for the birth cohort T_1 and the dependent cohorts. The T_7 controls were very similar to the T_1 group in means and standard deviations. The variation of SES level over the first seven study periods was not great. The Factor II (delivery complications) group has demonstrated a slight drop in McGuire and White SES scores, which means a slight *rise* in SES level. The difference is about five points, or a third of a standard deviation. The Factor III (Neonatal complications) group has been very stable in SES level as Table 8 shows. The highest intra-cohort variation at three and a half years from the control cases is the small Factor II group which is lower by approximately one-third of a standard deviation.

Criteria

The average height of all subjects three and a half years after birth was approximately thirty-eight inches. The average weight was around thirty-two pounds (see Table 11). The mean PPVT score of con-

Insert Table 11 about here

trols yielded a mental age of thirty-nine months, and an IQ of 94. The Factor II group which was quite small, had a lower mean, 24.61, which may be expressed as an M.A. of thirty-five months, and an IQ of 94. The Factor III group had a mean mental age identical with that of the controls, thirty-three months. The Factor IV probands resembled the Factor II's more than the controls and Factor III's. The mean PPVT score for Factor IV cases was 26.86 (M.A. = thirty-five months, IQ = 87). At this age the PPVT mean and standard deviation are 29.28, and 9.66.

Four Preschool Attainment Record subtests were administered. The subtests administered at forty-two months were the *Ambulation* and *Manipulation* tests, which when summed give a *Physical* score. A fourth criterion score was the PAR *Communication* test. Table 17 shows that the scores of controls and three high risk groups were essentially comparable at forty-two months. The sole exception is the slight elevation in mean reported for Factor III.

Forty-eight Months

The children tested at forty-eight months, the T_8 cohort, were the identifiable, cooperating, portion of the study group traced and tested at thirty-six months. At age three and one-half the target population of children located and visited in their homes numbered four hundred and fifteen.

As with other filial cohorts it was advisable to see if the passage of time and attrition of the number of cases had altered the T_8 cohort. Examination of Tables 5, 6, and 7 indicates the nature of height, weight, and social class in the T_1 cohort and Tables 12, 13, and 14 show the values for the T_8 group.

Insert Tables 12, 13, and 14 about here

Social Class

Examination of Table 12 shows the McGuire and White (1955) perinatal social class score of the T_8 cohort, arranged as control, Factor I and Factor III subjects. The mean ranges and standard deviations may be compared with those for the 1966-67 T_1 birth cohort by consulting Table 7. The differences revealed are virtually non-existent. In both the T_1 (birth) cohort and the T_8 cohort the McGuire and White social class scores of the Factor I (gestation disorders) cases are nearly a standard deviation higher than those of the control and Factor III (neonatal disorders) cases, indicating a lower social class origin.

Birth Weight

Birth weights for the T_1 and T_8 groups, shown in Tables 5 and 12, show there is a basic identity in this regard.

Birth Length

Birth lengths are also highly comparable, with identical values for Factor I cases in the T_1 and T_8 cohorts. The significance of these comparisons of social class score, weight, and height at birth is that it shows the representative nature of the T_8 cohort studied at forty-eight months. The T_8 cohort is not altered in its original character from that of the larger T_1 birth cohort, from which it has been drawn. This finding of essential similarity in birth characteristics between filial cohorts and the original cohort T_1 has been observed consistently.

Test Delay

At forty-eight months the problem of tracing highly mobile families had become a high order priority. The possibility of significant delays caused by testing well after the target period around the birthday, about two weeks, was recognized. Table 14 reports the test delay for the three groups of subjects examined at forty-eight months. The largest delay occurred in thr lowest social class group, the Factor I group, who experienced a mean testing delay after the anniversary of birth ($\bar{M}$ = .69 weeks). The correlation for four hundred and fifty-nine subjects between testing delay and social class is low, but it is also statistically significant ($r = .17$, $p < .01$) based on the degrees of freedom available.

Criteria

At age four the average control child weighed thirty-six pounds (36.11 lb.), and most were between thirty-two and forty pounds (sigma = 4.35 lb.). The Factor I (gestational risk) and Factor III (neonatal risk) subjects were about a half a pound lighter with means of 35.50 lb., and 35.48 lb., respectively. The standard deviation values for experimental subjects were similar to those obtained for the controls (4.25 lb., and 4.67 lb.). The heights of the subjects in all three groups were between forty and forty-one inches, on the average, as Table 14 shows. Standard deviations were also similar, being 1.71 inches, 1.88 inches, and 1.91 inches.

The cognitive domain at four years of age was represented by the Boehm Test of Basic Concepts (1969), and the Preschool Inventory (Caldwell, 1970). The group values for the criterion measures are also given in Table 14. Of interest is the generally slightly high values obtained by the Factor III subjects, in comparison with the controls. The lowest set of scores was obtained by the Factor I subjects. The social class scores for the three groups in Table 12 follow the same sequence, however. The order of social class levels begins with Factor III at the top ($\bar{M}$ = 51.17), and is followed by controls ($\bar{M}$ = 55.64), with the lowest level attained by the Factor I group, which had the highest McGuire and White social score ($\bar{M}$ = 65.65).

Looking at the elements of the cognitive criterion series the Boehm test control group results are generally close to those of two experimental groups, and the greater difference is between the two experimental groups. The range of means, 12.77 to 14.27, cannot be interpreted normatively since publishers' norms apply only down to kindergarten age children. Also, only the first twenty-five items of the Boehm Test of Basic Concepts were administered. The reasons were the ascending degree of difficulty and the fatigue of the children. No ceiling effects were encountered due to using the first twenty-five Boehm items.

The results of administering the Preschool Inventory to controls and two biological risk groups are also recorded in Table 14. The total scores are highest for the Factor III risk children ($\bar{M}$ = 33.81, σ = 11.98), followed by the controls ($\bar{M}$ = 31.93, σ = 12.07), and the Factor I group of experimentals ($\bar{M}$ = 29.54, σ = 11.78). This sequence of highest scores obtained by Factor III cases, and lowest scores obtained by Factor I subjects obtains for four of the five Preschool Inventory scores. The exception is for the first subtest, Personal-Social Responsiveness, in which the Factor III group is highest ($\bar{M}$ = 11.27, σ = 3.62); the Factor II group is slightly lower ($\bar{M}$ = 10.88, σ = 3.59). The range for all three means is slight, and the ranges are virtually identical. The grand mean total score for all groups, 31.84, may be interpreted as the mean ($\bar{M}$ = 30) given in the manual (Caldwell, 1970) for a national reference population at age four years to four years and five months.

The motoric domain of child growth was represented by the Ernhart Copy Forms test (Graham et al., 1960), which consists of a series of eighteen line drawings which children reproduce. Performance is scored in several categories including organization, intersection of elements and proportion. The means given in Table 14 for controls is 28.52, which is similar to the Factor III group mean of 30.49. The Factor I mean is a good deal lower, at 24.46. In all three groups the standard deviation and range were similar.

Fifty-four Months

Children studied at this criterion age were examined four and a half years after birth. The T_9 study group was composed of subgroups described at fo·ty-two months. The number of the target population actually traced and examined was four hundred and four and Table 17 shows the number of cases in each experimental factor subgroup.

Study of the T_9 cohort was valid because the group of four hundred and four children is representative of the original birth cohort. Tables 5, 6, and 7 provide an opportunity to compare the characteristics over time of the 1966 birth cohort with an account of the 1971 summer subgroup T_9 presented in Tables 15, 16, and 17.

Insert Tables 15, 16, and 17 about here

Birth Weight

The 1966 birth cohort of one thousand probands included infants of low, average, and high birth weight. At birth control infants (T_1) had a mean weight of 7.25 lb. and the T_9 control group had a mean birth weight of 7.26 lb. The difference of .01 lb. is trivial. T_1 and T_9 Factor II mean birth weights shown in Tables 5 and 15 are 7.08 lb., and 7.10 lb., which is also a very slight difference. T_1 and T_9 Factor III mean birth weights, 6.75 lb., and 6.68 lb. are very similar. Finally, T_1 and T_9 Factor IV mean birth weights are also very close, 6.37 lb., and 6.48 lb. Weight is, of course, a significant predictor of development, and the validity of the T_8 filial cohort in this regard is reassuring.

Birth Length

Equally valid are the T_9 cohort lengths for all groups of subjects. Tables 6 and 16 show the essential comparability of the T_1 lengths at birth and the lengths of the study cohort T_9.

Social Class

McGuire and White (1955) social class scores developed at birth are given in Table 7 for the birth cohort T_1 and the dependent cohorts. The T_9 controls in Table 15 are very similar to the T_1 means and standard deviations. The variation of SES level at nine study periods has been slight. The Factor II (delivery complications) group has demonstrated a slight drop in McGuire and White SES scores, which means a slight rise in SES level. The difference is about six points, or a third of a standard deviation. The Factor III (neonatal complications) group has been very stable in SES level, as Table 6 shows. The same consistency appears in Table 15 for the T_9 SES scores. The highest intra-cohort variation at four and a half years from the control cases is the small Factor II group which has generally been lower by approximately one-third of a standard deviation. At fifty-four months the SES level is closer to that of the controls and Factor III and IV groups. The McGuire and White (1955) social class score for all four hundred and four cases at fifty-four months was 54.20. There is a slight degree of fluctuation between the four perinatal status groups. Controls and Factor III cases tended to be very similar in mean perinatal SES score. Factor II (delivery complications) were lower in SES scores; it is not unexpected, however, since low SES and delivery complications are generally associated (Butler and Bonham, 1963). In contrast, the multiple complication group is slightly higher in SES level, to the extent of one-third of a standard deviation compared with the controls. Test delay at fifty-four months was generally not a problem, although test administrations were delayed as much as eight weeks in one case. For the entire group of T_9 probands the mean delay in testing was .007 weeks.

Criteria

The fifty-four month criterion measures for all four hundred and four subjects show that variability between independent variable groups was slight. The grand mean score on the Preschool Inventory (Caldwell, 1970) was 41.53. The seventy-nine Factor IV group cases had a lower mean of 37.58, and the one hundred and five Factor III group cases had the highest mean, 44.42. The range across groups is seven points. Boehm scores showed consistency between groups around a grand mean of 17.05. Copy Forms scores tend to consistency in range, mean, and standard deviation. The Factor IV mean, 32.66 was lower than the rest. The greatest inter-group range of means was for Factor IV, the lowest, and for the Factor III group, 38.85, which was slightly higher than the controls at 36.65.

Sixty Months

The children tested at sixty months, the T_{10} cohort, were the identifiable, cooperating, portion of the birth cohort which had previously been tested at forty eight months. At age three, one half of the birth cohort, T_1, was established as the target population. The reduction aided location of families by providing more time for tracing and actual testing. The actual number of children located and visited in their homes was four hundred and fourteen. Data are reported for four hundred and four, however. This is approximately eighty three percent of the birth population, the proportion realized in the previous year's study of the same group.

As with all study periods an attempt was made to trace all living members of the birth cohort. The results included contact with a family and child not seen since birth. The occasional discovery of such probands, usually one instance at each of the last several study periods, illustrates well the challenge to techniques of location and the occasionally surprising results. The proportion of control cases was forty nine percent; Factor I cases constituted twenty four percent of the T_{10} cohort; and twenty six percent were Factor III cases. These proportions are identical to those reported at forty eight months.

As with previous filial cohorts it is advisable to see if the passage of time and attrition of cases has altered the T_{10} cohort. Examination of Tables 18, 19, and 20 indicates the nature of the

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Insert Tables 18, 19, and 20 about here

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changes in height, weight, and social class in the T_1 cohort and its successors T_2 to T_{10}.

Social Class

Examination of Table 18 shows the McGuire and White (1955) Perinatal social class score of the T_{10} cohort, arranged as control, Factor I and Factor III subjects. The T_{10} means, ranges, and standard deviations established at birth may be compared with those established at birth for the 1966-67 T_1 cohort by consulting Table 7. The differences are revealed as virtually non-existent. In both the T_1 (birth) cohort and the T_{10} cohort the social class score of the Factor I (gestation disorders) cases are nearly a standard deviation higher than those of the control and Factor III (neonatal disorders) cases, indicating a lower social class origin. The grand mean McGuire and White social class score for all subjects (N = 1008) was 56.19.

Birth Weight and Length

Birth weights for the T_1 and T_{10} groups, shown in Tables 5 and 18 show there continues to be basic identity in this regard. The birth weights are virtually identical in both T_1 and T_{10} control groups. Birth lengths are also highly comparable, with identical values for Factor I cases in the T_1 and T_{10} cohorts. The significance of these comparisons of social class score, weight, and height at birth is that it shows the representative nature of the T_{10} cohort studied at sixty months. The T_{10} cohort is not altered in its descriptive character on developmental variables from that of the larger T_1 birth cohort, from which it had been drawn. This finding of essential similarity in birth characteristics between filial cohorts and the original cohort T_1 has been observed consistently at all study periods.

Criteria

At age five the average control child weighed forty two pounds (41.79 lb.), and most were between thirty five and forty eight pounds (sigma = 5.64 lb.). The Factor I (gestational risk) subjects were about a half a pound lighter than Controls and Factor I cases with a mean of 41.37 lb. The standard deviation values for experimental subjects were similar to those obtained for the controls (6.37 lb., and 5.75 lb.). The height of the subjects in all three groups was forty three inches, on the average, as Table 19 shows. Standard deviations for Controls and Factor I cases were similar, being 1.90 and 1.97 inches. The Factor III group had a slightly larger standard deviation, 2.29 inches.

The cognitive domain of development was represented at age five years by two tests from the Illinois Test of Psycholinguistic Abilities. The number of items passed on the Automatic Vocal Sequential (digit span), and the Automatic Association tests were used. The sixty month data on these and other measures used in the inferential analyses are recorded in Table 20. These measures have been found effective in educational studies of children by Bereiter and Engelmann (1966), and by Jensen (1961).

The WPPSI Vocabulary Test was employed as an additional criterion measure. The group means on all measures for all three groups were generally similar and variations in means were slight, as Table 20 indicates.

The domain of personality and adjustment was assessed by means of the Child Behavior Inventory (Spaner & Jordan, 1971). It is a twenty nine item checklist of behaviors of clinical significance which is filled out by the permanent mother figure. A high score means more difficulties. Inspection of the means in Table 20 indicates that the Factor III and control groups of probands had essentially comparable means, although the standard deviations are dissimilar. In contrast, the Factor I (gestational risk) group had a higher mean score, 6.06, and a wider standard deviation. This indicates, descriptively, a sligihtly higher incidence of parent reported problem behaviors at age five years.

Sixty Six Months

The T_{11} cohort is that portion of the 1966 cohort examined five and a half years after birth. It is formulated as the particular subgroups described previously and as the proportion of the target population actually traced and examined. The total number of children examined was three hundred and ninety two, which is seventy nine percent of the summer group at birth. Table 21 shows the number of cases in each experimental factor subgroup was generally sufficient for statistical analysis.

Study of the T_{11} cohort is meaningful in so far as the group of three hundred and ninety two children is representative of the original birth cohort. Tables 5, 6, and 7, provide an opportunity to compare the characteristics over time of the 1966 birth cohort with an account of the 1972 summer subgroup presented in Tables 21 and 22.

Insert Tables 21, 22, and 23 About Here

Birth weight and Length

The 1966 birth cohort of one thousand probands included infants of low, average, and high birth weight. At birth control infants (T_1) had a mean weight of 7.25 lb. and the T_{11} control group had a mean birth weight of 7.25 lb. The difference in sigma's is trivial. T_1 and T_{11} Factor II mean birth weights shown in Tables 5 and 21 are 7.09 lb., and 7.04 lb., which is also a very slight difference. T_1 and T_{11} Factor III mean birth weights, 6.75 lb., and 6.74 lb. are very similar. Finally, T_1 and T_{11} Factor IV mean birth weights are also very close, 6.37 lb., and 6.53 lb. Weight is, of course, a significant predictor of development, and the validity of the T_{11} filial cohort in this regard is reassuring. Equally valid are the T_{11} cohort lengths for all groups of subjects. Tables 6 and 19 show the essential comparability of lengths at birth and the lengths of the present cohort T_{11}, and the other dependent cohorts.

Social Class

McGuire and White (1955) Social Class scores based on the head of household's educational level, occupation, and source of income, developed at birth are given in Table III for the birth cohort T_1 and the dependent cohorts T_2 - T_{11}. The T_1 controls in Table 7 are very similar to the T_{11} means and standard deviations. The variation of SES level at eleven study periods has been minor. The Factor II (delivery complications) group has demonstrated a slight drop in McGuire & White SES scores, which means a slight rise in SES level. The difference is about eight points, or a half of a standard deviation. The Factor III (neonatal complications) group has been very stable in SES level, as Table 6 shows. The same phenomenon appears in Table 21 for the T_{11} SES scores. The highest intra-cohort variation at five and a half years from the control cases is the small Factor II group which has generally been lower by approximately one third of a standard deviation. At fifty four months the SES level is closest to that of the controls and Factor II and IV groups. McGuire and White (1955) social class level for all cases at sixty six months is exemplified by a family living in a five room apartment. There are three children, the father has a tenth-grade education, and he works as a carpenter.

Criteria

The typical height of three hundred and ninety two subjects at five and a half years of age was forty four to forty five inches (44.65 in.). The average weight at this age was forty three pounds (43.25 lb.). The sixty six month behavioral measures for all subjects (see Table 23) show generally comparable means and standard deviations for all cases. The range of means for the ITPA Digit Span was 11.71 to 12.29 around a grand mean of 12.09 (σ = 3.96). The second ITPA Subtest, Auditory Association, produced a wider range of means, 16.65 to 19.55. The grand mean was 18.28 (σ = 5.14). This last score yields an age equivalent of 65 months according to ITPA norms. The WPPSI Vocabulary had a range of almost three points, from 14.86 for the small Factor II group to 17.83 for the Factor III group. The grand mean for all subjects was 16.24 (σ = 5.07). On the Child Behavior Inventory the group means ranged from a high of 5.71 for the Factor II group to 3.96 for the Factor III group. The grand mean for this test at sixty six months was 4.92 (σ = 3.18). As at previous testing periods the test delay in weeks was recorded and used as a covariant in regression models. Inspection of Table 23 indicates that delay was minimal on the average. In general, the data on criterion measures at age sixty six months for cohort (T_{11}) reveal no great differences in means within the three experimental subgroups and the control subgroup.

Seventy Two Months

At seventy two months the identifiable, cooperating, portion of the birth cohort which had previously been tested at sixty months was tested once more and designated cohort T_{12}. The actual number of children located and visited in their homes was three hundred and ninety six. Data are reported for three hundred and seventy, however. This is approximately forty percent of the birth population, the proportion realized in the previous year's study of the same group. These figures may be appraised by recalling that, as in previous contacts with the 1966-67 birth cohort, an attempt was made to contact all of the original families except those who had withdrawn their cooperation, and in the case of approximately a dozen children those instances where the proband had died.

At seventy two months the proportion of control cases analyzed was fifty three percent; Factor I cases constituted twenty two percent of the T_{12} cohort; and twenty five percent were Factor III cases. These proportions are virtually identical to those reported at forty eight and sixty months.

As with previous sub-cohorts it is appropriate to see if the passage of time and attrition of the sample have distorted the T_{12} cohort. Examination of Tables 24, 25, and 26 indicates the nature of the changes in

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Insert Tables 24, 25, and 26 about here

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height, weight, and social class in the T_1 cohort and its successors T_2 to T_{12}.

Social Class

Examination of Table 24 shows the McGuire and White (1955) Perinatal social class score of the T_{12} cohort, arranged as control, Factor I, and Factor III subjects. The T_{12} means, ranges, and standard deviations established at birth may be compared with those established at birth for the 1966-67 T_1 cohort by consulting Tables 5-7. The differences are revealed as virtually non-existent. In both the T_1 (birth) cohort and the T_{12} cohort the social class score of the Factor I gestation disorders) cases are nearly a standard deviation higher than those of the control and Factor III (neonatal disorders) cases, indicating a lower social class origin. The grand mean McGuire and White social class score at birth (N=1008) was 56.19.

Birth Weight and Length

Birth weights for the T_1 and T_{12} groups, shown in Tables 5 and 24 show there continues to be basic identity in this regard. The birth weights are virtually identical in both T_1 and T_{12} control groups. Birth lengths are also highly comparable, with identical values for

Factor I cases in the T_1 and T_{12} cohorts. The significance of these comparisons of social class score, weight, and height at birth is that it shows the representative nature of the T_{12} cohort studied at seventy two months. The T_{12} cohort is not altered in its descriptive character on developmental variables from that of the larger T_1 birth cohort, from which it had been drawn. This finding of consistency in birth characteristics between filial cohorts and the original cohort T_1 was observed consistently at all study periods.

Criteria

At age six the average control child weighed forty six pounds (46.35 lb.), and most were between thirty nine and fifty two pounds (sigma = 6.46 lb.). The control Factor I (zero risk) subjects were virtually identical in weight to the Factor I and III cases with means of 46.53 lb. The standard deviation values for 72 month probands were lowest for controls and highest for Factor III children, but all three values were similar, ranging from 6.46 lb. to 8 lb. The height of the subjects in all three groups was forty six inches, on the average, as Table 25 shows. Standard deviations for Controls and Factor I cases were similar, being 1.81 and 1.89 inches. The Factor III group had a slightly larger standard deviation, 2.00 inches, an observation also made at age sixty months. A third physical measure of development employed with the T_{12} cohort was head circumference in cm. The three group means, 51.49 cm., 51.70 cm., and 52.19 cm., were very similar, although the controls had a much larger standard deviation (See Table 26).

At age six years cognitive-linguistic attainment of the three groups of children was assessed by means of three tests, the Denver Articulation Test (Drumwright, 1971), the PPVT(B), and Auditory Discrimination Test (Wepman, 1958). Mean performance of controls and the two neonatal *risk* groups was virtually identical, having a span of only 1.26 points. The grand mean for all subjects, 28.35 on the Denver articulation test yields a percentile of 47, according to Drumwright's data, indicating an average level of articulation for the average child. On Wepman's test of auditory discrimination a similarly narrow set of means is observed in Table 26. On Dunn's PPVT, for B, the six year old children produced a rather narrow range of means, the lowest being 54.19 for the Factor I group, followed by 56.21 for the controls, and 57.97 for the Factor III's. The PPVT raw scores for all 370 cases have a grand mean of 56.21. According to Dunn's norms this yields an IQ of 102. From this test score we can observe that the mental test performance of the T_{12} group of children is at the theoretical mean for boys and girls six years of age and so is representative in terms of that particular criterion measure.

The final two criterion measures in Table 26 are mixed lateral dominance and score on the Disability Screening Instrument. The first of these criteria of disability states, i.e. conditions which may precipitate learning problems later, is mixed lateral dominance. When a proband is so identified it means that there was a discrepancy between preferred hand and preferred eye on a standardized task. The Disability rating is based on test score cut-offs plus current observations made while testing children. The means for mixed dominance show that half of the six year old children in each predictor group had inconsistent preferences for right or left hand and eye. The means for the three groups are very similar, with the control and Factor I means being very close, .46 and .47. The third mean, that for the Factor III group was only slightly lower at .41. A more varied picture emerges on the number of disability states. The Factor I group seems most affected with a mean of .32. This mean is three times that of the Factor III's and 50 percent more than that of the controls.

Seventy-eight Months

The last study group to be described in this report is the set of youngsters traced and examined at age seventy-eight months. This is the group of three hundred and seventy-six originally established at age forty-two months as the T_7 cohort. This group is composed of children not at perinatal risk and used as controls, plus gestational risk Factor II cases, Factor III perinatal risk cases, and instances of multiple risk Factor IV. A total of three hundred and seventy children were located and tested. This T_{13} group was smaller than the T_9 and T_{11} study groups, but larger than the earlier T_7 group.

Within the T_{13} group at 78 months of age the controls were the largest single group - one hundred and seventy-three children amounting to 46% of this study cohort. Factor II cases constituted 4.6, Factor III cases were 26% of the total, and Factor IV cases amounted to 24%.

Comparison of the figures in Tables 5-7, and 27-29 permits consideration of the extent to which the T_{13} cohort is comparable to the T_1 birth cohort values established 78 months earlier.

Social Class

The social class scores given in Tables 7 and 27 are calculated from information on occupational title, educational attainment, and income source in the manner of McGuire White (1955). It can be seen that the T_{13} control cases in Table 27 have a mean SES score of 54.60, which is very close to the birth cohort (T_1) mean of 55.33; the standard deviations are equally similar. The T_{13} Factor II cases of gestational risk are a small group of 13 children. This mean SES score of 61.07 in Table 27 is very close to the 61.39 reported for 18 children at birth in Table 7. The Factor III mean at 78 months of 50.52 is very close to the 51.56 in Table 7, although the T_{13} standard deviation is smaller. A similarly acceptable degree of stability in social class level is seen in cohort T_{13}'s mean score of 55.31 at the T_1 mean of 57.89. In this instance, also, the standard deviations are similar. Thus we see that at the age of seventy-eight months the birth cohort has maintained consistent social class levels over time. The grand mean for all T_{13} children's families was 53.86 and is close to the mean at birth per one thousand cases, 56.21.

Birthweight and Length

In Table 27 we see that the T_{13} control cases had a mean weight at birth of 7.29 lb. This is very close to the mean of 7.25 lb. recorded for all control cases at birth in Table 5. In the case of T_{13} Factor II (gestational risk) children the mean birth weight in Table 23 is slightly lower at 7.08 lb. This is virtually identical to the mean of 7.09 lb. recorded in Table 5 for Factor II cases. A mean of 6.70 lb. is recorded in Table 27 for the Factor III cases, which is similar to the mean recorded in Table 5, 6.75 lb. Finally, the multiple complications group in Table 21 has a mean birth weight of 6.56 lb. which is slightly larger than the 6.37 lb. recorded in Table 5 for all cases of multiple risk at birth.

Insert Tables 27 and 28 about here

Much the same observation may be made about the less significant matter of birth length. The highest group mean length in Table 28 is that for the control babies, M = 20.00, and it is only .78 inches above that for the Factor III babies.

Criteria

The development of the T_{13} cohort is summarized in Table 29. Testing the children at 78 months was generally successful, and the grand mean deviation in time for all 370 children was .37 weeks. The largest mean delay in Table 29 is for the Factor III children, and was .83 weeks. The average T_{13} child weighed 47.76 lb., and stood 47.15 in. high. The small group of thirteen Factor II (gestation) had the smallest mean weight and height, 45.65 lb. and 46.48 in. This is a discrepancy from the grand mean of slightly more than 2 lb., and just over a half-inch. In contrast, the substantial number of Factor IV (multiple risk) cases were the heaviest and tallest children at age 78 months. The control and Factor III cases were similar to the grand mean in height and weight, as Table 29 indicates.

Insert Table 29 about here

The first non-physical criterion in Table 29 is the raw score on Form B of the Peabody Picture Vocabulary Scale. The grand mean per 370 children at age 78 months was 57.52 which yields an IQ of 95. The highest *risk* factor groups was Factor III whose mean raw score of 59.06 has an IQ equivalent of 97; the least risk group was the small Factor II group whose mean of 51 can be interpreted as IQ 81. The second criterion is the x score on Wepman's (1958) test of auditory discrimination. The x score is the number of failures to detect true differences between two stimulus words. The lowest mean error score, i.e. highest level of auditory discrimination, was not greatly different from the highest. Factor III children had the lowest mean error score of 5.67, and the small group of Factor II children had the highest mean error score of 6.84. A second linguistic-cognitive criterion in Table 29 is the score on the *reading* subtest of Jastak's (1965) Wide Range Achievement Test. Levels of reading skill at age 78 months, and generally after a year of kindergarten were wide. The range of raw scores for all children was 0 - 68, with a grand mean of 27. The lowest risk group mean was 24.87 a score obtained by the Factor IV cases. Above that was the Controls and Factor II cases with similar means of 26.67 and 26.69. The highest mean was that of the Factor III risk group whose mean of 29.02 was approximately .5 standard deviation above the lowest group, the Factor IV cases.

Mixed lateral dominance and score on the Disability Screening Instrument were the last two criterion at 78 months. Mixed lateral dominance, e.g. being left-eyed and right-handed, was the dominant form of perceptual-motor attainment. Forty-two percent of all T_{13} children had mixed lateral dominance. This condition was most common in Factor III, and control cases, with incidence 46% and 42%. Mixed lateral dominance was least prevalent in the Factor IV cases; 15% of the Factor IV children showed mixed lateral dominance; mixed lateral dominance occurred in 37% of Factor III cases. The mean score per all T_{13} children on the Disability Screening Instrument was .23. The lowest score was obtained by the Factor III group, .16; and the Factor II and III groups had scores of .30 and .35, which is double the score of the lowest group, the Factor III cases.

Inferential Findings

We may now turn to an inferential analysis of the data. The purpose is to examine the significance of perinatal data in an attempt to understand attainment at age three years. In this regard analysis of the data on three and four year olds is similar to the analyses reported in pervious Technical Reports.

Insert Tables 30, 31, 32, and 33 about here

Thirty-six Months

The subjects consisted of three hundred and thirty-two of the T_6 cases on whom complete information was available. This reduction in the amount of sixty cases was offset by facilitation of data processing.

The criterion series at age three years has been presented in Table 4. The measures presented there represent the development domains (a) *physical growth* (height, and weight), (b) *cognitive growth* (PPVT and PAR *Communication*), and (c) *motoric growth* (PAR *Ambulation, Manipulation,* and *Physical*). The status of the T_1 neonates as controls or children with suspicious pre- and para-natal histories (experimental Factor I indicating gestational complications, Factor III composed of neonatal complications) were used as the predictor series, and social class scores at birth were used as a covariant. Tables 30 - 33 summarize the inferential analyses testing the hypotheses just given. Results are given for seven criteria in three domains. The first of these, shown in Table 31 is Physical Growth.

Physical Growth

Two measures of physical growth, height in inches and weight in pounds, were used as criteria. Regression model one in Table 31 was the full model used to generate an optimum prediction of the physical criteria at thirty-six months. In Table 31 this is shown as the R^2 value .03 for regression model 1. Models 2, 3, and 4 are the alternate or restricted models for the criterion *weight*. Model 1 with an R^2 of .07 is the full regression model for *height*, and models 1, 2, and 3 are the restricted models used to evaluate the significance of selected vectors (see Table 30). The same arrangement is used for Tables 32 and 33.

Weight

Comparison of models 1 and 2 examined the contribution of information about the status of children by deleting all vectors representing membership as control and experimental cases. The loss of prediction was expressed by reduction of the R^2 value for weight from .03 to .01, a statistically significant difference ($F = 5.80$, $p = .01$). Significance of experimental status - Factor I representing gestational problems and Factor III representing neonatal abnormality - was expressed by comparing models 1 and 3. Model 3 had an R^2 value of .01 which was a statistically significant reduction ($F = 4.85$, $p = .02$). Comparison of models 1 and 4 tested the contribution of social class scores to prediction of weight. The drop in R^2 values was from .03 to .02, and was significant ($F = 2.41$, $p = .02$).

Height

Comparison of models 1 and 2 examined the contribution of membership information to prediction of height at thirty-six months. R^2 values dropped from .07 to .04; the results were statistically significant ($F = 11.04$, $p = .0009$). Models 1 and 3 when compared tested the significance of the experimental group membership data. The results were also statistically significant, the R^2 value of model 3 declines to .05. ($F = 4.90$, $p = .02$). The contribution of social class data was examined by comparing regression model 4 with the full model. The result was a decline in R^2 value from .07 to .03, which was statistically significant ($F = 8.43$, $p = .004$). See Table 31

Motoric Growth

Two subscales of the Preschool Attainment Record (PAR) *Ambulation* and *Manipulation* were employed. The summed value of the two subscales yields a PAR *Physical* score. Motoric Growth at age thirty-six months was assessed by means of the three scores. See Table 32.

Ambulation

The full regression model of *Ambulation* scores, model 1 in Table 32, had an R^2 value of .08. Restricted model 2 deleting all membership information produced a statistically significant drop in R^2 values to .06 ($F = 5.30$, $p = .02$). Use of model 3 against the full model tested the significance of the experimental vectors and produced insignificant results. The R^2 value of model 3 was .07 ($F = .95$, $p = .32$). The role of social class scores was examined by comparing restricted model 4 with the full model. The R^2 value of the restricted model was lower than that of the full model, declining to .03 ($F = 16.64$, $p = .00006$).

Manipulation

The full model of this criterion, model 1, had a very low R^2 value, $R^2 = .01$. Restricted model 2 deleting membership status vectors, had a lower R^2 value of .00001. The difference was statistically insignificant ($F = 3.45$, $p = .06$). Equally insignificant results were obtained for model 3, which collapsed the experimental membership vectors and developed an R^2 value of .008. The difference in R^2 values was not significant ($F = .05$, $p = .75$). Social class was equally insignificant as restricted model 4 produced an R^2 value of .008. The drop in prediction was statistically insignificant ($F = .11$, $p = .73$).

Physical

The summed scores for *Ambulation* and *Manipulation* expressed as the PAR *Physical* score are also given in Table 32. Full model 1 had an R^2 value of .05. Restricted model 2 testing the contribution of membership vectors yieldsan R^2 value of .02. The difference was statistically significant ($F = 7.63$, $p = .006$). The experimental vectors were tested by model 3, which had the same R^2 value as the full model ($F = .61$, $p = .43$). Restricted model 4 tested the contribution of social class scores. The R^2 value was .03, a statistically significant decline ($F = 6.70$, $p = .01$).

Cognitive Growth

Two measures were employed as criteria of cognitive attainment, the PAR *Communication* subscale, and the Peabody Picture Vocabulary Test (PPVT), and are reported in Table 33.

Communication

Regression models 1 and 2 in Table 33 tested the contribution of membership data to prediction of PAR *Communication* scores, dropping R^2 values from .23 to .19. The results were significant ($F = 18.66$, $p = .00002$). Models 1 and 3 examined the significance of the experimental membership vectors with statistically significant reduction to an R^2 of .20 ($F = 12.80$, $p = .0004$). Restricted model 4, which examined the contribution of social class scores, had an R^2 value of .09. The difference from the full model was highly significant ($F = 59.53$, $p = .00001$).

PPVT

The full model of PPVT scores, regression model 1, Table 33, had an R^2 value of .12. Restricted model 2, which had an R^2 value of .11, was reduced indicating the importance of group membership information. The reduction was slight, but statistically significant ($F = 5.30$, $p = .02$). Restricted model 3 examined the significance of the experimental vectors, with negative outcomes ($F = .75$, $p = .38$). Social class was examined as a hypothetically critical vector in restricted regression model 4. Its R^2 value of .03 was lower than that of the full model to a statistically significant degree ($F = 34.85$, $p = .004$).

Forty-two Months

Tables 35, 36, and 37 summarize the inferential analyses testing hypotheses. In those tables results are given for seven criteria in three domains using regression models in Table 34.

Insert Tables 34, 35, 36, and 37 about here

Physical Growth

Two measures of physical growth, height in inches and weight in pounds, were used as criteria. Regression model 1 in Table 34 was the full model used to generate an optimum prediction of the physical criteria at thirty-six months. In Table 35 this is shown as the R^2 value .05 for regression model 1. Models 2, 3, 4, and 5 are the alternate or restricted models for the criterion *weight*. Model 1 with an R^2 of .03 is the full regression model for *height*, and models 2, 3, 4, and 5 are restricted models used to evaluate the significance of selected vectors.

Weight

Comparison of models 1 and 2 in Table 35 examined the contribution of information about the status of children by permitting only the vector representing status as Factor II (gestational complications) cases to have an independent regression weight. The change of prediction was expressed by reduction of the R^2 value for weight from .05 to .03, an almost significant difference ($F = 3.33$, $p = .06$). The significance of Factor III representing neonatal abnormality was expressed by comparing models 1 and 3. Model 3 had an R^2 value of .04 which was a statistically insignificant change ($F = 1.16$, $p = .28$). Models 1 and 4 tested the significance of Factor IV (multiple complications) with insignificant results ($F = .007$, $p = .93$). Comparison of models 1 and 5 tested the contribution of social class scores to prediction of weight. The change in R^2 values was from .05 to .02, and was significant ($F = 7.07$, $p = .008$).

Height

Comparison of models 1 and 2 in the lower half of Table 35 examined the contribution of Factor II information to prediction of height at forty-two months. R^2 values dropped from .03 to .02; the results were statistically insignificant ($F = 3.08$, $p = .07$). Models 1 and 3 when compared tested the significance of the Factor III group membership data. The results were also statistically insignificant; the R^2 value of model 3 was unchanged ($F = .03$, $p = .84$). Factor IV status, model 4, was also insignificant ($F = .49$, $p = .44$). The contribution of social class data was examined by comparing regression model 5 with the full model. The result was a decline in R^2 value from .03 to .02, which was statistically significant ($F = 4.58$, $p = .06$).

Motoric Growth

Two subscales of the Preschool Attainment Record (PAR) *Ambulation* and *Manipulation* were employed. The summed value of the two subscales yields a PAR *Physical* score. Motoric Growth at age thirty-six months was assessed by means of the three scores. See Table 36.

Ambulation

The full regression model of *Ambulation* scores, model 1 in Table 36, had an R^2 value of .08. Restricted models 2, 3, and 4 testing membership information all produced no change in R^2 values. The role of social class scores was examined by comparing restricted model 5 with the full model. The R^2 value of the restricted model was lower than that of the full model, declining to .03 ($F = 29.19$, $p = <.00001$).

Manipulation

The full model of this criterion, model 1 in the middle of Table 36, had a very low R^2 value, $R^2 = .01$. Restricted models 2 - 4 representing membership status vectors had lower R^2 values. The differences were statistically insignificant. Equally insignificant results were obtained for model 5, which collapsed the SES vector. The difference in R^2 values was not significant ($F = .75$, $p = .38$).

Physical

The summed scores for *Ambulation* and *Manipulation* expressed as the PAR *Physical* score are also given at the bottom of Table 36. Full model 1 had an R^2 value of .02. Restricted models 2 - 4 testing the contribution of Factor II - IV vectors yielded R^2 values whose differences were statistically insignificant. Only restricted model 5 testing the contribution of social class scores was statistically significant ($F = 5.46$, $p = .01$).

Cognitive Growth

Two measures were employed as criteria of cognitive attainment, the PAR *Communication* subscale, and the Peabody Picture Vocabulary Test (PPVT), and are reported in Table 37.

Communication

Full regression model 1 in Table 37 tested the contribution of membership data to prediction of PAR *Communication* scores, having an R^2 value of .12. Results were insignificant when restricted. Models 2 - 4 examined the value of the experimental membership vectors. Restricted model 5, which deleted, and thereby examined, the contribution of social class scores had an R^2 value of .02. The difference from the full model was highly significant ($F = 29.96$, $p = <.00001$).

PPVT

The full model of PPVT scores, regression model 1 had an R^2 value of .18. Restricted models 2 - 4 had only slightly reduced R^2 values. This indicated the insignificance of group membership information in predicting PPVT scores. Social class was examined as a hypothetically critical vector in restricted regression model 5. Its R^2 value of .01 was much lower than that of the full model, to a statistically significant degree ($F = 68.01$, $p = <.00001$).

Forty-eight Months

The inferential results of the multiple linear regression models in Table 32 are shown in Tables 39, 40, and 41. The first series of results, given in Table 33, shows the results for the forty-eight month criteria in the physical growth domain.

Insert Tables 38, 39, 40, and 41 about here

Physical Growth

Weight

Two measures of physical growth, *weight* in pounds and *height* in inches, are reported. The full model of weight, model 1, is shown in Table 39 to have an R^2 value of .007. None of the restricted models, 2 - 4, varied more than a little from the R^2 values of the full model. Model 2 declines to an R^2 of .002, but, like all the analyses of weight, it was statistically insignificant. The result was an absence of effects in the restricted regression models for group information, model 2, for control cases versus experimentals, model 3, and for social class effects, regression model 4.

Height

Height produced a slightly higher R^2, one which achieved a level of statistical significance for the full model ($p = .02$). Only one comparison, the use of restricted model 2, produced a statistically significant decline in the R^2 value. This comparison examined the significance of information about group membership in toto. The difference between Factor I and Factor III cases versus controls produced no real decline in the R^2 value of .02 ($F = .54$, $p = .46$). The other comparison testing social class effects ($F = 1.42$, $p = .23$) was not significant.

Motoric Growth

The full regression model of Copy Forms raw scores model 1 at the bottom of Table 39 produced an R^2 value of .14. Comparison with restricted model 2 testing group information produced an identical R^2 value, which was of course in no way statistically different ($F = .17$, $p = .84$). Comparison of full model 1 and restricted model 3 tested the significance of the difference between the two experimental groups. The results were insignificant since there was no appreciable difference in the R^2 value ($F = .25$, $p = .61$). The contribution of social class data, however, was very different. Comparison of model 4 with the full model produced a drop in R^2 from .14 to .02. The comparison yielded a statistically significant difference ($F = 39.26$, $p = <.000001$).

Cognitive Growth

Two instruments were used to assess cognitive development at forty-eight months, The Boehm Test of Basic Concepts (1969), and Caldwell's Preschool Inventory (1970). Tables 40 and 41 show the results of multiple linear regression analyses, using the models shown in Table 38.

Preschool Inventory

This criterion differed from others in that the results of administering the test were recorded for four sub-sections together with a fifth full scale score. The four sections are abbreviated in Tables 40 and 41 as $PI_{(1)-(4)}$, and PI_{Total}.

Personal-Social Responsiveness $PI_{(1)}$

Full regression model 1 developed an R^2 of .08. Restricted model 2 testing the value of knowledge of status as a control versus experimental groups (Factors I and III) was almost identical in R^2 value .07, and so was insignificantly different as a predictor ($F = 1.81$, $p = .16$). Restricted model 3 testing the difference between the two experimental groups also produced an R^2 value of .07, and was insignificantly different from the full model ($F = 2.35$, $p = .12$). In contrast, model 4, which deleted the social class scores, produced a significant drop in R^2 value $R^2 = .004$ ($F = 31.50$, $p = .00001$).

Associative Vocabulary $PI_{(2)}$

The full regression model for this subtest of the Preschool Record, model 1, had an R^2 value of .18. The value of status in two experimental groups and the control group was tested by comparing restricted model 2 with the full model. The effects were insignificant ($F = .001$, $p = .98$). Comparison of the two experimental groups by use of regression model 3 was also insignificant ($F = .001$, $p = .96$). As with other criteria the regression model deleting social class was very different in R^2 value from the full model. The R^2 for restricted model 4 was .03, which is significantly different from the value .18 obtained for the full regression model ($F = 65.24$, $p = <.00001$).

Concept Activation-Numerical $PI_{(3)}$

The full regression model of the numerical subscore was statistically different from zero ($p < .00001$), although the R^2 was not high ($R^2 = .11$). An identical R^2 value was developed by the first restricted model, 2, indicating a lack of significance in the data indicating membership in the experimental and control groups ($F = .38$, $p = .69$). Similar results obtained for comparison of the two experimental groups when restricted model 3 was compared with the full model ($F = .36$, $p = .54$). Social class effects were found, due to the drop in R^2 obtained by use of model 4; $R^2 = .04$ ($F = 31.97$, $p = <.00001$).

Concept Activation-Sensory $PI_{(4)}$

The full model of this criteria had the highest R^2, .25. Similar predictive power was developed by the first regression model 1, which evaluated membership in experimental and control groups ($F = .07$, $p = .93$). Equally ineffective as a predictor was the second restricted model 3, comparing the two experimental groups. The R^2 was also .25, yielding a small F-ratio ($F = .08$, $p = .75$). Once more the social class restriction in model 4 materially reduced the predictive power of the regression model, in this case model 4 in Table 41. The R^2 of .03 was significantly different from the full model ($F = 103.43$, $p = <.00001$). Test delay was insignificant in its effects on prediction reducing the regression model 5 R^2 by only .01 to .24 ($F = .24$, $p = .62$).

Total Score

The sum of the raw scores on the four subtests was used as a criterion in Table 41. The full regression model for this criterion was .22. Model 2, testing information on status as experimental and control cases was only slightly different ($F = .48$, $p = .61$). Similar results were obtained for comparison of the two experimental groups by comparing model 3 with the full model ($F = .47$, $p = .48$). Model 4 was constricted by deleting social class scores. The effect was to depress the R^2 from .22 to .02 ($F = 91.27$, $p = .00001$).

Boehm Test

The full model of Boehm scores, 1, was highly significant ($R^2 = .16$, $p = <.00001$). The first restricted model tested the significance of information about status as a control, Factor I, or Factor III case. The results were insignificant ($F = .17$, $p = .84$). Equally insignificant outcomes emerged from testing the second hypothesis of differences between the two experimental groups, and controls using model 3, ($F = .24$, $p = .62$). In contrast, the hypothesized influence of social class scores was demonstrated in model 4. Highly significant reduction of the model R^2 resulted, and model 4 had an R^2 of .03, a reduction of .12 ($F = 54.21$, $p = .00001$).

Fifty-four Months

Tables 43, 44, and 45 summarize the inferential analyses for nine criteria in three domains using the regression models in Table 42. The first of these, shown in Table 43, is Physical Growth.

Insert Tables 42, 43, 44, and 45 About Here

Physical Growth

Two measures of physical growth, height in inches and weight in pounds, were used as criteria. Regression model 1 in Table 43 was the full model used to generate an optimum prediction of the physical criteria at previous intervals of six months. In Table 43 this is shown as the R^2 value .03 for regression model 1. Models 2, 3, 4, and 5 are the alternate or restricted models for the criterion *weight*. Table 43 also records the regression values for *height*. Model I with an R^2 of .03 is the full regression model for *height*, and models 2, 3, 4, and 5 are restricted models used to evaluate the significance of selected vectors.

Weight

Comparison of models I and 2 examined the contribution of information about the status of children by permitting only the vector representing status as Factor II (delivery complications) cases to have an independent regression weight. The change of prediction was expressed by reduction of the R^2 value for weight from .05 to .02, an insignificant difference ($F = .80$, $p = .37$). The significance of Factor III representing neonatal abnormality was expressed by comparing models 1 and 3. Model 3 had an R^2 value of .02 which was a statistically insignificant change ($F = 1.16$, $p = .28$). Models I and 4 tested the significance of Factor IV (multiple complications) with insignificant results ($F = .41$, $p = .51$). Comparison of models 1 and 5 tested the contribution of social class scores to prediction of weight. The change in R^2 values was from .13 to .01, and was significant ($F = 6.56$, $p = .01$).

Height

Comparison of models 1 and 2 examined the contribution of Factor II information to prediction of height at forty-two months. R^2 values dropped from .03 to .01, which is statistically insignificant ($F = 1.15$, $p = .28$). Models 1 and 3 when compared tested the significance of the Factor III group membership data. The results were also statistically insignificant, the R^2 value of model 3 was unchanged ($F = .36$, $p = .54$). Factor IV status, model 4, was also insignificant ($F = .006$, $p = .93$). The contribution of social class data was examined by comparing regression model 5 with the full model. The result, a decline in R^2 value from .02 to .008, was statistically significant ($F = 5.38$, $p = .02$).

Motoric Growth

Results of testing hypotheses about performance on the Copy Forms Test are also given in Table 43. The full regression model for this criterion was reduced from .20 to .19 when Factor II group membership was allowed to operate with an independent regression weight in model 2. The drop in R^2 was statistically significant ($F = 5.27$, $p = .02$), although the decline in R^2 value was only .01. An equally slight reduction was reported when the Factor III status had an independent regression weight. The reduction to R^2 = .19 was not statistically significant, however, (F = 2.44, p = .11). No reduction in R^2 was associated with model 4 which tested the independent contribution of Factor III status (F = .18, p = .66). A very different outcome, however, was produced by comparing model 5 with the full model. The comparison, which tested the contribution of social class scores, produced a drop in R^2 value from .20 to .03, (F = 75.05, p = <.000001).

Cognitive Growth

Two measures of cognitive attainment employed at forty-eight months were repeated. The first was the *Preschool Inventory* (PI), with its four components labelled (1) *Personal-Social,* (2) *Conceptual-Sensory,* (3) *Conceptual-Numerical,* (4) *Associative Vocabulary.* The second was the *Boehm Test of Basic Concepts.* Results for PI and Boehm Tests are in Tables 44 and 45.

Preschool Inventory $PI_{(1)}$: Personal-Social Responsiveness

Comparison of regression model 2 which permitted Factor II membership to have an independent regression weight with full model 1 reduced the R^2 from .14 to .11 (F = 10.65, p = .001). No such effect was detected for Factor III status; regression model 3 had an R^2 value of .13 (F = 2.76, p = .09). Equally insignificant findings emerged from comparison of model 4 which tests the significance of Factor III risk status (F = .001, p = .97). The influence of social class was tested by comparing full model 1 with model 5, which omitted the social class scores, given in Table 42. The result was a significant loss of prediction associated with restricted model 5. The R^2 value dropped from .14 to .03 (F = 42.96, p = <.000001).

$PI_{(2)}$: Associative Vocabulary

The second PI area, Associative Vocabulary, fell below the third in predictability with an R^2 of .19. The effect associated with Factor II was tested by comparing regression model 2 with full model 1. Significant results were achieved despite a drop in R^2 to only .17 (F = 9.06, p = .002). Trivial results were produced for Factor III status, with the R^2 value of model 3 remaining .19 (F = .28, p = .59). Equally insignificant effects were associated with Factor IV status (F = .95, p = .32). As with other *Preschool Inventory* criterion measures a powerful social class effect was detected (F = 70.65, p = <.000001).

$PI_{(3)}$: Concept Activation-Numerical

The full model for this criterion, 1, had the highest R^2 value of the four PI subdomains, R^2 = .25. The effect associated with delivery problems, Factor II, was slight, but achieved statistical significance (F = 8.61, p = .003). No loss of prediction was associated with perinatal risk status, when restricted model 3 was compared with the full model ($F = .40$, $p = .52$). A drop in R^2 from .25 to .24 was identified with model 4 testing the effect of multiple complications, Factor IV ($F = .70$, $p = .40$). Social class effects were high, as for other PI subtests. Deletion of McGuire and White social class scores in model 5 dropped the R^2 from .25 to .04 ($F = 97.76$, $p = <.000001$).

$PI_{(4)}$: Concept Activation-Sensory

The full model R^2 value shown in Table 45 for this criterion was .15. The loss of prediction due to collapsing Factors III and IV, and allowing Factor II to maintain an independent regression weight was slight, .01. However, the loss of prediction was significant at the .05 level ($F = 4.09$, $p = .04$). An equally slight loss associated with Factor III was elicited by comparing restricted model 3 with full model 1 ($F = 3.05$, $p = .08$). No loss of prediction ($R^2 = .15$) was associated with Factor III ($F = .57$, $p = .45$). A considerable effect due to the presence of social class scores in the full model was detected in restricted model 5 which deleted social class scores ($F = 56.19$, $p = <.000001$).

Preschool Inventory Total Score

This criterion was developed by summing the raw scores on the four subtests. The R^2 of full model 1 which is given in Table 45 as .24, was reduced by the role of Factor II status in restricted model 2. The drop of .02 to $R^2 = .22$ was statistically significant ($F = 10.64$, $p = .001$). No effects were associated with Factor III status ($F = 2.04$, $p = .15$), or with Factor IV status ($F = .03$, $p = .84$). Model 5, deleting social class scores produced a drop in R^2 from .24 to .03. The loss was statistically significant to a high degree ($F = 97.36$, $p = <.000001$).

Boehm Test of Basic Concepts

The R^2 value for full model 1 was .19. A slight loss of predictive power from .19 to .18 due to the influence of Factor II status was statistically significant ($F = 5.04$, $p = .02$). No effect was detected in the comparison of restricted model 3 with the full model, due to Factor III information ($F = .25$, $p = .61$). Factor IV was equally insignificant when allowed to have an independent regression weight in model 4. Social class effects were pronounced when model 5 which omitted social class scores was tested against the full model ($F = 75.39$, $p = <.000001$). See Table 45.

Sixty Months

Table 38 presents the regression models used at sixty months and Tables 46, 47, and 48 present the comparisons of regression models for criteria #33 through #38. Two measures of physical growth at sixty months, weight in pounds and height in inches, are reported. The full model of weight, model 1, is shown in Table 46 to have an R^2 value of .01. None of the restricted models 2 - 6, varied more than a little

Insert Tables 46 and 47 about here

from the R^2 values of the full model. Model 6 declined to an R^2 of .004 and, unlike other analyses of weight, it reached statistical insignificance ($p = .05$). No effects were detected for group membership information, social class, or test delay.

Height produced a slightly higher R^2, .02, one which achieved a level of statistical significance for full model 2 ($p = .03$). Only one comparison, the use of restricted model 6, produced a statistically significant decline in the R^2 value. This comparison examined the significance of information about test delay in toto. The difference between regression models produced a decline in the R^2 value to .01 ($F = 5.73$, $p = .01$). None of the other comparisons, testing social class effects, and group membership differences were significant.

Cognitive Growth

Three tests were used to assess cognitive development at sixty months, ITPA Digit Span and Auditory Association, and WPPSI Vocabulary. Tables 41 and 42 show the results of multiple linear regression analyses, using the models shown in Table 38.

ITPA Digit Span

The full regression model of ITPA Auditory-Vocal Sequencial - digit span - scores had an R^2 of .008, which did not achieve statistical significance against a model of zero value ($p = .50$). Restricted models 2 - 6 in Table 47 produced virtually no loss of information when compared with model 1, the full model.

ITPA Auditory Association

A more substantial state of affairs was achieved by means of regression model 1 in Table 47, which used the ITPA Auditory Association subtest as a criterion. The R^2 value of model 1 was .19, which was statistically significant from zero ($p<.000001$). Most of the comparisons generated by testing restricted models 2 - 6 produced little reduction in R^2 value. The exception was model 5, which deleted, and thereby tested the significance of the vector representing social class scores. Model 5 in Table 41 achieved an R^2 value of only .02, a drop in R^2 of .17 of criterion variance from the full model's value of .19. The result was statistically significant to a high degree, showing the contribution of social class to ITPA Auditory Association scores ($F = 78.29$, $p<.000001$).

WPPSI Vocabulary

The full model of this criterion, shown in Table 48, generated an R^2 value of .11. As with the preceding criterion only the regression model restricted by deletion of the McGuire & White social class

Insert Table 48 about here

score produced a significant difference. Model 5 produced an R^2 of .03, a substantical decline from .11 achieved by the full model ($F = 33.34$, $p < .00001$). In model 5 social class scores were deleted.

Presence of clinically significant behaviors indicative of maladjustment, was assessed by means of the Child Behavior Inventory, a measure developed by Spaner & Jordan, (1971). Full model 1 in Table 42 achieved an R^2 value of .06. Most of the comparisons effected by means of the restricted models described in Table 38 were insignificant, the R^2 values of the restricted models remaining at the level of .06. However, deletion of social class scores in model 5 dropped the R^2 value by one half to .03. The result was statistically ($F = 10.46$, $p = .001$). Also, differences in development scores were revealed between the two experimental groups by means of model 4 ($F = 4.39$, $p = .03$).

Sixty-six Months

The inferential results of the multiple linear regression analyses are shown in Tables 49 - 51. The first series of results, given in Table 43, shows the results for the sixty six month criteria in the physical growth domain.

Physical Development

Weight

Two measures of physical growth, weight in pounds and height in inches, are reported. The full model of weight, model 1, is shown in Table 49 to have an R^2 value of .02. None of the restricted models 2 - 7, varied more than a little from the R^2 values of the full model. Models 5 and 7 declined to an R^2 of .01 but, like other analyses of weight, they failed to reach statistical significance. No effects

Insert Table 49 about here

were detected for group membership information, social class, or test delay.

Height

Height produced a slightly higher R^2, .03, one which achieved a level of statistical significance for the full model (p = .02). Only one comparison, the use of restricted model 5, produced a statistically significant decline in the R^2 value. This comparison examined the significance of information about social class. The difference between regression models produced a decline in the R^2 value to .02 (F = 5.01, p = .02). None of the other comparisons were significant.

Linguistic-Cognitive Growth

The tests used to assess cognitive development at sixty six months were ITPA Digit Span and Auditory Association, and WPPSI Vocabulary. Tables 50 and 51 show the results of multiple lienar regression analyses, using the models shown in Table 42.

ITPA Digit Span

The full regression model of ITPA Auditory-Vocal Sequential - digit span - scores had an R^2 of .007, which did not achieve statistical significance against a model of zero value (p = .77). Restricted models 2 - 7 in Table 50 produced virtually no loss of information when compared with the full model.

Insert Tables 50 and 51 about here

ITPA Auditory Association

A more substantial state of affairs was demonstrated by the full regression model in Table 44, which used the ITPA Auditory Association subtest as a criterion. The R^2 value of model 1 was .23, which was statistically significant from zero (p<.000001). Most of the comparisons generated by testing restricted models 2 - 7 produced little reduction in R^2 value. The exception was model 5, which tested the significance of the vector representing social class scores. Model 5 in Table 50 achieved an R^2 value of only .02, a drop in R^2 of .21 of criterion variance from the full model's value. The result was statistically significant to a high degree, showing the contribution of social class to ITPA Auditory Association scores (F = 97.58, p<.000001).

WPPSI Vocabulary

The full model of this criterion, shown in Table 51 generated an R^2 value of .21. Only the regression model restricted by deletion of the McGuire & White social class score produced a significant difference. Model 5 produced an R^2 of .01, which is much less than the R^2 (.11) achieved by the full model (F = 83.41, p .000001).

Adjustment

Presence of behaviors suggesting maladjustment, was assessed by means of the Child Behavior Inventory, a measure developed by Spaner & Jordan (1971). Full model 1 in Table 51 achieved an R^2 value of .08. All but one of the comparisons using the restricted models in Table 42 were insignificant, the R^2 value of the restricted model created by deletion of social class scores in model 5 dropped the R^2 value to .01. The result was statistically significant (F = 23.41, p = .00001).

Seventy Two Months

The inferential results of analyzing the data taken at seventy-two months of age are presented in Tables 52-54. The regression models examined the contribution of experimental group membership, socal class and testing delay for each of eight criteria.

Physical Development

Weight

The full model of weight, model 1, is shown in Table 52 to have an R^2 value of .01. None of the restricted models, 1 - 6, varied more

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Insert Table 52 About Here

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than a little from the R^2 values of the full model. Model 2 declined to an R^2 of .004 but, like other analyses of weight, it failed to reach statistical insignficance. No effects were detected for group membership information, social class, or test delay.

Height

Height produced a still lower R^2, .009, one which failed to achieve a level of statistical significance for full model 2.1 (p=.34). None of the comparisons, testing social class effects, risk group membership, and test delay were significant. The full regression model of head circumference was the best of the three poorly predicted physical characteristics. The full model was statistically significant (R^2 = .04, p=.001). None of the hypothesized effects was significant, with the exception of the testing delay. Examined by regression model 3.5, information on test delay when deleted dropped the R^2 value to .01. This was a statistically significant drop from R^2 = .04 (F = 13.73, p=.0002).

Cognitive - Linguistic Growth

Three tests were used to assess cognitive development at 72 months, The Denver Articulation Test, the PPVT(B) and Wepman's test of auditory discrimination. Table 53 shows the results of multiple linear regression analyses using the models shown in Table 42.

Articulation Test

The full regression model of correct scores on the Denver Articulation Test was statistically significant (R^2=.04, p.004) as Table 53 indicates. The first hypothesis tested by means of comparing model 2 with the full model was not quite supported. It indicates that group membership data is significant. While the R^2 value of model 2 dropped from .04 to .02 it was not quite significant (p=.06). This trend achieved significance through model 4.3 which tested control versus risk status. The drop of fifty percent from R^2 =.04 to R^2=.02 was statistically significant (p=.02). Social class scores, deleted in model 4, was a statistically significant predictor (F=4.62, p. 03). Testing delay was not a significant influence.

PPVT

In the case of PPVT scores (Form B) at age six years a still higher - if still modest - R^2 value of .12 was generated by full model 1. Only one hypothetical effect was detected by multiple linear regression. Deletion of the McGuire & White social class score, based on occupation, education and income source, dropped the R^2 from .12 to .02. This drop associated with regression model 4 was highly significant (F=41.30, p<.0001). No other effects produced a change in the R^2 value of the regression models.

Auditory Discrimination

The third linguistic-cognitive criteria was the score on Wepman's (1958) Auditory Discrimination Test. The full model gave a poor account of the criterion variance, with an R^2 value of .02, which was not statistically significant from zero. None of the hypothesized effects were significant, as Table 53 indicates.

Psychomotor Growth

Growth in this domain was assessed by noting the presence or absence of consistent use of left or right hand and eye in simple tasks of reaching, and moving a card with a small hole to the preferred eye. The full regression model of this criterion was very poor, (R =.008), and none of the possible influences was noteworthy, as Table 54 shows.

Insert Tables 53 and 54 About Here

Disability

The Disability Screening Index noted the presence of developmental problems in eight categories based on test data or examiner's observations. The R^2 value of this criterion was .03, which reached statistical difference from zero. No significant effect was detected by multiple linear regression except that for social class ($F=7.82$, $p=.005$).

Seventy Eight Months

The last set of inferential analyses were perfomred on data gathered at 78 months of age, and they are reported in Tables 55-58. The analyses employed the regression models given in Table 42, and are reported for three hundred and fifty four children using criteria #53-60.

Physical Development

Weight

The full regression model of weight in Table 55 produced an R^2 value of .02, which was not statistically significant from a model of zero weights. One significant effect was detected, that associated with membership in the experimental Factor II group composed of thirteen children whose gestation had been at risk.

Insert Tables 55-58 about here

Height

An equally small account of criterion variance was generated by the full regression model of height, $R^2 = .02$. Only one effect was deleted by multiple linear regression as approaching statistical significance. It was the effect due to social class score ($p=.06$).

Head Circumference

In Table 56 the full regression model of head circumference in centimeters has an R^2 value of .02, which is not statistically significant. One effect was deleted by regression analysis; it was the contribution of social class score which was statistically significant ($F=5.97$, $p=.01$).

Achievement

WRAT

Table 56 also contains the fourth criterion, the raw score in the reading subtest of Jastak's (1965) Wide Range Achievement Test. This criterion had the highest R^2 value, $R^2 = .17$. A significant effect was detected by deleting from the full model the vector representing Factor II group membership (F=5.50, p=.01). An even more powerful effect was detected for social class scores (F=63.12, p<.00001).

Cognitive-Linguistic Attainment

PPVT

The first criterion measure in this domain, the score on Form B of the Peabody Picture Vocabulary Test, is reported in Table 57. Three effects were detected. The first was associated with Factor II risk group membership (F=4.70, p=.03). A second was associated with Factor III risk group membership (F=6.27, p=.01). The largest effect was that detected by deleting social class scores from the full regression equation (F=44.33, p=< .00001) dropping the R^2 from .14 to .03.

Auditory Discrimination

The second of two criterion measures the $\bar{x}$ - error score on Wepman's (1958) Auditory Discrimination Test is reported in Table 57 to have an R^2 of .02. Only one significant effect was detected, that due to McGuire and White social class score (F=5.97, p=.01).

Disability

In Table 58 the scores on the Disability Screening Inventory representing the number of disability states identified by child study is recorded. Two effects were detected. The first was associated with Factor II group membership dropping the R^2 value from .03 to .01 (F=4.04, p=.04). The second was due to social class and also dropped the full model R^2 from .03 to .01 (F=5.34, p.02).

Psychomotor Attainment

The last criterion used with the T_{13} subjects at 78 months of age is the mixed lateral dominance score reported in Table 58. The full regression model generated a low account of criterion variance, $R^2 = .04$. Only one effect was detected, that associated with deletion of the vector representing social class scores from the full model (F=12.22, p=.0005).

PART FOUR

DISCUSSION

The hypotheses of the inferential analysis were examined by comparing regression models of development. The models varied considerably in their capacity to account for criterion variance. The R^2 values in Tables 31 through 58 show that a wide range exists. The full models of weight and height are consistently around $R^2 = .02$ and .03 at eight ages. At the top end the linguistic measures at eight ages had full models with R^2 values ranging up to $R^2 = .23$, and averaging $R^2 = .16$. These values are not high and represent the contribution of the *risk* categories, social class scores, plus delay and error vectors.

Thirty Six Months

Predictors

Group membership data, that is, perinatal status as a control case (risk free) or an experimental case - prenatal risk factors (Factor I) and neonatal risk factors (Factor III) - was the first hypothesis applied to seven criteria at age three years. In most cases it emerged that information about the subjects added to prediction of their developmental status. In the case of the Motoric domain (see Table 32) the contribution of group membership data, specification of status as control and experimental cases at birth, was significant only for *Ambulation* scores ($F = 5.30$, $p = .02$). This is a criterion of gross motor activity which includes such early childhood activities as running, balancing, climbing, jumping, and hopping. The *Manipulation* score, the other element in this domain, just missed the .05 level of significance ($F = 3.45$, $p = .06$). This PAR subscale deals with finer motor activities such as unwrapping, assembling, throwing, catching, and copying designs. The summed scores were highly related to the information in vectors representing birth status ($F = 7.63$, $p = .006$). Group membership information was significantly associated with the weight and height in the Physical growth domain. The probability levels were quite different; height turned out to be more highly significant ($p = .0009$) and the regression model was also more sturdy ($R^2 = .07$) than that of weight. The latter variable, weight, reached the .01 level of statistical association with the group membership predictor.

Experimental group membership status (prenatal and neonatal risk) failed to reach significant levels of statistical association with the criterion series in four instances. A modest if not high relationship between experimental groups membership and weight and height was evident (p = .02). A more robust association was found with PAR *Communication* scores (p = .0004), and none was found with PPVT scores, the second of the two cognitive criteria.

Experimental group membership (Factors I and II) information, on the other hand was related to three aspects of development. Experimental status in the perinatal period, i.e. being at risk, was quite unrelated to attainment in the motoric domain. Experimental group information was related to development in the physical domain. Experimental status was related at a highly significant level to one element in the cognitive domain, PAR *Communication* (p = .0004), but not to the second element, PPVT scores.

Insert Tables 59 and 60 about here

The third hypothesis applied to the criterion series of seven elements treated the contribution of McGuire and White social class scores. This predictor was significant in five of seven relationships, most of them at a highly significant level, as Table 60 shows. Social class score was related to height (p = .003). *Ambulation* was also related (p = .00006), but *Manipulation* was not, although the summed score *Physical*, was related (p= .01). Social class scores were related to both cognitive measures, PAR *Communication* and PPVT, at a highly significant level (p = .00001).

Of the three predictive elements examined, total information about perinatal status, information about at risk perinatal status, and social class scores, the most significant was social class data. Examination of the correlation matrix, Table 59, shows a number of robust correlations. Some are negative, reflecting the inverse relationship between status and McGuire and White scores. The correlation with PPVT scores (r =-.32, p = <.001) is quite substantial, while that with PAR *Communication* scores is greater (r = .22, p = <.001), and height at age three (r = -.19, p = <.001) are also sturdy. They show that social class effects are well established at age three. This observation may be related to previous findings (Jordan, 1971) in which the influence of social class progressively increased during the first two years of life.

Criteria

Consideration of the three domains of development at age three years indicates that cognitive attainment is most predictable. The full regression model scores accounted for twenty-three percent of the variance of PAR *Communication* scores and twelve percent of the variance of PPVT scores. The correlation between the two variables is high ($r = .43$, $p = <.001$), although they differ markedly in predictability. The physical domain, growth in height and weight, is the next most predictable of the three indices of development; in terms of variance accounted for by the full regression model, and by elements in the predictor series. The *Motoric* domain was least efficiently predicted by the regression model. Most of the poor predictability was due to the PAR *Manipulation* subtest.

Forty-two Months

The R^2 values in Tables 35, 36, and 37 range from .01 to .18. The full models of physical growth in Table 35 had R^2 values of .03 and .05. These low values are consistent with what has been presented in previous reports from birth. The full models of motoric growth in Table 36 were a little higher for *Ambulation* and the summed *Physical* scores; however, the *Manipulation* R^2 value for full regression model 1 was only .01, which is very low. The two measures of cognitive attainment were predicted comparatively well by full regression models. The PAR *Communication* R^2 value was .12, and the R^2 value for the Peabody Picture Vocabulary Test was .18. The R^2 values for these two criteria are encouraging when compared to the other R^2 values.

Predictors

Group membership data, that is, perinatal status as a control case (risk free) or an experimental case - prenatal risk factors (Factor I) and neonatal risk factors (Factor III) - was the first hypothesis applied to the criteria at age three and a half years. In most cases it emerged that information about the subjects' biological risk status added little to prediction of their developmental status. In the case of weight and height Factor II (delivery complication) approached significance. In the case of the Motoric domain (see Table 35) the contribution of group membership data, specification of status as biological *risk* cases at birth, was significant for

Insert Tables 61 and 62 about here

none of the criterion scores. Perinatal risk status was equally insignificant for cognitive attainment.

Social class emerged in analysis of development at age forty-two months as the only significant predictor. The associations given in Table 61 are robust, and show that social class effects are well established by age three and a half years. At the risk of over-interpretation they are perhaps slightly stronger than they were at age three, and certainly not weaker. Examination of the correlation matrix in Table 61 shows a number of robust correlations. Most are negative reflecting the relationship between growth and social class. The correlation with PPVT scores ($r = .42$, $p = <.001$) is also sturdy. Social class effects are well established at age three and a half.

Criteria

Consideration of the three domains of development at age three years, physical, motoric, and cognitive growth, indicates that cognitive attainment is most predictable. The full regression model scores accounted for eighteen percent of the variance of PPVT scores and twelve percent of the variance of PAR *Communication* scores. The correlation between the two variables is high ($r = .48$, $p = <.001$). The physical domain, growth in height and weight, is the next most consistently predictable of the three indices of development in terms of variance accounted for by the full regression model. The Motoric domain was least efficiently predicted by the regression model. Most of the poor predictability was due to the PAR *Manipulation* subtest.

Forty-eight Months

The amount of data in the basic regression models given in Table 38 is not large. The vectors consisted of social class data, mutually exclusive classification as a control, Factor I, or Factor III case, and the delay in testing expressed in weeks, together with the unit vector and the error vector. The R^2's which were generated were, accordingly, not excessively low, due to the limited but critical data employed. The lowest R^2 values were obtained for the physical measures, weight and height. Higher values were obtained for the cognitive measures. The lowest Preschool Inventory R^2 value was .08, obtained for the criterion *Personal-Social Responsiveness*. The highest R^2 was obtained for the full model of the subscore, *Concept Activation-Sensory* ($R^2 = .25$). The Boehm Test R^2 value fell between the two, approximately, at .16.

Predictors

At forty-eight months the predictive variables were status as control, Factor I (gestation complications), or Factor III (neonatal risk), cases, together with a perinatal social class score. Testing delay was included as a procedural check, in view of possibly excessive delays after the optimal testing period. Factor I, the disorders in mother or child in the prenatal stage, and Factor III, neonatal disorders, did not produce an abnormal performance when compared with control cases. Further, the two experimental groups did not differ from each other. The only significant finding about group membership was in the Physical domain. A statistically significant value was associated with knowledge of subjects' status in the control and experimental groups for the criterion forty-eight month height. It should be pointed out that this finding touches on classification in any of the three groups of subjects, controls, Factor I (gestation factors), or Factor III (neonatal risk). The value of the knowledge was tested by assigning a common regression weight to the three classification groups. In contrast, no associations were found between social class scores and height or weight. Social class scores were, however, highly significant, as Table 63 shows, and were correlated at a high level (r = .27 - .49) with all measures in the cognitive domain. The strength of association is clear when expressed by probability levels in Table 41. However, it is equally clear when expressed as decline in R^2 values in Tables 39, 40, and 41. The decline in R^2 due to deletion of social class scores is seen in the

Insert Tables 63, 64, and 65 about here

Preschool Record total score. Restricted model 4 in Table 41 has an R^2 value of .02, compared with the full model with a value of .22. The difference in R^2 values shows that ninety percent of the variance is due to social class effects. In the Preschool Inventory subtest, *Concept Aotivation-Sensory* (see Table 41) the decline in R^2 due to social class is also marked. Eighty-four percent of the variance is due to social class scores.

In summary, two predictor effects may be seen. First, biological risk data have virtually lost their predictive value, and social class influences on cognitive attainment have become quite clear.

Criteria

The least predictable criteria are clearly those in the physical domain. They are also least influenced by the predictor series. On the other hand, the cognitive measures are fairly predictable from limited information, with the Preschool Inventory R^2 value of .22. Presumably, more extensive predictor series can give much larger accounts of criterion variance. The inter-relations of measures in this report is interesting. Boehm test scores relate quite closely to Preschool Inventory test scores; the correlations in Table 63 range from .62 to .73, which with over four hundred degrees of freedom, are highly significant.

Test delay is significantly related to social class (r = .17) and emerges from the difficulty encountered in tracing and testing lower class families. Test delay did not emerge as significant in the regression analysis of height and weight. It played some role in the cognitive measures. The Boehm R^2 dropped from .16 to .15 when the vector representing testing delay in weeks was dropped. One Preschool Inventory subtest, *Concept Activation-Numerical*, dropped in R^2 from .11 to .10 ($F = 4.14$, $p = .04$). The reality of the change is better represented by the R^2 value than the probability level of the F-ratio. The Preschool Inventory total score was not affected by the testing delay. The R^2 value remained unchanged, .22, after the delay vector was deleted.

An interesting finding is the lack of a significant relationship between social class and physical measures. The correlation of SES and height, and weight is identical ($r = -.06$) with the negative value showing direction favoring higher growth with *rising* SES level. However, the r-value is not great and did not achieve statistical significance. The finding is all the more interesting in view of the contrasting strong correlations between SES and cognitive attainment, all of which are significant at the .05 level, with some being at a higher level. The correlation between McGuire and White SES scores and Preschool Inventory total scores is, for example, .47, which is very high for between three and four hundred cases.

Fifty-four Months

The hypotheses of this investigation study the effects of perinatal status and social class within a context of regression equations. The basic data are rich in a clinical sense, but when represented in the regression equations are much more restricted. Accordingly, expectations for the predictive value of regression equations should be modest. As Tables 43 to 45 show, the full regression models provide moderate accounts of raw score criteria variance. The lowest account of criteria variance by a full regression model is that provided for fifty-four month weight, $R^2 = .02$. The other physical criterion, height, was predicted to an equally limited extent, $R^2 = .03$. A far more robust state of affairs obtains for the cognitive criteria. The lowest values, .14 and .15, were generated by the *Preschool Inventory* (PI) subtests *Personal-Social Responsiveness*, and *Concept Activation-Sensory*, respectively. *Copy Forms*, PI *total* scores, and *Concept Activation-Numerical* scores yielded similar R^2 values of .20, .24, and .25. The remaining PI subtest, *Associative Vocabulary*, had an R^2 value of .19. The R^2 values available for analysis in the comparison of regression models varied from substantial in the case of the cognitive measures to virtually non-existent in the case of the physical criteria.

Predictors

The problems of gathering data in a longitudinal study are many. Delays in administering tests are inclined to arise because families move; lower-class families can be hard to trace and child study may occur well after the target date for test administration. For this reason the regression models shown in Table 42 include a vector, x_6 which represents test delay. The mean delay in testing for all subjects at fifty-four months was .007 weeks, which is trivial. The maximum delay for any single case was thirteen weeks. The value of the x_6 vector was tested by deleting it from the full regression model for all nine criteria. In no case was there a significant effect in predicting the criterion score due to test delay. This procedural element can be set aside in favor of the conceptual elements in the predictor series.

The role of perinatal risk in development at fifty-four months was assessed by vectors representing membership in three categories of risk, Factor II (delivery complications), Factor III (neonatal complications) and Factor IV (multiple complications). Factor II effects were not found for the two physical criteria. In contrast Factor II effects were found for all seven cognitive criteria in the small Factor II group (N = 11). Statistically significant reductions in R^2 values appeared when Factor II status information was deleted from the full models shown in Tables 43 and 45. The significance is expressed by the probability level associated with the F-test value. However, the statistical model of this research activity, multiple linear regression, directs investigators' attention to an additional element, the reduction in R^2. The proportion of variance actually associated with the statistically significant findings in Tables 44 and 45 ranges from .01 to .03. The statistical significance is primarily a consequence of the degrees of freedom available. In the face of a small but statistically significant effect associated with the small number of cases a second regression analysis was performed. This analysis uses an alternate way to assess Factor II effects by using a different set of full and restricted regression models. The models employed were regression model #7 in Table 42, and regression model #2*. The comparison was made for all seven cognitive criteria. The results, presented in Table 64, were insignificant, both in the reduction of R^2 values in the probability levels associated with the F-test. The meaning of the re-examination of Factor II effects is that they are not confirmed. A lack of significance for Factor effects with fifty-four month criteria is consistent with the findings at earlier stages of development.

No Factor III (neonatal risk), or Factor IV (multiple complications) effects were associated with the two physical criteria, the psychomotor criterion, or with the six cognitive criteria.

Insert Tables 66 and 67 about here

The predictor, social class, based on McGuire and White social class scores, stands in marked contrast to the other predictors. This predictor was a powerful influence in all three criterion. Deletion of social class for the weight criterion was influential, and it was even more significant as an influence on height. Virtually the only

*This alternate mode of comparison was developed by Dr. Steven D. Spaner functional element in the predictor series for Copy Forms was social class. Much the same observation may be made about the Preschool Inventory raw scores used as criterion measures, and about the role of social class scores with the Boehm criterion. The McGuire and White social class scores accounted for better than two-thirds of the variance in all nine of the criterion measures. The role of social class was equally distinct for the three domains, physical attainment, psychomotor attainment, and cognitive attainment. The role of social class far outweighed perinatal status in the predictor series.

Criteria

The use of three domains of development at age four and a half years was an attempt to represent the breadth of children's attainments towards the end of the preschool period. The criteria remained as predictable as they had generally been earlier in the preschool years. The physical measures yielded unimpressive R^2 values, and did not attain statistical significance, even with substantial groups of children. The psychomotor measure, the Ernhart Copy-Forms, was moderately well predicted by the group information and by social class, and the cognitive measures were quite well predicted. The Preschool Inventory results are intended to be used as a single score, despite the format which permits separate subscores to be computed for four areas. The $PI_{(3)}$ Conceptual-Numerical area yielded the highest R^2 from the full model, $R^2 = .25$, in contrast to the other subtest scores with R^2's of .14 (PI_1), .15 (PI_4), .19 (PI_2), and .24 (PI_{Total}). A closer examination shows that the more robust of these R^2 values, e.g. $PI_{(3)}$ and $PI_{(Total)}$ are highly influenced by social class effects. In the case of $PI_{(Total)}$ the contribution of social class to the R^2 value is .21, leaving only .03 to be assigned to other sources. In the case of $PI_{(3)}$ Conceptual-Numerical, the contribution to the criterion variance is .21 also, leaving .04 of the criterion variance to be assigned to other sources in the regression model. In the case of the Boehm criterion the results are about the same; the R^2 value of .19 is largely explained by social class (.17), leaving .02 of the variance to other sources in the regression model.

Table 66 presents correlations between the variables employed at fifty-four months of age. There is confirmation in the correlation matrix for the view that Preschool Inventory performance should be used as a total score, rather than as a set of subscores. The PI subtest correlations are all statistically significant, many well beyond the .01 level of probability.

The relationship between the Boehm score and the Preschool Inventory total score is high and positive ($r = .71$, $p = <.01$). Both Boehm score and the five PI scores are significantly associated with social class scores, with a spread of r values from .33 to .48; the latter correlation is for the Concept-Activation-Numerical subtest, which also has the highest correlation with the Boehm ($r = .64$, $p = <.01$). Far less robust correlations exist between length and weight and social class.

In general, the fifty-four month data summarized in Table 67 support the emerging picture in prior reports of perinatal status 'at risk' declining in importance in the years after birth; conversely, the influence of social class continues to rise, contributing increasingly to the proportion of criterion variance, especially for non-physical criterion measures.

Sixty Months

Regression Models.

The amount of data in the basic regression models given in Table 38 is not large. The vectors consisted of social class data, mutually exclusive classification as control, Factor I, or Factor III cases, delay in testing expressed in weeks, together with the unit vector and the error vector. The R^2's generated were, accordingly, not excessively low, due to the limited but critical data employed. The lowest R^2 values were obtained for the ITPA digit span test, with weight and height giving only slightly higher values. Of these three poorly predicted criteria only height yielded a statistically significant full model ($p = .03$). The WPPSI Vocabulary and ITPA Auditory Association test were considerably more robust with R^2's of .11 and .19 respectively. The Adjustment criterion (Child Behavior Inventory) yielded a statistically significant full model of $R^2 = .06$ ($p = .0001$).

Predictors.

At sixty months of age there were five predictive vectors plus the unit vector in the full model. Three were status vectors, controls and two risk categories, McGuire and White scores represented social class, and the last element in the full regression model was testing delay in weeks.

The first predictor examined for significance was Factor I group membership, a vector representing gestational complications in the probands' histories. As assessed in comparison 1 and 2 there was no significant difference getween controls and Factor I cases for any of the six criteria. Model 3 compared Factor III (neonatal) risk cases with controls. Here again, no differences were revealed for any of the criterion measures. Model 4 compared Factor I and Factor III subjects. In one instance, there was a significant difference between the two experimental groups. It emerged on the development criterion ($F = 4.39$, $p = .03$). It should be pointed out, however, that the decline in R^2 was from .06 to .05. Model 5 tested the contribution of the McGuire and White social class scores. No effects were found on the physical measures. None was found for the digit span test, a finding supporting the general observation that this measure of cognitive skill is resistant to social class effects and, accordingly, gives a fair picture of cognitive attainment. Substantial social class effects were detected, in order of magnitude, for ITPA Auditory Association, WPPSI Vocabulary, and Adjustment (Child Behavior Inventory) scores. The final element in the regression models was test delay expressed in weeks. The results were significant for the two physical measures. Test delay affected weight, reducing the R^2 from .01 to .004, a reduction of less than one percent in a statistically insignificant model. The reduction for height was from $R^2 = .02$ to .01 in a statistically significant model. No significant effects associated with test delay for the other measures employed at sixty months. The significance of delay information expressed in R^2 values was not great, even for the physical measures. However, it may well have been useful in creating a statistically significant model for height ($R^2 = .02$, $p = .03$). For other models 1 - 6 the test delay information was redundant. At a procedural level it is helpful to see that unavoidable delays in testing children due to tracing mobile families has not been a serious problem.

It is helpful to note that the seven-item predictor series actually consist of a smaller number of functional variables. The three group membership vectors are mutually dependent to a degree; Factor I cases are those which are not Factor III's or Controls. Factor III cases are non-Factor I and non-Control cases. Controls are non-Factor I or III cases. In fact, only Factor I or III are real vectors of positive information, and both of them are sub groups of all experimental cases. The test delay vector is non-developmental data in (generally) developmental models. The unit and error vectors are standard in all regression equations. The social class data and the biological data, Factor I or III, are the really functional classes of data.

Summarizing the predictor effects we see that risk group membership information at birth is not meaningful for the criteria at sixty months, generally speaking. On the other hand, social class accounts for a good deal of the criterion variance in three non physical measures. In the case of ITPA Auditory Association results in Table 41 we see that seventeen of nineteen percent of the criterion variance is due to social class, a proportion of approximately eighty five percent of the total R^2 value. For WPPSI Vocabulary the percent of criterion variance due to social class is about eighty percent, while for Development it is fifty percent.

Criteria

The least predictable criterion is the ITPA Digit Span test followed by the measures of height and weight. Auditory Association is perhaps the best prediction followed in order by WPPSI Vocabulary and Development. The most predictable measure, Auditory Association, is not well predicted (R^2 = .19) but that state of affairs is highly dependent on the nature of the predictive measures employed.

Inter-relations within the criteria are informative Weight and height are not related to the predictor elements or to the other criteria, but are related to each other (r = .62, p<.01). Similarly, digit span is not related to the other criteria in Table 68 and it is not related to social class. In this regard digit span, or more fully ITPA Automatic Vocal Sequential, meets the specifications leading to its selection as a criterion measure to some extent. Jensen (1961) has suggested that digit span tests are not subject to a host of influences and so may be considered a measure of native ability. The correlation of .03 (df = 381) with SES certainly indicates a limited responsiveness to social class affects. However,

Insert Tables 68 and 69 about Here

a correlation with race for digit span at sixty months (r = .16, p<.01) shows less utility as a culture-fair measures of aptitude.

On the other hand some criterion measures should be chosen because they are sensitive to a wide variety of influences. This permits investigators to identify predictor variables which cause criterion measures to fluctuate. In this regard the other three criterion measures meet the specification. ITPA Auditory Association is related to social class to a considerable extent (r = -.43*), WPPSI Vocabulary is also highly responsive to social class (r = -.32*), as is the case with adjustment on the Child Behavior Inventory (R = .21). Reasonably, Auditory Association and Vocabulary are also correlated (r = .56). Adjustment, a broad criterion measure of freedom from personality and behavior problems, is negatively correlated with Vocabulary, r = -.17, though to a lesser extent. It is also related to social class to a degree (r = .21, p .01). As in previous reports test delay is related to social class (r = .21*, p .01) indicating that more delay due to tracing problems was encountered in testing lower class children. However, the mean test delay for over four hundred subjects was less than a week.

Overall, the data show a lack of significant association between the critical predictor element based on categorical risk at birth and six criteria of development at age sixty months. In contrast, social class continues to emerge as a consistently powerful influence on children's attainment, being related to Adjustment and two of the Cognitive criteria.

*McGuire & White (1955) high scores mean low social class.

Sixty Six Months

Regression Models.

The data in the basic regression models consisted of social class data, mutually exclusive classification as control, Factor II, III, and IV cases, delay in testing expressed in weeks, together with the unit vector and the error vector. The R^2's generated were generally similar to those obtained at sixty months. The significant exception was the R^2 value obtained at sixty six months which was .21, nearly double the value of .11 generated in the sixty month study group. The R^2 values for weight and height were higher than that obtained for ITPA Digit Span, which was the lowest. The adjustment R^2 value reached statistical significance. The value of .08 was quite similar to the .06 generated at sixty months with another group of children. The highest R^2 values were those for ITPA Auditory Association ($R^2 = .23$) and WPPSI Vocabulary ($R^2 = .21$). This is not surprising since the correlation between these two measurs of verbal facility was .57 (df = 362, $p < .01$) at sixty six months.

Predictors

The models employed at sixty six months were based on six pieces of information, four linearly dependent vectors representing status as members of three perinatal risk categories or as controls. The additional vectors were the three factor social class scores, testing delay, the unit vector and the error vector.

At sixty six months the probands whose delivery had been at risk to some degree, Factor II cases in model 2, were a small group (N = 14). Their identification as a group was tested in regression model 2 with insignificant effects on all six criteria. Reductions in criterion variance associated with the presence of delivery complications five and a half years previously had no significance statistically. The Factor III group were assessed by model 3. This heterogeneous set of neonatal risk elements composed primarily from Apgar scores and low birthweights also produced significant results. The multiple complication group, Factor IV cases was tested by regression model 4. Slightly high F-values were generated by this category of risk cases but the F-values were in no case significant.

A rather different state of affairs emerges when social class is considered as an influence on developmental attainment. Proportionally large, if statistically insignificant drops in R^2 values show that 66 months weight and height were slightly affected[1]. However, the lack of statistical significance is similar to that encountered at 60 months for an SES effect on physical development.

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[1]A similar lack of effect has been noted for two criteria of body build and nutrition at sixty six months, Tuxford's Index (1917), and the Ponderal Index (Jones, 1938; Domey, Duckworth, and Morandi, 1964).

The data of the report do not provide a basis for understanding a lack of influence on weight and height by social class. An explanation might lie in the extent to which even poor children in our urban centers are now provided with nutritional supplements. Data presented by the investigator elsewhere (Jordan, 1973b) indicate that most children of school entry age are enrolled in quasi-educational programs in which at least one balanced and nutritionally sound meal is offered. In contrast, social class scores executed a strong and consistent effect in the domain of cognitive development. The influence seems equally demonstrated in the case of ITPA Auditory Association and Digit Span. In the case of Auditory Association the R^2 produced by regression model 5 dropped to .02 from .23 ($F = 97.58$, $p<.00001$). Quite similar results are seen in WPPSI Vocabulary when the full model 5 dropped from .21 to .03 for model 5 ($F - 83.41$, $p<.00001$). This is an SES effect which is commonly encountered, and illustrates differences in class cultural patterns of language.

Social class effects on ITPA Digit Span were different however. The full model for this criterion was capable of only minimal prediction ($R^2 = .007$, $p = .27$), and the model deleting social class had an R^2 value of .004. While this is a drop of nearly fifty percent in the variance accounted for by the model, the basic full regression model was so ineffective that speculation seems unwise. This is not to say that consideration of Digit Span performance is not useful. Jensen (1961), and Bereiter & Engelman (1966) believe that the lack of social class bias is precisely what makes digit span a useful index of mental ability.

We may now comment on the social class effect on the maternal report of inappropriate behaviors. The regression data indicate that the number of problems in the average child ($\overline{M} = 4.51$) rises sharply as social class declines. This finding is parallel to that reported in 1970 by Rutter, Tizard, and Whitmore, who found that 71.7% of cases of psychiatric disorder in children occurred in families whose occupational level was "manual" and lower. In 1972 the same trend was evident in the fifteen thousand children studied British National Child Development Study (Davie, Butler, and Goldstein, 1972). Accordingly, we see that social class effects have established their influence on characteristics related to meeting the major developmental tasks of children at age sixty six months. The social context for learning which is the classroom presumes a degree of non-neuroticism and adaptation. The lower class portion of the 1966 birth cohort tended to be more likely to show behavior patterns which will appear maladaptive to middle class teachers in middle class schools.

Finally, it is helpful to observe that test delay expressed as weeks since the birth anniversary was not large. It was no great problem on the average ($\overline{M} = -.07$ weeks) and, indeed, it was possible to test a number of children slightly in advance of the birth anniversary. On the other hand, the maximum delay encountered was nearly four months. Persistence in tracing such cases is justified by the need to maintain data taking on children whose development has been followed prospectively. Use of testing delay recorded in weeks as a covariant permits use of such occasional cases in group analyses.[1]

Summarizing the materials in the predictions it emerges that the categorical predictors of biological risk in the neonatal period in 1966-67 exerted little or no influence on development at age sixty six months. Social class is revealed as the sole and powerful influence in the regression models.

Criteria

As at sixty months digit span was the least predictable criterion. The R^2 value of the full model was statistically insignificant. In this regard it is helpful to recall earlier remarks about the nature of the predictive series, and the linear dependence of the group membership vector. The remaining five criteria at sixty six months achieve statistical significance. Two of the five reached R^2 value of .21 (Vocabulary) and .23 (Auditory Association). In terms of previous experience with regression models, and in particular those containing a great deal of information on children at school entry age (Jordan, 1973a), R^2 values of .21 and .23 are not unusual. The unassigned variance is considerable and constitutes a major challenge to child study.

It remains to comment on the inter-relations between the criteria. The physical measures, weight and height, are highly correlated in Table 70 (r = .94) shows that body build tends to reflect the axes of growth which sophisticated analyses have revealed (Hammond, 1942). Height alone seems related to social class, although the correlation is low and barely reaches statistical significance. Height is also correlated with Auditory Association and Vocabulary. The connection is perhaps through SES also, since the correlation, .15 and .13, are not robust. The cognitive elements of the criterion series tend to be related. Apart from the r Vocabulary/Auditory Association noted earlier there are the significant associations Digit Span/Auditory Association (R = .21) and Digit Span/Vocabulary (r = .12); both, as Table 57 shows are significant at the .05 and .01 levels. Apart from these relates Digit Span is not correlated with other measures. The lack of significant correlation with social class at sixty six months (r = -.04) confirms the views cited a little earlier from Jensen, and from Bereiter and Engelmann.

In general, the data gathered and analyzed at sixty six months, the T_{11} filial cohort, indicates that the perinatal risk categories had ceased to exert any great influence on development. In contrast, the predictor, social class score continued to demonstrate a steady

[1]Since records are maintained as raw scores requests from schools for reports on probands are manageable using the actual age in months when referring to norms.

Insert Tables 70 and 71 About Here

influence. As social class level declines, so attainment on cognitive and adjustment criteria declines. As Table 71 indicates, no such influence is apparent for height and weight at age sixty six months.

Seventy Two Months

Regression Models

The amount of data in the basic regression models given in Table 38 is not large. The vectors consisted of social class data, mutually exclusive classification as control, Factor I, or Factor III cases, delay in testing expressed in weeks, together with the unit vector and the error vector. The R^2's generated were, accordingly, not excessively low, in view of the limited but critical data employed. The lowest R^2 values were obtained for the height and mixed dominance ITPA digit span test, with weight auditory discrimination and disability scores giving only slightly higher values. Of the predictors only PPVT yielded a substantital R^2 (.12) which was also significant ($P<.00001$).

Predictors

At seventy two months of age there were five predictive vectors plus the unit vector in the full model. Three were status vectors, controls and two risk categories, McGuire & White scores represented social class, and the last element in the full regression model was testing delay in weeks.

The first predictor examined for significance was group membership, a vector representing gestational and perinatal complications in the probands' histories for two groups of children, and freedom from any apparent degree of biological risk for a third group. This vector failed to detect any substantial significance in group membership. A second predictive approach contrasted control -vs- risk status in two categories. This was only slightly better than the preceding formulation and produced a significant finding for one of the eight criteria, score on the Denver Articulation Test. A far more powerful predictor was the three factor McGuire & White social class score. It generated significant effects detected in three criteria, PPVT score, Denver articulation score, and the disability score. The procedural check on testing delay was also insignificant, except in the case of head circumference. This finding is anomalous since head circumference does not expand perceptibly in a matter of weeks. Among all the predictor effects the most pronounced was that of social class score on PPVT scores. The contribution to the R^2 value of full model 1 due to SES score was .10, which indicates that social class was accounting for eighty percent of the criterion variance. Summarizing the predictor effects we see that *risk* group membership information at birth is not meaningful for the criteria at seventy two months, generally speaking. On the other hand, social class accounts for sixty to eighty percent of the criterion variance in three non-physical measures.

Criteria

Perhaps the aspect of the criterion series most requiring comment is the low predictability. In the series of analyses beginning at 36 months R^2 values expressing the proportion of criterion variance accounted for by predictors have not been substantial. None have been much beyond .20, for example. In the 60 month criterion series only one criterion, PPVT, form B, raw score has a substantial R^2 value, .12, although it is statistically significant to a high degree ($p=.009$) from a model R^2 of zero. The remaining R^2 values drop sharply to the level of $R^2=.94$, .03, and .02, and .01, for criteria Articulation score, Disability score, auditory discrimination, and weight, respectively. The criteria 60 month height, and mixed cerebral dominance are so low as to invalidate all but the most elementary observation, namely that there is virtually no connection between these two criteria and the predictor series. As with previous sub-cohort criterion series the greatest source of variance seems to be the social class score.

Interrelations

Table 72 shows the intercorrelations of predictors and criteria. Within the matrix of correlations the egregious relationship between test delay and head circumference found in Table 56 emerges once more. It seems that measurement in cm. is a growth criterion sensitive to relatively brief passages in time, suggesting that metrication in study of physical development is a useful idiom. In the reports of this research program ounces were

Insert Tables 72 & 73 about here

originally used as a measure of weight, and are fairly close to kilograms as a sensitive measure. Pounds avoirdupois are less sensitive, although we have emphasized accuracy to the quarter pound in taking data. This standard is quite strict when compared to other longitudinal studies. Newens and Goldstein (1972) for example, reported that the British 1958 cohort has used the nearest pound and nearest inch as criteria of precision. It seems, however, from the seventy-two month data that a metric standard shows a more desirable level of sensitivity for analyses of physical development.

A major predictive influence continued to be the SES score generated from occupational, educational and income data. It affected three of the five non-physical criteria, articulation ($r=-.15, p<.01$), disability score ($r=.17, p<.01$), and most of all, PPVT score ($r=-.35, p<.01$).

Status as a control subject was not associated with any other variable.

However, status as a Factor I *risk* proband (gestational risk) was highly correlated with low social class (r=.29,p<.01) and to a lesser extent with articulation, PPVT score, and disability score. Status as a Factor III proband was less associated with SES (r=-.23,p<.01) and with all the cognitive criteria, though to a lesser degree.

Among the criteria articulation and auditory discrimination scores were highly correlated (r=-.41,p<.01), a predictable finding in view of the generally low auditory discrimination encountered in children with poor articulation at age six. A less pronounced relationship exists between articulation and another linguistic element PPVT score (r= .21,p< .01).

Seventy Eight Months

The data set examined at 78 months consisted of one more element than at age 72 months. This was the use of an extra predictor set based on biological risk in the early development period. Continuity with the 72 month criteria is seen in continued use of physical measures, laterality, PPVT, auditory discrimination, and disability states.

Regression Models

The regression models given in Table 42 of the RESULTS section were continued at age 78 months. Their value remained at level R^2 = .02 - .03, based on the vectors used to generate the full models of eight criteria. There remained rather poor R^2 values observed for the same models at earlier ages and with low R^2s obtained over the span from birth to age five years by Jordan and Spaner (1970, 1972, 1974) using a different set of predictors.

Predictors

Among the experimental factor groups based on perinatal biological *risk* status only use, the Factor II group, had only statistical significance. This, the gestational risk category, dropped the R^2 for 78 month weight from .02 to .005 within a statistically insignificant regression model. The other two effects dropped the R^2 for the reading subtest of Jastak's Wide Range Achievement Test from .17 to .16. In the case of the DSI criterion, that is the total number of disability states identified at age seventy-eight months, the R^2 was dropped from .03 to .01. In evaluating these three reports it is necessary to recall that the Factor II risk group at 78 months consisted of only thirteen children. Under the circumstances we are inclined to interpret the findings cautiously and to see them as indicative and not strong enough to merit generalization.

In the case of the Factor III group result reported in Table 57 on the PPVT criterion the drop in R^2 value is from .14 to .12 and so, despite the .01 level of significance generated in view of the degrees of freedom available, it seems that a cautionary position on interpretation is called for. This sum attitude seems suitable for the low Factor IV finding of a significant drop in R^2 on the Peabody Picture Vocabulary Test at age 78 months from .14 to .12. Interestingly, both the Factor III and IV results shown in Table 75 are for the PPVT criterion.

Insert Tables 74 and 75 About Here

A far less equivocal and theoretical more generalizable finding at seventy-eight months is that associated with social class. Table 75 shows that the McGuire and White (1955) three factor index of social class was a significant sum of variance for six of eight criteria. In the case of the first perinatal effects recorded in Table 75 we see a drop in the R^2 for head circumference in cm. from .02 to .01. The full regression model, however, is statistically insignificant (p.07), and the decline accounts for one percent on the criterion variance. Equally slight, and also not previously observed at 72 months, is the SES effect on Wepman's auditory discrimination test. The R^2 declined in the regression model of auditory discrimination from .02 to .01.

Far more substantial are the results in Table 75 on the influence of social class score in criteria 57 to 60. The contribution to the PPVT score made by SES is 78 percent, as deletion of the SES vector dropped the full model R^2 from .14 to .03. Slightly larger is the contribution to reading score. A powerful SES effect is seen in the drop for WRAT reading R^2 from .17 to .02. This drop accounts for 88 percent of the variance in a statistically significant model. Of lesser statistical importance is the drop in R^2 which SES produced in the total number of disability states for the 78 month children. On the other hand, the drop from .03 to .01 accounts for two thirds of the criterion variance in a statistically significant regression model ($p=.05$). Equally, social class is associated with the tendency for children to have mixed preference for eye and hand on simple tasks. In this case the drop in R^2 from .06 to .009 represents about 76 percent of the criterion variance.

The sum of these observations is that biological risk at gestational decline shows a slight but probably spurious relationship to development at age 78 months. On the other hand, an unequivocal effect is shown by social class level on non-physical attainment. The effect is statistically significant within regression models which are also statistically significant. Reiteration of this observation may be based on the correlations reported in Table 74. All five of the correlations with non-physical criterion are statistically significant, and three of the five are at a probability level $<.01$.

Criteria

The PPVT grand mean raw score of 57.52 points an opportunity to assess the general representatives of the 78 month cohort, and so of the 1960 cohort at the end of the period covered by this report. According to Dunn's norms for the PPVT form A a score of 57.52 yields a mental age of six years and six months - 78 months. From this we may conclude that the series of children studied at the half year anniversary of birth - 78 months - are exactly where we would hope them to be in average mental maturity at the thirteenth study period.[1]

Within the criterion set of physical measures it is interesting to see that height and weight are well connected ($r=.04$, $p<.01$) and that both are highly connected with head circumference $r=.34$ & $.35$. Equally connected are the ability discrimination errors (x-score) and total score in the WRAT reading test. That is, errors in the ability to discriminate different phonemes are negatively related to reading success. This relationship ($r=-.21$, $<.01$) shows that reading failure can be related to a non-reading language skill in the fashion that reading specialists have long suggested. Reading is also related in a statistically significant way to mixed lateral dominance ($r=.12$, $p=.05$), but to a weaker degree. An interesting observation in Table 74 is the lack of significant relationship between social class and physical development. This is probably due to the study population's lowest levels of social class being about the minimal level for adequate overall development. Overall, the criterion at 78 months showed generally expected interelations.

General Observations

Having discussed the nature of the findings at each age-level it is now appropriate to consider the age span, 36 - 78 months, and the phenomena of the period beginning with the Physical domain.

Physical Domain

At thirty-six months it was possible to detect the influence of perinatal *risk* status on the domain of Physical growth. This is reasonable, since it is rational to expect that biological predictors will relate to biological criteria. However, the predictors and criteria are not precisely matched, since the *risk* predictor status is slightly different from the criteria expressed in pounds and inches. By age forty-two months, however, the influence of perinatal biological risk had disappeared from the domain of physical development. An influence due to the Factor II (gestational and presentation risk) was detected at 78 months but was probably spurious in view of the small number ($n=13$) of Factor II cases. Conversely, social class exerted some influence at thirty-six and forty-two months. At forty-eight months of age it declined and reappeared in a modest role ($p<.02$) at fifty-four months and seventy-eight months for head circumference.

Insert Table 76 About Here

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[1]The 72 month T_{13} grand mean PPVT IQ was 102, and the grand mean mental age was 76 months (N=396).

Psychomotoric Domain

It is helpful to point out that the measures of motoric skill were not as homogeneous as the physical criteria. They varied in two ways. First they ranged from gross to fine with increasing age; second, they changed from heavily (though not totally) indirect measurement at ages thirty-six and forty-two months, to direct measures at ages forty-eight months and later.

There was only one age at which perinatal *risk* information affected criterion performance. That was at age thrity-six months, and it appeared on the PAR *Ambulation* criterion. This influence was also seen in criterion (5), which was the sum of the two PAR motor tests. After age thirty-six months no effects of the risk data on motoric growth were detectable. Social class effects for PAR *Ambulation* were evident both at thirty-six months and at forty-two months, but not for PAR *Manipulation*. At forty-eight and fifty-four months social class effects were evident on the quite precise tasks of the Copy Forms criterion. SES effects were also detected on tasks of lateral dominance - hand and eye- at age seventy-eight months.

Congitive Domain

At thirty-six months perinatal status information influenced the PAR *Communication* scores. A slight effect (.02) was detected on the PPVT scores. By forty-two months both effects were gone, and did not reappear. In contrast, social class effects were present in this domain at age thirty-six months, and proceeded to persist throughout all ages and for all cognitive measures. It is clear from the preceding commentary that perinatal *risk* data plays a small but limited role at ages three and four. The influence exists, but extinguishes relatively quickly. In contrast, the social class data, McGuire and White (1955) scores based on occupation, education, and source of income, played a far more significant role which was persistantly strong through the seventy-eight month criteria.

Social Class

Consideration of Table 76 shows the role of social class, expressed as R^2 values. The table shows that social class effects are generally low and trivial in the physical domain. SES effects in the motoric domain were equally slight at thirty-six months, but increase substantially with the four year criteria. In contrast to both of the preceding domains the effects of SES on cognitive attainment were comparatively pronounced. SES effects were relatively substantial at age three increasing their contribution at age four, and persisting through age six years.

Examination of column and row mean R^2 values in Table 76 shows SES effects by specific ages, and by domains. At each age level the mean R^2 values due to SES effects for all five criterion domains are shown. The SES effect within the regression models is very low at age thirty-six months, mean R^2 = .041. At age forty-two months it increases slightly to R^2 = .046. At age forty-eight months it jumps substantially to R^2 = .13. These values should be evaluated within the context of limited regression models which yield correspondingly low R^2 values. Thus, the column R^2 mean values in Table 76 are proportionately higher than they would seem. The trend to clearly emerged SES influences by age three and four is evident.

It can be seen that perinatal *risk* data, information in traditional biological formulations, plays a modest role in the attainment of three to six year olds at best. This view should be mediated by recalling the nature of the risk data. The range of degree of risk in the predictor series is wide. The reason was that moderate and mild risk are present in children, as well as high risk. In this latter category there is an abundance of information, as Part One of this report and the Bibliography demonstrate. The contribution of categorical risk, i.e., prenatal, -natal and postnatal risk at all degrees permits some attenuation of effects. On the other hand, there is little evidence on the outcomes of apparent mild risk, while high risk is so well investigated that no real urge to inquire into its isolated effects seems justified.

The combination of social class and risk factors in a study population is combined, to some extent. At age three the correlation between social class and Factor I (prenatal) risk is .31 ($p = <.01$), while the correlation between Factor III (perinatal) risk and SES is .21. Accordingly, the probability arises that putative risk assigned to biological data may, in fact, be largely attritutable to covariate social effects. That is, the presence of risk and identified disability may emerge from adverse social processes. This observation is supported by the Kauai Longitudinal Study of Werner, Bierman, and French (1971). Their Hawaiian data led to the conclusion that the contribution of a poor environment was ten times greater than that of "serious perinatal stress," as they expressed it. A similar conclusion was reported in 1972 by Davie, Butler, and Goldstein from the British National Child Development Study of fifteen thousand children at age eleven years.

PART FIVE

PATTERNS OF DEVELOPMENT

So far we have considered two elements, a perinatal *risk* series and a set of criterion measures affected at age 36 - 78 months. In this section, Part Five, we examine the temporal sequence aspects of development, the characteristics of children from birth to age five years.

An educational product of developmental studies is the identification of states of readiness for learning and their correlates. For the purposes of this report an attempt is made to sketch the developmental patterns of children in the upper and lower one-third groups at age five on three measures. Thus, the criterion groups are three; first, there is identification by means of scores on the WPPSI Vocabulary scale, second, a parallel measure is the ITPA Auditory Association measure. The third is quite different, the digit span test from the ITPA (Auditory Sequential Memory). This measure is used because it is held by some to be a more valid, culture-fair measure of mental ability. The line of reasoning for identifying criterion groups may be recapitulated as follows:

1. Vocabulary - Verbal intelligence, highly correlated with school success.

2. Auditory Association - Linguistic skill related to information processing.

3. Digit Span - culture fair measure of mental ability

For each of the high and low groups on these three measures background data in the form of means and standard deviations was extracted for nineteen aspects of development. These nineteen elements are grouped in Tables 77, 78 and 79 in three domains, intellectual, maternal, and environmental information. Data are presented for all subjects, usually just under 400 probands, and for the high and low groups, usually sixty to seventy cases, depending on the variables. Perhaps the significant exception is the accounting of Binet mental ages in Table 77, a maximum of about one hundred and fifty cases being available.

Preschool Intellectual Performance

Data in Table 77 are the means and standard deviations of the children at ages two, three and four years. When WPPSI Vocabulary is the criterion we see from Table 77 it is the high group which is most evident. On most measures inspection of means and standard

Insert Table 77 about here

deviations shows elevated means for the high group. Further, the means tend to be quite separated from those of the low group of children. With the exception of the Ammons at age two the trend is consistent. Equally, the low group of children show a picture of depressed mean scores. For ITPA Auditory Association groups at age five the picture in Table 77 is essentially the same. The high group is identifiable at age two on Binet M.A., and on the Ammons (picture vocabulary test), and on all subsequent measures. The low group emerges as a distinguishable group a little later, at age three on the Peabody (PPVT). The gap between means of high and low group is pronounced and generally consistent, beginning at age two with a difference of ten months of mental age. By age four the Preschool Inventory means are two standard deviations apart. In the case of digit span a very different picture emerges on six largely verbal measures of intellectual performance and attainment. The high group tend to be slightly above the mean for all subjects, but not exceptionally so. The low group tend to be at slightly below the grand mean. Their performance is lowest on the two age four years measures, the Caldwell and Boehm tests. In general, the picture of mental development which emerges in the preschool years for children with high and low scores on mental tests at age five is consistent. Three low groups groups at age five were never ahead of the average child. Generally were at the average level at best, at age two years, and a trend to lower performance became more pronounced across the preschool years. In the case of the advanced group at age five, their verbal precocity was evident at age two and became more pronounced as the years went by. By age four high and low groups on all three criterion measures, including digit span, were clearly far apart in mean scores on the Preschool Inventory. The gap is two standard deviations for the WPPSI Vocabulary and ITPA Auditory Association groups and one standard deviation for the digit span groups. This latter finding is perhaps the most interesting, since it suggests that low performance on the Preschool Inventory and other amalgams of cultural elements is not entirely divorced from level of attainment on a nominally less biased measure, digit span.

Maternal Characteristics

The adage which observes that the hand which rocks the cradle rules the world is now capable of some empirical assessment. Like most sayings it expresses an essentially correct observation, but

It also shows the limitations of any statement reducing human experience to a few words. The data of the St. Louis Baby Study to date permit observations to be made about the discriminating characteristics of mothers whose children at age five score high and low

Insert Table 78 about here

on three mental tests. As with the preceding remarks on intellectual development of probands there are observations, being based on inspection of means and variances in Table 78. The seven maternal measures in the table were gathered incidentally while testing children in their homes. Data were taken only when the informant was the biological mother or a permanent mother figure. Mental status and age were noted at time of delivery by direct interview in the obstetric unit. Loevinger's measure of authoritarian family ideology (AFI_{68}) was administered just prior to discharge, and the anxiety measure, Bendig's version of the Taylor scale, was delayed until six months post partum to avoid temporary and misleading raises due to delivery. Intelligence was measured by means of the Quick Test. Educational attitude score was derived from administering Medinnus' (1962) Parent Attitude to Education Scale at child age five years.

On the WPPSI Vocabulary criterion we see in Table 78 that mothers of high scoring children are more likely to be married than other mothers and age at delivery tends to be relatively typical. Authoritarianism (AFI_{68}) is generally lower in mothers of high scoring children, on the order of .5 standard deviation, and they tend to be less anxious. The mothers are somewhat higher than average in intelligence, also about .5 standard deviations. Their mean level of education is well above the average, but their attitude to education is quite typical in mean score. Low WPPSI Vocabulary mothers are far more typical in marital status, delivery age, and AFI_{68} score. They differ however by being markedly higher in mean anxiety score from the high group of mothers. Intelligence and educational level are below average, and well below the means for high vocabulary mothers. Mean scores for attitudes to education are markedly different in the two groups of mothers, with the more positive scores reported for high low group mothers. Inspection of the means on ITPA Auditory Association indicates a very similar state of affairs, with AFI_{68} scores discriminating more clearly between high and low group mothers. On ITPA Digit Span the high group mothers tended to be very close in mean values to the grand means, and only rarely exceeded them, and then to a slight degree. Low group mothers were also very clear, generally not falling below grand means in Table 78. In intelligence mean scores and educational level the low digit span mothers were a little lower. Unlike the tendency for maternal characteristics to discriminate mothers of high and low groups on the two verbal criteria, there seem to be no really discriminating characteristics of mothers whose children scored high and low on the digit span task.

Environmental Characteristics

Table 79 reports means and standard deviations on six environmental characteristics of high and low groups of five year olds on the three element criterion series. The six elements begin with social risk, a five point scale score based on social data. Race is ethnic group-essentially, being and not being, black. SES is the three factor McGuire & White score based on educational level, occupation, and income source. STIM is Caldwell's quantification of the degree to which a home presents a stimulating environment. Home density is the proportion of people to rooms. A high score indicates crowding.

We see in Table 79 that the WPPSI Vocabulary high group children are markedly lower in social risk, and low in the probability of being black. High group mothers have lower McGuire and White SES scores indicating a social level about .5 standard deviation higher than the average. This same level of higher condition is paralleled by their STIM scores and the educational level of the head of the household.

Insert Table 79 about here

Low group children are above average in social risk and four times more likely than high group to be black. Their mean SES level is about a half standard deviation. Home density is above average but not very much. The educational level of the head of household is below average, and well below that of the high mothers. On the ITPA Auditory Association a similar set of observations emerges. The low scoring children have slightly more depressed social level, STIM scores, and educational level for head of houshold. Home density is slightly higher than on the WPPSI Vocabulary. The trend is for low Auditory Association scores to be associated with more depressed conditions than low Vocabulary scores. On Digit Span in Table 79 the high group children are close to the grand mean on virtually all scores. The exception is the tendency for high scoring children to be black. The environmental characteristics of the low digit span children show a generally average set of means. Interestingly, they are less likely to black than the average child in the group of nearly four hundred reported here. Only 26% of the low digit span group are black. On all other environmental variables the low scoring group of children tend to be like all children and also like the high scoring group.

SUMMARY

From the point of view of this essentially discriminative commentary based on means of high and low groups of children it is possible to sketch a picture of what high and low groups present at school entry age by way of background and previous history.

<u>High Verbal attainment</u> children tend to emerge relatively early from the mass of children, perhaps as early as age two. By three they tend to be discriminable from low attainment youngsters, and by four the trend is quite clear. Correlated with these elements are trends to greater permissiveness in their mothers value systems and lowered anxiety. Educational level of mothers tends to be higher, and their attitudes to education are in the low average range, perhaps suggest a little more reality in their attitudes. In terms of environmental factors mothers of high verbal attainment children come from favored backgrounds, tend to be white rather than black, share their homes with fewer people, proportionately, who are generally above average in educational attainment.

<u>Low verbal attainment children</u>, in contrast, emerge as a discriminable group a little more slowly; however, they are discriminable by age three, and by age four their lower attainment levels are clearly established. The mothers of these children are typical in age of delivery, but more likely to be authoritarian and anxious than most mothers, and certainly mothers of highly verbal children. Such mothers are perhaps, low average in verbal intelligence, of less than average educational attainment, and hold more positive convictions than mothers of typical children, and to a more pronounced degree than mothers of highly verbal children. Low verbal children are three to four times more likely to be black, and to have been born and raised in adverse social circumstances. They have grown up in a slightly more crowded home with adults with less than average levels of schooling.

<u>High and low digit span children</u> are much harder to discriminate from other boys and girls. Their early performance on verbal mental tests tend to be average, although high and low groups tend to be discriminable by age three, and clearly so by age four. Mothers of both high and low groups have the same delivery age as other mothers, the same levels of authoritarianism, intelligence, anxiety, and attitude to education.

It can be seen that ability at verbal skills conducive to effective performance in school is not accidental, it emerges from the circumstances of childrens' preschool lives and can be tied with some accuracy to home and community influences. While it is not true, as the nineteenth century librettist had it that "every little boy or girl alive, is born a little Liberal or a Conservative"; it is clear that attempts to promote equality of opportunity can be founded in the years preceding school entry. As the circumstances of life tend to depress attainment they also tend to elevate attainment in other children. The stability of these phenomena, especially those dealing with the role of parental educational attainment and social level have been replicated by the writer elsewhere (Jordan, 1973a). We observe that the readiness for schooling in children is a determinate state, one which can be related to social process and the views of childhood which obtain in Lippmann's terms, as public philosophy.

At a more pragmatic level we can observe that the materials just presented suggest some strategies for education.

First, there is the finding that high and low readiness states are processes of development going back into the years before school entry. Accordingly, it can be concluded that intervention strategies need to intrude into children's lives perhaps as early as age three years, if deviate patterns of growth are to be avoided.

Second, there is a nidus of social factors in the family and larger community which suggest that early identification of instructional risk is feasible. More specifically, it should be possible to define a configuration of child, home, and social factors which can be used to identify children for purposes of special instruction.

Third, there seem to be related probabilities of identifying high aptitude children at an early age. They are youngsters whose readiness for schooling is manifestly unrelated to present age/grade concepts of grouping children.

Fourth, the entire nexus of preschool development processes is demonstrably capable of explication. That is, both the salient domains of influence, and the elements within those domains can be demonstrated. Accordingly, we have reason to believe that the phenomena of success and failure in the early grades can be subjected to more complete and effective explanation. In view of the size of national expenditures on elementary education, thirty six billions of dollars in 1972-73 (Jordan, 1973b) it should be possible to explicate the contribution of homes, children, schools and finance to the levels of attainment which children reach.

PART SIX

DISABILITY STATES

Introduction

The program of studies from which this report emerges has as its object the study of the contribution of early social and biological adversity to learning characteristics in school age children. Within that broad assertion are a number of subordinate propositions, one of which is assessment of disability states at the end of the preschool years. A knowledge of the nature and correlates of disabilities can contribute to instructional planning in the school entry years.

The nature of difficulties which children show at age four is not self-evident. The writer believes that we need to distinguish a series of separate conditions in children (Jordan, 1962). The first is *disease*, referring to tissue-level problems in children, some of which are mild and perhaps of merely aesthetic significance. The instances of this condition are illustrated by mild visual disorders in girls, who dislike wearing glasses, or in a more serious degree by the loss of hair in a girl after an acute illness. Such difficulties need not interfere with learning or living.

The second term is *disability*, and it refers to interference with life processes. Again, the condition may have minor or major significance. An example is loss of a limb; a farm child who loses his left arm in a farm accident, and there are such children, is incapable of a number of motor activities which are basic to his life style. The term *disability* connotes loss of a normal body activity. Its evaluation depends on contextual factors, losing use of the left hand is far less critical than loss of the right-hand functions.

Finally, there is the term *handicap*, which the writer uses (Jordan, 1971c) to describe the tissue and disability states which manifestly disrupt the teaching/learning process. A condition becomes an *instructional handicap* when it interferes with expected classroom functioning.

The three-term nomenclature presented here moves from tissue to classroom function, with increasing attention to the instructional context. It follows that children's problems at age four can be described as *disability states*, because they have been assessed in a context of home life. They may or may not be at the tissue-level; they cannot be interpreted automatically as instructional handicaps. That determination will be made in a context of learning and teaching, a very different context from that used in this investigation because behavioral expectancies are quite different.

The basic intent of this three-term nomenclature is to distinguish problems of priority concern for instructional planning from problems in the most general sense. There is ample reason for doing so. Scholarship generally tends to generate new terms on the basis of an explicit set of ground rules, *vide* principles of taxonomy in biology and trans-uranic physics. In medicine the condition *appendicitis* was not introduced until 1886 (Crichton, 1971), although a variety of acute abdominal signs had been observed for centuries. In contrast, education has not been intellectually self-conscious and conservative. The term *learning disability* has at least three connotations none of which is explicit except to the person using the neologism. Equally dangerous is the introduction of terms which turn out to be non-existent (Rutter, Graham, and Birch, 1966), a form of innovation which has endless possibilities (Jordan, 1971d). The solution is, of course, some eight hundred years old, and consists of unsheathing Occam's Razor when nominalism appears in modern dress.

On the basis of the foregoing it can be seen that the writer's study of problems in four year olds is a consideration of disability states. Problems identified in the context of repeated clinical case studies in the home do not automatically constitute learning handicaps. The materials to be presented should be construed as reflecting the preceding considerations.

Insert Tables 80 and 81 about here

Part One

The object of the study reported in this section is description of the incidence and correlates of disability states.

Attempts to study the incidence and nature of problems in school children have been reported in recent years by Sapir and Wilson (1967), Haring and Ridgway (1967), and Keogh and Smith (1970).

Sapir and Wilson (1967) applied a developmental scale composed of ten psycholinguistic, motor and orientation tasks to a population of young children. The developmentally oriented scale successfully identified salient deficits, which were related to subsequent instructional problems in the first two years of schooling.

Haring and Ridgway (1967) took a larger population, 1200 children, beginning with ratings of children made by their teachers. A sophisticated battery of diagnostic tests was administered. ITPA subtests produced useful results, and several other nominally instruction-related diagnostic tests produced relatively little useful information. General language ability seems to have been the most useful factor in the complex of tests.

Keogh and Smith (1970) studied identification of learning problems by means of the Bender-Gestalt test. The scale was used to identify children at *risk* of learning difficulty. Interesting findings from this study were that evidence of low risk was a better predictor than high risk, and that statements made at kindergarten level were useful predictors at fifth grade.

All of these efforts came after children are enrolled in the mechanisms of instruction. What is called for is data in advance of need which will give early warning of problems and will estimate the extent and nature of problems. This section addresses itself to the second of these needs.

Method

The ascertainment of disability states was tied to data collection procedures at forty-eight and fifty-four months. Caseworkers administered the criterion test series to the cooperating probands at study periods eight (T_8) and nine (T_9). This testing was a repeat of child study at previous times and was often part of continued study by the same examiner over several years. Directions called for completion of a questionnaire immediately after test administration and scoring, and with the full developmental history (excluding perinatal *risk* status) available. Examiners were urged to see the four-year criterion measures as a controlled experimental situation providing information for a *Disability Screening Index* (DSI).

The categories of behavior assessed by the disability screening procedure are as follows:

1. Category Visual Disorders. Score yes for children reported by Mother as having visual problems and for children who, in the testing situation, showed visual limitations, e.g. wore glasses or held materials close to their eyes.

2. Category Hearing Disorders. Score yes for children reported by Mothers as not hearing (not inattentive), or showing difficulty hearing in the testing situation.

3. Category Mental Retardation. (Scored yes for children scoring low on tests of cognitive attainment by automated data processing.)

4. Category Experiential Deprivation. Score yes for children with STIM score 26 and below, or when you feel there are significant restrictions on child experiences, e.g., a clearly disorganized home run by an inadequate mother.

5. Category Motor Disorders. This category is meant to record children with obvious muscular problems, crippled children. Score yes for obvious defects.

6. Category Behavior Disorders. Score yes for abnormal behavior, more than five year old's awkward and defensive behavior.

7. Category Speech Defects. All five year olds have some speech defects. Score yes for children who have speech which is not easy to understand. Ignore simple consonant substitutes such as wabbit for rabbit.

Findings

Table 80 lists the incidence of disability states in the 1966 birth cohort at age four. Ages forty-eight and fifty-four months were combined. The six month difference in developmental age was not considered a crucial piece of information likely to influence reporting disability states. In Table 80 percentage figures are given for seven disability states. The percentages are reported in terms of perinatal *risk* status, the independent variable of the entire investigation, and for all subjects.

Data were reported on eight hundred and ten children at age four. In four hundred and five control (low risk) children the incidence of apparent hearing problems was zero. Motor problems were next in order of rarity (1%), followed by vision problems (2%), mental retardation (3%), and behavior disorders (4%). A distinctly higher rate of incidence sets apart the remaining conditions. Significant speech disorders were encountered in ten percent of the four year-olds, and experiential deprivation was reported in eleven percent.

For the Factor I (gestational risk) the figures in one hundred and one four year olds were slightly lower, by one percent, in most categories. One disability state, experiential deprivation, however, was much more common in Factor I cases. The incidence of reported experiential deprivation was twenty-one percent.

The small number of Factor II (delivery complications) makes use of incidence figures unreliable. In this group of twelve children there were no reported cases of hearing problems, mental retardation, motor disorders, or behavior disorders. In contrast, the incidence of vision problems, one case, was high; speech disorders were more common in this small group of children (17%) than in any other. Finally, as Table 44 shows, the incidence of experiential deprivation was also the highest reported - 44% - which is one child in three.

The Factor III (neonatal risk) group was substantial with data reported on 215 children. No hearing or motor disorders were reported. Visual and intellectual problems were quite low, two and three percent, respectively. There was a six percent incidence of behavior disorders, and the highest incidence figures arose from experiential deprivation and speech disorders, twelve percent in each category.

In seventy-seven Factor IV (multiple complications) cases the only unreported category was hearing disorders. Three percent incidence was reported for vision and motor problems, both of which were the highest incidence, except for the small Factor II group. Mental retardation was reported in six percent of the Factor IV children at age four years. Much higher incidence of the remaining categories was reported; ten percent incidence of emotional disorders; sixteen percent incidence of speech problems, and an incidence of nineteen percent for experiential deprivation were ascertained.

The last row in Table 79 combines the incidence figures for eight hundred and ten children. The incidence figures are very similar to those for the controls, who constituted exactly fifty percent of the reported cases.

Most consistently deviant were the Factor IV (multiple risk) probands, amounting to seventy-seven cases. The incidence of mental retardation was double the figure for the controls, six versus three percent. Motor disorders were three times as common, three versus one percent. Behavior disorders were two to three times more common in multiple risk children than in control cases, ten versus four percent. Speech disorders were half again as common, sixteen versus ten percent.

Closest to the controls were the Factor I (gestational risk) and Factor III (neonatal risk) probands. In the Factor I group the incidence of experiential deprivation, however, was double the control group's incidence figure.

Discussion

The first observation which may be made is that there is clear significance in some if not all perinatal risk data. In particular, knowledge that there have been multiple complications (Factor IV) predisposes children at age four to intellectual and behavior disorders. For all risk groups there is associated probability of experiential deprivation. It is least for the Factor III cases, but is roughly doubled for the substantial Factor I and IV groups of children.

The incidence of experiential deprivation at age four is alarming. For controls it is on the order of eleven percent, meaning one child in ten of this population is growing under adverse family circumstances of maternal deprivation or in a setting whose structure is inadequate. Setting aside the small Factor II group we see a still higher incidence in the Factor I and Factor IV cases. Given the high incidence of several problems in the Factor IV (multiple complications) probands it is disturbing to see that one in five (19%) is growing under adverse environmental circumstances.

Table 81 indicates the extent to which disability states are related to race and social class, and to each other. It is helpful to note that race and social class are highly correlated in the group of four-year olds (r = .57, $p < .01$). This arises because most black subjects are lower class and forty-two percent of the probands are black. Race itself turns out to be connected with the disability states mental retardation and speech disorder to a low but statistically significant extent (r = .07, $p < .05$). The statistical significance is marginal, and due to the high number of degrees of freedom. In contrast, the correlation of race/experiential deprivation is substantial, and accordingly statistically significant (r = .36, $p < .01$). As in the relationship with social class the connection is not surprising. It is, however, regrettable, since it puts the population of black children clearly at *risk* in the social sense. Sex, being a boy, is associated with only one disability state, speech problems (r = .15, $p < .01$).

The disability states tend to be largely independent of each other. The most statistically sound connection is between mental retardation and speech disorders (r = .26, $p < .01$). The next most common is speech disorders and behavior disorders (r = .22, $p < .01$), a connection the writer has discussed extensively elsewhere (Jordan, 1972). The third most robust pairings are the connection between mental retardation and experiential deprivation (r = .18, $p < .01$), and visual disorders and motor disorders (r = .18, $p < .01$). This is followed by mental retardation and behavior disorder (r = .17, $p < .01$).

It is worth noting that the disability state most consistently associated with other disability states is speech. The strength of the relationship to other states is not large, with correlation coefficients no higher than .26. However, the connection is extensive and involves all seven disability states except visual disorders. It is helpful to recall the eleven percent incidence figure for all eight hundred and ten children given in Table 80. Special problems constitute a pervasive and connecting element in the nexus of disability states in young children.

The general observation emerges that a population of low biological risk four year olds contains a number of children with significant problems. When a contrast group of perinatal *risk* children is studied a more acute picture of problems of potential significance for schools emerges. The range of incidence figures is generally highest for experiential deprivation, speech problems, and behavior disorders. Environmental factors play a significant role in disability states. Table 82 shows the effects of applying the sixty six months regression models to the Disability Scoring instrument. Model

Insert Table 82 about here

5, deleting social class scores, dropped the R^2 value of the model from .04 to .01. We see that three quarters of the variance in this barely statistical significant model (R^2 = .03) was due to social class.

Part Two

From the analyses of Part One it is clear that disability states at the end of the preschool years can be traced to perinatal information. The information contains a hiatus, however, at the point of information from a variety of sources in the years between birth and the criterion age. For this reason a second analysis of disability criteria at ages six and six and a half years of age (T_{12} and T_{13}) was conducted. Predictors were assembled from three domains and are shown in Table 83. From the domain of *child development* measures were retrieved for the following variables birth weight in lb., Apgar score (Apgar & James, 1962), sex, biological risk, somatype (small, length and weight), and 12 month development. Apgar score is a rating from an expected maximum of 10 down to zero on five aspects of neonatal condition, and biological risk describes degree of biological jeopardy on a scale from zero for no apparent risk to five for a maximum degree of risk, e.g. very low birthweight or very low Apgar. This rating scheme is given in the Appendices. From the domain of *social experience* the perinatal social class score (McGuire & White, 1955), a social risk score from 1-5 based on the lowest half only of the SES distribution for 1008 newborns, ethnic group member-

Insert Table 83 About Here

ship and a life changes score were selected. This last element, the life changes score, is the work of Coddington (1972) and consists of a weighted score for degrees of change and upheaval in a child's life (see Appendix). From the domain of *maternal characteristics* three elements were chosen; they were mother's level of education plus her age and marital status at the time of delivery. The entire set of predictors is listed in Table 83. Criteria for the analyses were those elements of the disability set which contained enough cases to make multivariate analysis applicable. The criteria were five - the total number of disabilities recorded for each child, retarded mental performance, experiential deprivation, speech problems and abnormal behavioral states.

Method

The statistical technique used to analyze antecedents to disability at age six was chosen on the basis of (1) a multivariate approach (2) exploration of interaction effects and (3) deletion of non-significant predictors. The method chosen was Koplyay's (1972) AID-4 regression interaction program. This technique developed by Sonquist (1970) dichotomizes predictors in order of power to raise the R^2 value for the criterion within arbitrary limits for size of cells and levels of predictor values. Table 83 lists the levels of the predictor variables, which are not necessarily in obvious form; e.g. Apgar levels and Apgar scores.

Findings

Figures One to Five show the AID-4 trees for the five predictors. The first, Figure 1, shows the interaction regression model for the total sum of identified *disability states*. The maximum number of states recorded for any six year old was four, while the majority of children

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Insert Figures 1 to 5 About Here

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had none. The number of cases at age six (T_{12} + T_{13}) with all pieces of information in the predictors and criterion series was almost four hundred (N=384). Of the thirteen predictors employed the program selected six, and they were in order of magnitude of contribution to maximizing the R^2 value life changes, delivery age, Apgar score, sex, and SES. The maximum R^2 value of the model after seven splits was .24.

The AID-4 Tree in Figure 2 presents the pattern and order of significant predictors for *mental retardation* identified at age six. Figure 2 shows that a set of successive dichotomies of the data on three hundred and six children created a regression model with a maximum R^2 value of .10. The most significant dichotomy was based on ethnic group, with quite similar mean criterion scores of 1.84 and 1.95, although the number of cases in the two cells is markedly different. The high side of the tree - meaning criterion scores indicative of non-retardation - is explicated only a little further, and by Apgar scores. On the more extensive low side of the tree group 2 composed of 56 cases is more fully elaborated by delivery age, SES, and life changes.

Insert Table 84 About Here

Figure 3 reports the AID-4 analysis of factors influencing the presence of *experiential deprivation* in three hundred and seventy (N=370) children at age six years. On the high side of the tree two terms (white) ethnic group and life change scores raised the R^2 value to .25. The low side of the tree, indicative of the tendency to experiential deprivation through mean scores closer to 1.00, is more elaborated. The life changes scores in groups 6 and 7 raise the R^2 to .29, and subsequent elaborations through maternal level of education - including a squared vector in groups 11 and 12 raise the proportion of criterion variance accounted for to .34.

Figure 4 presents data on *speech problems* on over three hundred children (N=325) by means of an AID-4 analysis. Koplyay's Interaction program produced a brief array of predictors in a regression model which gave a low account of criterion variance (R^2 = .05, $p<.01$). The order of the predictors used in the regression model was 12 month development, maternal education, and birthweight in a simple symmetric tree.

The last figure, dealing with *abnormal behavior* analyzed data from N=383 children from birth to age six years. The maximum R^2 generated by the AID-4 program after five splits was R^2 = .08. The order of the predictors, in Figure 5 shows, was sex, life changes, Apgar, maternal education and delivery age.

Discussion

The five criteria employed were those on which there were enough observations to make an analysis worthwhile. After excluding visual and auditory problems on these grounds the remaining five criteria were analyzed in statistically significant regression models. The R^2 values summarized in Table 84 show a range from .05 for speech problems to .34 for experiential deprivation. The mean of the five R^2 values in Table 84 is R^2 = .15. All the models were statistically significant, and ranged from R^2 = .05 to .34. The most complex model with the longest predictor series is that in Figure 1 for the total disability score. The briefest was that for speech problems in Figure 4. Apart from the size of the R^2 values generated by maximizing dichotomies the AID-4 program generates a tree whose shape is noteworthy. Only one tree, that in Figure 4 for speech problems is symmetric. The rest of the trees are asymmetric, with three of the four elaborated on the side of the disability states.

In Sonquist's (1970) view asymmetry of a tree, a *CS* model as he terms it, is best explained as one in which interaction effects among variables is maximal. In this regard, we can observe therefore, that the antecedents to discrete disability states in the data of this report are more than merely additive linear components, but also interactive to a considerable degree. A further consideration in the branching patterns of the trees is that the tree in Figure 1 for the sum of disability states, i.e., multiple disabilities, is what Sonquist calls a trunk-branch type. This symmetric pattern is a representation of additivity among the independent variables. A final observation in the nature of the AID-4 trees is the occasional existence of non-linear components. In Figure 1 Apgar scores occur twice, as groups 5, 7 and 10, 11. This indicates a squared element in the interaction pattern. It is also seen more clearly in Figure 3 which has maternal education in groups 8, 9, and 10, 11, as well as life changes in groups 4, 5 and 6, 7.

Insert Table 85 About Here

The predictors elicited as the potential influences on the criterion series were thirteen in number. However, some of the predictors were discarded in all five analyses. In Table 85 we see that the first of the rejected predictors was somatype in the *development* domain. This was membership in the class of newborns whose length and weight were both in the lowest cell of a 2 x 2 table. This possible indicant of low biological level had no sequelae in the form of the disability states analyzed at age six. Equally trivial was the degree of *biological risk* calculated from perinatal data, a finding not unrelated to Parts Two to Four of this report. The third consistently rejected predictor in Table 85 is the *social risk* score, a value calculated by treating the SES scores, which turned out to be more useful in their original form. A fourth unused predictor, from the maternal domain, was the status of the proband's mothers as married/unmarried at delivery.

In a positive sense some of the predictors groups turned out to be especially useful in the context of the full set of thirteen predictors. The criterion mental retardation drew on five predictors and three of them were in the domain of social experience, life changes, ethnic group, and SES score. Among the predictors the element used most frequently was Coddington's (1972) life changes score. It was used in regression models of four criteria, the sole exception was the criterion speech problems. More interestingly, the life changes score created one of the first two dichotomies in three of the five criterion trees. Three other predictors were used in three of five regression models. In the predictor domain of child development Apgar scores were used to raise significantly the R^2 value of criteria total score, mental retardation, and abnormal behavior. This is an interesting finding since Apgar scores have not proven significant for criteria beyond the period of infancy in the writer's analyses of development. However, in none of the analyses was Apgar used in the early, most influential AID-4 splits of predictors. Two other predictors, both from the domain of maternal characteristics were retained in three of five trees. They were maternal age at delivery of the proband and level of schooling.

In generalizing from the findings of this analyses of disability states it is interesting to note the value of Coddington's *life changes*.

This measure consists at all stages of child development of weighted experiences ranging from mild to serious, from benign to catastrophic, and taking the form of either direct experiences by a child or in his family. In this sense the life changes assess the dynamic aspect of a child's life, and we see in the importance of the Coddington measure, which is listed as an appendix, the effects of stress on child development.

A second generalization is that a multivariate approach to disability states in children at age six is shown to be beneficial. For each of the five disability states a unique set of significant antecedents may be glimpsed (in Table 85). In contrast, there tends to be consistency in the configuration of interactions - asymmetric trees - for each unique set of predictors. The range and complexity of influences on disability states and school entry age is thus elucidated to some extent, with the promise of greater clarity for emerging from further work.

Perhaps the most basic observation of all is that disability states may be viewed as susceptible to analysis in rational terms. From empirical analyses of disability states can flow a better grasp of the points at which child maldevelopment can be approached on a reasoned basis of population characteristics as well as idiosyncratic (individual) case histories.

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TABLE 1

CRITERIA FOR SELECTION OF EXPERIMENTAL SUBJECTS IN 1966 COHORT[1]

Factor I	Disorders of Pregnancy and Gestation
	Anemia of pregnancy, toxemia, pyelonephritis, diabetes, miscarriages, eclampsia, pre-eclampsia, serious infections, over-and under-age, developmental anomalies, hypertension, hemorrhages
Factor II	Disorders of Delivery
	Cord complications, delivery complications
Factor III	Neonatal Disorders
	Low birth weight, immaturity, hemolytic disease, low Apgar, anoxia, multiple birth (not twins), traumatic defect.
Factor IV	Multiple Complications
	Factors I + II, I + III, II + III, I + II + III

[1]All diagnoses equated by use of the International Classification of Diseases.

TABLE 2

NUMBER OF CASES STUDIED AT

AGES 36 - 78 MONTHS

(T_6) 36 Mos.	(T_7) 42 Mos.	(T_6 + T_7) 3 yrs.
380	376	756
(T_8) 48 Mos.	(T_9) 54 Mos.	(T_8 + T_9) 4 yrs.
421	404	825
(T_{10}) 60 Mos.	(T_{11}) 66 Mos.	(T_{10} + T_{11}) 5 yrs.
414	392	806
(T_{12}) 72 mos.	(T_{13}) 78 mos.	(T_{12} + T_{13}) 6 yrs.
396	370	766

TABLE 3

WINTER AND SUMMER TARGET STUDY GROUPS

GROUP	T_6, T_8, T_{10}, T_{12}, WINTER 36, 48, 60 and 72 Mos.	T_7, T_9, T_{11}, T_{13} SUMMER 42, 54, 66, and 78 Mos.
Controls	50%	50%
Factor I *(Gestational Risk)*	all	none
Factor II *(Delivery Risk)*	none	all
Factor III *(Neonatal Risk)*	50%	50%
Factor IV *(multiple Risk)*	none	all

TABLE 4

MEASURES USED IN SIX DOMAINS AT EIGHT AGES

ohort	N	Physical	Psychomotoric	DOMAINS Cognitive-Linguistic	Disability	Adjustment	Academic Achievemen
6 (36 months) and 7 (42 months)	380 359	Inches Pounds	Preschool Attainment Record (PAR) PAR *Ambulation* PAR *Manipulation* PAR *Physical*	Peabody Picture Vocabulary Test (PPVT) PAR *Communication*			
8 (48 months) and 9 (54 months)	415 404	Inches Pounds	Ernhart-Graham Copy Forms	Preschool Inventory (PI) Boehm Test of Basic Concepts			
10 (60 months) and 11 (66 months)	414 392	Inches Pounds		Illinois T. of Psycholinguistic Abilities ITPA *Auditory Association* *Digit Span* Wechsler Preschool and Primary Scale *Vocabulary*	Disability Screening Index	Child Behavior Inventory	
12 (72 months) and 13 (78 months)	396 370	Inches Pounds Head Circumference (cm.)	Mixed Lateral Dominance	Peabody Picture Vocabulary T. Wepman Auditory Discrimination T.	Disability Screening Index		Wide Range Achieve.T. *(Reading)*

TABLE 5

NEONATAL COHORT: WEIGHT AT BIRTH (T_1), TWELVE MONTHS (T_3), TWENTY FOUR MONTHS (T_4) THIRTY MONTHS (T_5), THIRTY SIX MONTHS (T_6), AND FORTY TWO MONTHS (T_7)

Subjects		T_1 Birth	T_3 12th Month	T_4 24th Month	T_5 30th Month	T_6 36th Month	T_7 42nd Month
CONTROLS	Range	5.50-9.80	15.87-30.80	21.00-37.00	23.00-27.00	22.50-45.00	25.00-64.50
	Mean	7.25	22.50	27.87	29.37	33.89	33.89
	Sigma	.98	2.60	3.27	2.62	4.73	4.73
	N	497	281	351	98	*179	**179
EXPERIMENTALS							
(Factor I)	Range	5.50-10.56	17.00-29.06	21.00-36.00	23.00-33.00	24.00 41.00	
	Mean	7.09	22.12	27.87	29.06	34.50	
	Sigma	.98	2.81	3.51	2.50	4.42	
	N	128	58	78	24	*91	
(Factor II)	Range	2.37-8.67	16.62-30.00	22.00-32.00	23.00-29.00		25.00-39.00
	Mean	7.03	22.75	25.80	25.37		31.88
	Sigma	.83	3.62	3.45	2.20		3.76
	N	18	11	10	4		**13
(Factor III)	Range	2.37-9.75	15.35-30.01	19.00-43.00	20.00-43.00	24.00-51.00	22.00-32.00
	Mean	6.75	22.18	27.69	29.25	32.79	28.46
	Sigma	1.62	2.80	3.81	3.50	4.82	2.72
	N	258	171	193	59	*101	**87
(Factor IV)	Range	1.99-11.50	16.50-27.75	21.12-40.00	24.00-35.00		26.00-60.00
	Mean	6.37	21.12	28.00	27.99		33.61
	Sigma	1.84	2.31	4.31	2.75		5.40
	N	99	54	69	26		**68

* = Winter study group

TABLE 5 (CONT'D)

NEONATAL COHORT: WEIGHT AT FORTY EIGHT MONTHS (T_8), FIFTY FOUR MONTHS (T_9), SIXTY MONTHS (T_{10}), SIXTY SIX MONTHS (T_{11}), SEVENTY TWO MONTHS (T_{12}), AND SEVENTY EIGHT MONTHS (T_{13})

Subjects		T_8 48th Month	T_9 54th Month	T_{10} 60th Month	T_{11} 66th Month	T_{12} 72nd Month	T_{13} 78th Month
CONTROLS	Range	24.00-51.00	26.00-72.00	27.00-63.00	30.00-75.00	28-75	31-86
	Mean	36.11	38.88	41.79	43.83	46.26	48.40
	Sigma	4.35	5.80	5.65	6.82	6.18	7.51
	N	*176	**189	*204	**200	*177	**185
EXPERIMENTALS							
(Factor I)	Range	25.00-40.00		35.50-47.50		32-72	
	Mean	35.50		43.39		46.26	
	Sigma	4.25		1.93		7.83	
	N	*88		*99		*75	
(Factor II)	Range		30.00-45.00		35.00-49.00		40-56
	Mean		36.10		42.12		45.65
	Sigma		4.32		4.09		4.68
	N		**11		**15		**13
(Factor III)	Range	23.00-50.00	28.00-52.00	34.00-47.50	32.00-55.00	34-82	36-65
	Mean	35.48	37.78	43.18	41.95	46.94	46.44
	Sigma	4.67	4.69	2.27	5.40	7.90	6.11
	N	*95	*92	*111	**103	*91	**97
(Factor IV)	Range		29.00-78.00		30.50-104.00		33-110
	Mean		38.56		43.92		49.10
	Sigma		5.82		9.85		11.06
	N		**68		**77		**74

* = Winter study group
** = Summer study group

TABLE 6

NEONATAL COHORT: LENGTH AT BIRTH (T_1), TWELVE MONTHS (T_3), TWENTY FOUR MONTHS (T_4) THIRTY MONTHS (T_5), THIRTY SIX MONTHS (T_6), AND FORTY TWO MONTHS (T_7)

Subjects		T_1 Birth	T_3 12th Month	T_4 24th Month	T_5 30th Month	T_6 36th Month	T_7 42nd Month
CONTROLS	Range	16-23	23-36	25-40	24-40	30-50	33.00-44.50
	Mean	19.82	29.74	33.89	35.76	36.23	39.29
	Sigma	1.32	1.61	2.30	1.99	3.29	1.76
	N	462	282	353	98	*188	**179
EXPERIMENTALS							
(Factor I)	Range	16-20	19-33	25-37	33-38	30-41	
	Mean	19.49	29.37	32.71	35.90	34.97	
	Sigma	1.10	2.04	2.94	1.34	3.00	
	N	118	54	78	21	*91	
(Factor II)	Range	17-21	25-31	27-35	34-35		37.00-42.00
	Mean	19.28	28.80	32.60	34.57		38.90
	Sigma	1.21	1.77	2.15	.25		1.42
	N	11	10	10	44		**13
(Factor III)	Range	14-23	19-34	23-39	24-39	30-50	33.00-32.00
	Mean	19.39	29.60	33.51	35.76	36.21	35.21
	Sigma	1.57	1.87	2.54	2.04	3.05	1.19
	N	244	168	195	59	*101	**87
(Factor IV)	Range	14-23	26-34	26-39	29-39		33.20-46.50
	Mean	19.26	29.49	33.83	35.55		39.16
	Sigma	1.61	1.65	2.39	2.03		1.91
	N	83	53	68	26		**69

* = Winter study group

TABLE 6 (CONT'D)

NEONATAL COHORT: LENGTH AT FORTY EIGHT MONTHS (T_8), FIFTY FOUR MONTHS (T_9), SIXTY MONTHS (T_{10}), SIXTY SIX MONTHS (T_{11}), SEVENTY TWO MONTHS (T_{12}), AND SEVENTY EIGHT MONTHS (T_{13})

Subjects		T_8 48th Month	T_9 54th Month	T_{10} 60th Month	T_{11} 66th Month	T_{12} 72nd Month	T_{13} 78th Month
CONTROLS	Range	34.00-47.00	32.50-48.00	35.00-49.30	39.00-53.00	40.50-50.50	32-54
	Mean	40.93	42.04	43.65	44.88	46.20	47.23
	Sigma	1.77	1.96	1.89	2.18	1.81	2.41
	N	*176	**139	*204	**200	*177	**185
EXPERIMENTALS							
(Factor I)	Range	32.00-44.00		30.00-63.00		41-49.50	
	Mean	40.42		41.07		45.79	
	Sigma	1.88		6.22		1.94	
	N	*88		*99		*75	
(Factor II)	Range		38.50-46.00		41.00-49.00		43.00-52.50
	Mean		41.56		43.95		46.48
	Sigma		2.05		1.91		2.36
	N		**11		**15		**13
(Factor III)	Range	31.00-44.50	38.50-45.80	30.00-60.00	35.00-49.50	41.30-50.00	42.50-56.00
	Mean	40.31	41.78	41.56	44.28	46.00	46.90
	Sigma	1.91	1.69	5.94	2.09	2.02	2.09
	N	*95	**92	*111	**103	*91	**97
(Factor IV)	Range		39.30-53.00		35.00-51.00		40.60-53.00
	Mean		42.11		44.69		47.31
	Sigma		2.17		2.34		2.13
	N		**68		**77		**74

* = Winter study group
** = Summer study group

TABLE 7

NEONATAL COHORT: PERINATAL SOCIAL CLASS SCORES AT BIRTH (T_1), TWELVE MONTHS (T_3), TWENTY FOUR MONTHS (T_4), THIRTY MONTHS (T_5), THIRTY SIX MONTHS (T_6), AND FORTY TWO MONTHS (T_7)

Subjects		T_1 Birth	T_3 12th Month	T_4 24th Month	T_5 30th Month	T_6 36th Month	T_7 42nd Month
CONTROLS	Range	14-84	20-84	14-84	14-84	16-84	14-84
	Mean	55.53	51.73	54.05	52.43	53.99	54.99
	Sigma	14.97	15.64	14.98	15.86	15.62	14.32
	N	494	281	358	150	*188	**179
EXPERIMENTALS							
(Factor I)	Range	24-84	24-81	24-84	38-81	24-84	
	Mean	65.91	62.15	64.60	63.45	63.97	
	Sigma	11.25	12.63	11.74	10.89	11.75	
	N	129	59	81	24	*91	
(Factor II)	Range	24-78	24-70	24-78	65-70		24-78
	Mean	61.39	57.63	62.80	67.50		60.46
	Sigma	11.21	12.21	14.21	1.80		12.56
	N	18	11	10	4		*13
(Factor III)	Range	16-84	16-78	16-84	17-81	17-84	20-81
	Mean	51.56	45.87	49.51	49.01	51.85	52.42
	Sigma	16.70	15.71	16.85	16.47	17.30	15.27
	N	258	170	196	81	*101	**87
(Factor IV)	Range	24-84	24-80	24-80	24-80		24-84
	Mean	57.89	53.48	55.82	53.32		57.46
	Sigma	15.11	14.94	15.00	16.67		15.76
	N	100	54	69	34		**69

* = Winter study group
** = Summer study group

TABLE 7 (CONT'D)

NEONATAL COHORT: PERINATAL SOCIAL CLASS SCORES AT FORTY EIGHT MONTHS (T_8), FIFTY FOUR MONTHS (T_9), SIXTY MONTHS (T_{10}), SIXTY SIX MONTHS (T_{11}), SEVENTY TWO MONTHS (T_{12}), AND SEVENTY EIGHT MONTHS (T_{13})

Subjects		48th Month	54th Month	60th Month	66th Month	72nd Month	78th Month
CONTROLS	Range	16-84	16-84	14-84	23-84	16-84	16-84
	Mean	55.54	54.98	55.39	54.93	53.90	54.72
	Sigma	15.31	13.93	14.95	13.85	15.47	14.08
	N	*176	**205	*204	*199	*177	**185
EXPERIMENTALS							
(Factor I)	Range	24-84		24-84		24-84	
	Mean	65.65		65.81		63.57	
	Sigma	11.23		11.01		11.91	
	N	*88		*99		*75	
(Factor II)	Range		24-78		24-78		24-78
	Mean		60.46		61.20		61.07
	Sigma		12.56		11.94		12.82
	N		**13		**15		**13
(Factor III)	Range	16-84	20-81	14-84	20-81	16-78	20-81
	Mean	51.17	51.00	51.82	51.09	48.19	50.61
	Sigma	17.63	14.99	16.77	14.50	16.89	14.88
	N	*95	**105	*111	*102	*91	**97
(Factor IV)	Range		24-84		24-84		24-84
	Mean		55.40		55.62		55.43
	Sigma		15.32		15.40		15.38
	N		**76		**77		**74

* = Winter study group
** = Summer study group

TABLE 8

INFERENTIAL STUDY GROUP (T_6): PERINATAL SOCIAL CLASS SCORES AND WEIGHT AND LENGTH AT BIRTH, SIX, TWELVE, TWENTY FOUR, AND THIRTY MONTHS

		Perinatal Social Class Class	Birth Weight (lb.)	Birth Length (in.)	6th Month Weight (lb.)	6th Month Length (in.)	21th Month Weight (lb.)	21th Month Length (in.)	24th Month Weight (lb.)	24th Month Length (in.)	30th Month Weight (lb.)	30th Month Length (in.)
CONTROLS	Range	16-84	5.50-12.00	16-23	9.62-28.68	23-31	17.37-30.12	25-36	22-37	26-38	23.50 41.00	24-39
	Mean	53.99	7.28	19.88	17.14	26.49	22.51	29.77	28.12	33.87	29.79	35.43
	Sigma	15.62	1.04	1.33	2.44	1.55	2.46	1.47	3.36	2.27	2.83	2.36
	N	188	188	188	188	188	188	188	188	188	188	188
EXPERIMENTALS												
(Factor I)	Range	24-84	4.93-10.56	16-22	12.06-22.37	22-29	17.43-27.12	24-33	21-36	25-37	23.80-33.50	33-38
	Mean	63.97	7.24	19.52	16.86	26.36	22.16	29.35	27.80	32.78	29.12	35.87
	Sigma	11.75	1.02	1.11	2.16	1.34	2.61	1.62	3.60	2.88	2.80	1.37
	N	91	91	91	91	91	91	91	91	91	91	91
(Factor III)	Range	17-84	2.12-10.00	16-23	9.68-23.50	22-31	15.25-30.12	24-33	20-43	26-39	20-43	33-39
	Mean	51.85	6.93	19.63	16.92	26.25	22.18	29.48	28.10	33.52	29.71	36.25
	Sigma	17.30	1.70	1.47	2.52	1.80	3.14	1.85	4.02	2.73	4.23	1.33
	N	101	101	101	101	101	101	101	101	101	101	101

TABLE 9

INFERENTIAL STUDY GROUP (T_6): CRITERION VALUES AT THIRTY SIX MONTHS

SUBJECTS		Physical Domain		Motoric Domain			Cognitive Domain	
		(1) Weight (lb.)	(2) Height (in.)	(3) PAR Ambulation	(4) PAR Manipulation	(5) PAR Physical	(6) Communication	(7) PPVT
CONTROLS	Range	22.50-45.00	30-50	4-14	3.82-	10.0-22.5	3.5-12	0-52
	Mean	33.86	36.23	9.65	9.10	17.22	7.21	26.04
	Sigma	4.15	3.29	2.02	7.99	2.33	1.74	9.72
	N	188	188	188	188	188	188	188
EXPERIMENTALS								
(Factor I)	Range	24.00-41.00	30-41	5.50-13.5	3-15	10-23	4-10	4-49
	Mean	34.50	34.97	10.57	7.97	18.21	5.40	22.81
	Sigma	4.42	3.00	2.02	2.53	2.41	1.71	6.88
	N	91	91	91	91	91	91	91
(Factor III)	Range	24.00-51.00	30-50	6-13.5	4.15	12-21.5	3.5-10	6-54
	Mean	32.79	36.21	9.94	8.19	17.61	7.88	27.09
	Sigma	4.82	3.05	1.68	1.95	2.00	1.78	10.34
	N	101	101	101	101	101	101	101

TABLE 10

INFERENTIAL STUDY GROUP (T_7): PERINATAL SOCIAL CLASS SCORES, WEIGHT AND LENGTH

AT BIRTH, SIX AND TWELVE MONTHS

SUBJECTS		Perinatal Social Class Score	Birth Weight (lb.)	Birth Length (in.)	6th Month Weight (lb.)	6th Month Length (in.)	12th Month Weight (lb.)	12th Month Length (in.)
CONTROLS	Range	14-84	5.50-9.18	16.00-22.00	13.00-26.01	19.00-31.00	16.90-30.00	23.00-34.00
	Mean	54.99	7.30	19.97	17.47	36.57	22.69	27.99
	Sigma	14.32	.86	1.12	2.28	1.51	2.75	1.67
	N	79	79	79	79	79	79	79
EXPERIMENTALS								
(Factor II)	Range	24-78	5.62-8.69	18.00-21.00	11.37-19.50	23.00-29.00	16.62-30.00	25.00-31.00
	Mean	50.46	7.16	19.25	16.01	25.87	22.68	28.55
	Sigma	12.56	.74	.96	2.51	1.76	2.70	1.70
	N	13	13	13	13	13	13	13
(Factor III)	Range	20-81	2.50-9.75	14.00-23.00	11.50-22.50	23.00-19.00	17.56-30.00	26.00-34.00
	Mean	52.42	6.65	19.18	16.53	26.32	22.09	29.74
	Sigma	15.27	1.57	1.72	2.31	1.16	2.60	1.64
	N	87	87	87	87	87	87	87
(Factor IV)	Range	24-84	1.99-11.50	14.00-23.00	8.99-22.10	22.00-30.00	17.50-27.75	26.00-34.00
	Mean	57.46	6.54	19.18	6.37	26.08	21.12	29.41
	Sigma	15.76	1.76	1.67	2.56	1.68	2.31	1.59
	N	69	69	69	69	69	69	69

TABLE 10a

INFERENTIAL STUDY GROUP (T_7): WEIGHT AND LENGTH AT

TWENTY FOUR, THIRTY, AND FORTY TWO MONTHS

SUBJECTS		24th Month Weight (lb.)	24th Month Length (in.)	30th Month Weight (lb.)	30th Month Length (in.)	42nd Month Weight (lb.)	42nd Month Length (in.)
	Range	21.00-36.00	26.00-40.00	24.00-37.00	26.80-40.00	25.00-64.50	35.00-44.50
CONTROLS	Mean	27.99	34.16	29.53	35.86	33.89	39.29
	Sigma	3.42	2.05	8.03	2.05	4.73	1.76
	N	79	79	79	79	79	79
EXPERIMENTALS							
	Range	22.00-32.00	27.00-35.00	23.50-29.00	34.20-35.00	25.00-39.00	37.00-42.00
(Factor II)	Mean	25.77	32.33	25.37	34.50	31.88	38.90
	Sigma	3.64	2.10	2.16	.18	3.76	1.42
	N	13	13	13	13	13	13
	Range	19.00-37.00	23.00-37.00	22.00-32.00	33.00-37.20	22.00-32.00	33.00-37.20
(Factor III)	Mean	27.39	33.40	28.46	35.21	28.46	35.21
	Sigma	3.56	2.57	2.72	1.19	2.72	1.19
	N	87	87	87	87	87	87
	Range	21.00-40.00	26.00-40.00	26.00-39.00	24.00-35.50	29.50-39.20	26.60-46.50
(Factor IV)	Mean	27.88	33.73	28.00	35.17	33.61	39.16
	Sigma	4.49	2.54	3.17	2.03	5.40	1.91
	N	69	69	69	69	69	69

TABLE 11

INFERENTIAL STUDY GROUP (T7): CRITERION VALUES AT FORTY TWO MONTHS

SUBJECTS		Physical Domain (8) Weight (lb.)	(9) Height (in.)	Motoric Domain (10) PAR Ambulation	(11) PAR Manipulation	(12) PAR Physical	Cognitive Domain (13) PAR Communication	(14) PPVT
CONTROLS	Range	25.00-64.50	33.00-44.50	1-14	5.50-12.00	2-26	3-11	4-96
	Mean	33.89	39.29	11.10	8.43	19.48	7.84	31.33
	Sigma	4.73	1.76	1.93	.96	2.70	2.06	12.38
	N	179						
EXPERIMENTALS								
(Factor II)	Range	25-39	37-42	7.50-14.00	6.50-10.50	16.00-24.50	1.50-11.00	11-41
	Mean	31.88	38.90	11.30	8.57	19.88	7.03	24.61
	Sigma	3.76	1.42	2.26	1.19	3.02	2.84	9.66
	N	13						
(Factor III)	Range	25-45	9-42	7-14	7.00-11.50	15-78	2.50-11.50	5-60
	Mean	32.40	38.51	11.05	8.58	20.32	8.29	31.43
	Sigma	3.63	3.51	1.41	1.03	6.50	2.11	13.44
	N	87						
(Factor IV)	Range	26-60	33.20-46.50	7-14	6.00-11.50	14.00-24.50	3.50-11.00	10-54
	Mean	33.61	39.16	11.27	8.26	19.54	7.39	26.86
	Sigma	5.40	1.91	1.56	.96	2.20	2.11	11.62
	N	69						

TABLE 12

INFERENTIAL STUDY GROUP (T_8): PERINATAL SOCIAL CLASS SCORES AND WEIGHT AT BIRTH, SIX, TWELVE, TWENTY FOUR, THIRTY, THIRTY SIX AND FORTY EIGHT MONTHS

SUBJECTS		Perinatal Social Class Score	Weight (lb.)	Weight (lb.)	Weight (lb.)	24th Month Weight (lb.)	30th Month Weight (lb.)	36th Month Weight (lb.)	48th Month Weight (lb.)
CONTROLS	Range	16-84	5.50-12.00	9.60-28.60	17.60-30.10	22-37	23.50-36.00	24-46	24-51
	Mean	55.54	7.25	17.21	22.54	28.08	29.50	32.02	36.11
	Sigma	15.31	1.01	2.45	2.41	3.30	2.32	3.73	4.35
	N	176							
EXPERIMENTALS									
(Factor I)	Range	24-84	4.90-10.00	11.80-22.30	17.40-26.50	25-37	23.80-33.00	24-41	25-50
	Mean	65.65	7.13	16.62	21.91	32.73	28.96	31.71	35.50
	Sigma	11.23	.93	2.21	2.49	2.78	2.82	3.84	4.25
	N	88							
(Factor III)	Range	16-84	2.10-10.00	9.60-23.50	15.20-29.00	20-43	20-43	20-57	23-50
	Mean	51.17	6.66	16.86	22.12	28.23	29.78	31.50	35.48
	Sigma	17.63	1.72	2.52	3.07	4.21	4.09	5.28	4.67
	N	95							

TABLE 13

INFERENTIAL STUDY GROUP (T_8): LENGTH AT BIRTH, SIX, TWELVE, TWENTY FOUR, THIRTY, THIRTY SIX, AND FORTY EIGHT MONTHS

SUBJECTS		Birth Length (in.)	6th Month Length (in.)	12th Month Length (in.)	24th Month Length (in.)	30th Month Length (in.)	36th Month Length (in.)	48th Month Length (in.)
CONTROLS	Range	16-23	23-31	25-36	26-38	24-39	35-50	34-47
	Mean	19.87	26.54	29.83	33.73	35.41	38.18	40.93
	Sigma	1.32	1.47	1.48	2.41	2.40	1.63	1.77
	N	176						
EXPERIMENTALS								
(Factor I)	Range	16-22	22-29	24-33	25-37	33-38	31-41	32-44
	Mean	19.49	26.22	29.33	32.73	35.72	37.41	40.42
	Sigma	1.06	1.37	1.62	2.78	1.35	1.78	1.88
	N	88						
(Factor III)	Range	16-23	22-31	24-33	26-39	33-39	31.00-50.50	31.00-44.50
	Mean	19.55	26.20	29.45	33.73	36.26	37.65	40.31
	Sigma	1.51	1.73	1.85	2.53	2.80	2.26	1.91
	N	95						

TABLE 14

INFERENTIAL STUDY GROUP (T_8): TEST DELAY AND CRITERION VALUES AT FORTY EIGHT MONTHS (T_8)

SUBJECTS		Test Delay (wks.)	Physical Domain (15) Weight (lbs.)	Physical Domain (16) Height (in.)	Motoric Domain (17) Copy Forms	Cognitive Domain (18) PI (1)	Cognitive Domain (19) PI (4)	Cognitive Domain (20) PI (3)	Cognitive Domain (21) PI (2)	Cognitive Domain (22) PI Total	Cognitive Domain (23) Boehm
CONTROLS	Range	-3-+9	24-51	34.00-47.30	2-61	0-18	0-12	0-11	0-15	0-58	0-25
	Mean	.27	36.11	40.93	28.52	10.88	5.10	5.34	10.74	31.93	13.75
	Sigma	1.45	4.35	1.77	12.71	3.59	3.02	2.77	4.57	12.07	4.70
	N	176			141	176					
EXPERIMENTALS											
(Factor I)	Range	-1-+12	25-50	32.00-44.00	2-59	0-17	0-11	0-10	0-19	0-53	0-23
	Mean	.69	35.50	40.42	24.46	11.04	4.31	4.70	9.47	29.54	12.77
	Sigma	1.94	4.25	1.88	14.82	3.84	3.09	2.67	4.43	11.78	4.92
	N	88			63	88					
(Factor III)	Range	-3-+6	23.40	31.00-44.50	2-60	0-17	0-11	0-30	0-19	0-52	0-23
	Mean	.16	35.48	40.31	30.49	11.22	5.49	5.94	11.36	33.81	14.27
	Sigma	1.28	4.67	1.91	13.94	3.62	2.80	3.91	4.30	11.98	5.08
	N	95			79	95					

TABLE 15

INFERENTIAL STUDY GROUP (T_9): PERINATAL SOCIAL CLASS SCORES AND WEIGHT IN POUNDS AT BIRTH, SIX, TWELVE, TWENTY FOUR, THIRTY, FORTY TWO, AND FIFTY FOUR MONTHS

SUBJECTS		SES	Birth	6th Month	12th Month	24th Month	30th Month	42nd Month	54th Month
CONTROLS	Range	16-84	5.50-9.80	13-25	16.90-30.00	21-36	24-37	25.00-64.50	26.00-72.00
	Mean	54.25	7.26	17.22	22.47	27.80	29.50	33.88	38.36
	Sigma	14.01	.88	2.11	2.73	3.32	3.06	4.77	5.80
	N	189							
EXPERIMENTALS									
(Factor II)	Range	24-78	5.80-8.60	11.30-19.50	16.60-30.00	22-32	23.50-25.00	25.00-39.00	30-45
	Mean	52.72	7.10	15.97	22.95	26.14	24.16	31.68	41.63
	Sigma	13.49	.77	2.83	3.90	3.97	.62	4.03	4.32
	N	11							
(Factor III)	Range	24-84	2.50-9.70	11.50-22.50	17.10-30.10	19-37	22-32	25.00-45.00	28-52
	Mean	54.73	6.68	16.50	22.04	27.24	28.37	32.42	37.78
	Sigma	15.74	1.49	2.27	2.70	1.81	2.76	3.68	4.69
	N	92							
(Factor IV)	Range	20-81	1.90-11.50	12.00-22.10	17.50-27.70	21-40	24.00-35.50	26.00-60.00	29-78
	Mean	49.88	6.48	16.53	21.05	27.81	28.00	33.84	38.56
	Sigma	15.00	1.73	2.34	2.34	4.42	3.25	5.41	6.82
	N	68							

TABLE 16

INFEREMTIAL STUDY GROUP (T_9): LENGTH AT BIRTH, SIX, TWELVE, TWENTY FOUR, THIRTY, FORTY TWO AND FIFTY FOUR MONTHS

SUBJECTS		BIRTH	6th Month	12th Month	24th Mon h	30th Month	42nd Month	54th Month
CONTROLS	Range	17.00-22.00	19.00-30.00	23.00-34.00	26.00-40.00	26.80-40.00	33.00-44.50	32.50-48.00
	Mean	20.03	26.54	29.76	34.16	35.88	39.26	42.04
	Sigma	1.08	1.54	1.70	2.07	2.11	1.86	1.96
	N	189						
EXPERIMENTALS								
(Factor II)	Range	18.00-21.00	23.00-29.00	25.00-31.00	27.00-35.00	34.20-34.50	37.00-42.00	38.50-46.00
	Mean	19.16	25.66	18.50	32.14	34.40	38.83	41.56
	Sigma	1.06	1.97	1.80	2.35	.14	1.53	2.05
	N	11						
(Factor III)	Range	14.00-23.00	23.00-29.00	26.00-34.00	23.00-27.00	33.00-37.20	-48.00	38.50-45.80
	Mean	19.35	26.34	29.81	33.54	35.18	38.55	41.78
	Sigma	1.61	1.81	1.63	2.48	1.26	3.68	1.69
	N	92						
(Factor IV)	Range	14.00-23.00	23.00-30.00	26.00-34.00	26.00-39.00	29.50-39.20	33.20-46.50	39.30-53.00
	Mean	19.30	26.28	29.59	33.98	35.10	39.26	42.11
	Sigma	1.59	1.61	1.54	2.48	2.06	1.98	2.17
	N	68						

TABLE 17

TEST DELAY AND CRITERION MEASURES AT FIFTY FOUR MONTHS

SUBJECTS	Delay	Test Delay (wks)	Physical Domain Weight (lb.)	Physical Domain Height (in.)	Motoric Domain Copy Forms	CRITERIA Cognitive Domain *PI(1)	*PI(2)	*PI(3)	*PI(4)	*PI Total	Boehm
CONTROLS	Range	-5-+.3	26.00-72.00	30.50-49.00	1-67	1-18	0-12	0-15	4-19	9-61	5-25
	Mean	.05	38.88	42.04	36.65	13.60	7.18	7.52	13.97	42.11	17.34
	Sigma	1.55	5.80	1.96	12.96	3.04	2.72	3.03	3.59	10.46	4.24
	N	189									
EXPERIMENTALS											
(Factor II)	Range	-3-+1	30-45	38.50-46.00	15-48	10-16	2-10	1-11	8-17	24-50	9-23
	Mean	-.36	41.63	41.56	36.90	13.63	6.36	7-09	14.27	41.36	16
	Sigma	1.06	4.32	2.05	10.06	1.87	2.60	2.77	3.19	7.79	3.95
	N	11									
(Factor III)	Range	-6-+6	28-52	38.50-45.80	8-64	5-18	0-12	2-15	1119	18.67	6.25
	Mean	-.13	37.78	41.78	35.85	14.29	8.00	8.26	14.36	45.38	18.05
	Sigma	1.65	4.69	1.69	13.38	2.77	3.00	2.84	3.88	10.43	4.69
	N	92									
(Factor IV)	Range	-4-+8	29-78	39.50-53.00	3.65	4-18	0-12	0-13	3-19	8-57	3-24
	Mean	-.05	38.56	42.11	32.66	12.35	6.29	6.92	12.58	38.30	15.98
	Sigma	2.06	6.82	2.17	13.68	3.46	3.09	3.17	4.38	12.28	4.95
	N	68									

$*PI_{(1)}$ = Preschool Inventory Personal-Social

$*PI_{(2)}$ = Preschool Inventory Concept, Activation-Sensory

$*PI_{(3)}$ = Preschool Inventory Concept Activation-Numerical

$*PI_{(4)}$ = Preschool Inventory Associative Vocabulary

TABLE 18

INFERENTIAL STUDY GROUP (T_{10}): PERINATAL SOCIAL CLASS SCORES, AND WEIGHT

AT BIRTH, TWELVE, TWENTY FOUR, THIRTY SIX, FORTY EIGHT, AND SIXTY MONTHS

		Perinatal Social Class Score	Birth Weight (lb.)	12th Month Weight (lb.)	24th Month Weight (lb.)	36th Month Weight (lb.)	48th Month Weight (lb.)	60th Month Weight (lb.)
	Range	16-84	55.50-12.00	17.30-30.00	22-37	27.50-46.00	24-51	27-63
ITROLS	Mean	54.27	7.24	22.41	28.14	31.86	36.19	41.79
	Sigma	15.56	1.03	2.32	3.38	3.73	4.26	5.64
	N 194							
ERIMENTALS								
	Range	24-84	5.50-10.50	17.40-29.00	21-36	24-41	25-50	30-63
ctor I)	Mean	64.41	7.13	22.12	27.83	31.84	35.57	41.37
	Sigma	11.42	1.00	2.79	3.67	4.07	4.42	6.37
	N 88							
	Range	16-78	2.10-10.00	15.20-29.00	20-43	20-57	23-50	30-60
:tor III)	Mean	49.54	6.82	22.58	28.06	31.44	35.46	41.63
	Sigma	17.19	1.64	3.05	4.01	4.87	4.72	5.75
	N 102							

TABLE 19

INFERENTIAL STUDY GROUP (T_{10}): LENGTH AT BIRTH, TWELVE, TWENTY FOUR, THIRTY SIX, FORTY EIGHT, AND SIXTY MONTHS

SUBJECTS		Length (in.)	12th Month Length (in.)	24th Month Length (in.)	36th Month Length (in.)	48th Month Length (in.)	60th Month Length (in.)
	Range	17-23	25-36	26-38	33.50-49.90	34.00-47.30	35.00-49.30
CONTROLS	Mean	19.82	29.76	33.79	38.15	40.95	43.66
	Sigma	1.30	1.47	2.27	1.77	1.78	1.90
	N 194						
EXPERIMENTALS							
	Range	16-22	24-33	25-37	32.00-41.30	32-44	35.50-47.50
(Factor I)	Mean	19.51	29.50	32.62	37.40	40.46	43.41
	Sigma	1.09	1.67	3.03	1.81	1.88	1.97
	N 88						
	Range	16-23	24-33	26-39	31.00-51.50	31.00-44.50	34-37
(Factor III)	Mean	19.61	29.53	33.77	37.62	40.21	43.13
	Sigma	1.46	1.77	2.34	2.24	2.07	2.29
	N 102						

TABLE 20

INFERENTIAL STUDY GROUP (T_{10}): TEST DELAY AND CRITERION VALUES AT SIXTY MONTHS

(N = 384)

BJECTS		Test Delay (wks.)	Length (in.)	Weight (lb.)	Digit Span	Assocation	Vocabulary	Adjustment
NTROLS	Range	-2- +11	35.00-49.30	27-63	2-25	4-33	3-32	0-15
	Mean	.86	43.66	41.79	11.08	15.48	14.17	4.76
	Sigma	1.92	1.90	5.64	4.13	5.13	4.95	3.34
	N 194							
PERIMENTALS								
actor I)	Range	-3- +10	35.50-47.50	30-63	2-23	3-26	2-25	0-23
	Mean	1.37	43.41	41.37	11.10	14.10	12.91	6.06
	Sigma	2.50	1.97	6.37	3.98	5.11	4.29	4.37
	N							
actor III)	Range	-3- +7	34-47	30-60	2-19	4-28	2-29	0-13
	Mean	.55	43.13	41.63	10.33	16.39	15.19	4.23
	Sigma	1.45	2.29	5.75	3.42	4.79	5.01	2.90
	N 102							

TABLE 21

INFERENTIAL STUDY GROUP (T_{11}): PERINATAL SOCIAL CLASS SCORES AND WEIGHT IN POUNDS AT BIRTH, SIX, TWELVE, TWENTY FOUR, THIRTY, FORTY TWO, FIFTY FOUR, AND SIXTY SIX MONTHS

SUBJECTS		SES	Birth	6th Month	12th Month	24th Month	30th Month	42nd Month	54th Month	66th Month
	Range	16-84	5.50-9.80	13-25	16.90-30.00	21-36	24-37	25.00-64.50	26.00-72.00	30-75
CONTROLS	Mean	54.47	7.25	17.22	22.47	27.92	29.55	33.92	38.81	43.67
	Sigma	14.02	.83	2.11	2.75	3.35	3.08	4.80	5.81	6.61
	N = 185									
EXPERIMENTALS										
	Range	24-78	5.60-8.60	11.30-19.50	16.60-30.00	22-32	23.50-29.00	25.00-39.00	30-45	35-49
(Factor II)	Mean	61.14	7.04	15.97	22.66	25.78	25.38	31.88	36.47	41.71
	Sigma	12.36	.76	2.83	3.81	3.64	2.16	3.76	4.07	3.94
	N = 14									
	Range	20-81	2.50-9.70	11.50-22.50	17.10-30.10	19-37	22-32	25.00-45.00	28-52	32-55
(Factor III)	Mean	50.46	6.74	16.50	22.17	27.35	28.79	32.33	37.68	42.05
	Sigma	14.66	1.52	2.27	2.75	3.64	2.68	3.67	4.67	5.41
	N = 96									
	Range	24-84	1.90-11.50	12.00-22.10	17.50-27.70	21-40	24.99-35.50	27.50-60.00	29-78	31.0-104.0
(Factor IV)	Mean	55.31	6.53	11.53	21.08	27.91	28.18	33.87	38.32	43.79
	Sigma	15.77	1.67	2.34	2.31	4.33	3.15	5.22	6.67	9.48
	N = 70									

TABLE 22

INFERENTIAL STUDY GROUP (T_{11}): LENGTH AT BIRTH, SIX, TWELVE, TWENTY FOUR, THIRTY, FORTY TWO, FIFTY FOUR, AND SIXTY SIX MONTHS

SUBJECTS		Birth	6th Month	12th Month	24th Month	30th Month	42nd Month	54 Month	66th Month
CONTROLS	Range	17.00-22.00	19.00-30.00	23.00-34.00	27.00-40.00	26.80-40.00	33.00-44.50	32.50-48.00	35-53
	Mean	19.98	26.54	29.73	34.26	35.83	39.26	42.03	44.56
	Sigma	1.10	1.54	1.76	1.96	2.12	1.81	2.02	2.20
	N = 185								
EXPERIMENTALS									
(Factor II)	Range	17.00-21.00	23.00-29.00	25.00-31.00	27.00-35.00	34.20-35.00	37.00-42.00	38.50-46.00	41.00-49.00
	Mean	19.00	25.66	28.55	32.33	34.55	38.90	41.59	43.95
	Sigma	1.15	1.97	1.71	2.11	.29	1.42	1.92	1.97
	N = 14								
(Factor III)	Range	14.00-23.00	23.00-29.00	26.00-34.00	23.00-27.00	33.00-37.20	35.50-42.00	38.30-45.80	35.00-49.50
	Mean	19.30	26.34	29.86	33.60	35.35	38.49	41.76	44.31
	Sigma	1.60	1.81	1.63	2.49	1.14	3.66	1.75	2.11
	N = 96								
(Factor IV)	Range	14.00-23.00	23.00-30.00	26.00-34.00	26.00-39.00	29.50-39.20	33.20-46.50	39.30-53.00	35.00-51.00
	Mean	19.38	26.28	29.65	33.84	35.18	39.32	42.08	44.77
	Sigma	1.59	1.61	1.51	2.49	2.08	1.94	2.15	2.25
	N = 70								

TABLE 23

INFERENTIAL STUDY GROUP (T_{11}): TEST DELAY AND CRITERION VALUES AT SIXTY SIX MONTHS

(N = 365)

UBJECTS		Test Delay (wks)	Length (in.)	Weight (lb.)	ITPA Digit Span	ITPA Auditory Association	WPPSI Vocabulary	Child Behavior Inventory
ONTROLS	Range	-3.0-7.0	39.00-53.00	30.00-75.00	4-28	4-28	3-33	0-14
	Mean	.01	44.86	43.67	12.29	18.15	16.23	4.71
	Sigma	1.04	2.20	6.61	3.96	4.81	4.89	3.38
	N = 185							
XPERIMENTALS								
Factor I)	Range	-3.0-3.0	41.00-49.00	35.00-49.00	6-18	10-24	10-19	2-11
	Mean	-.29	43.95	41.71	11.71	16.65	14.86	5.71
	Sigma	1.53	1.97	3.94	2.96	3.48	2.90	2.22
	N = 14							
Factor III)	Range	-2.0-4.0	35.00-49.50	32.00-55.00	3-22	5-33	7-31	0-16
	Mean	-.20	44.31	42.05	12.08	19.55	17.83	3.96
	Sigma	.92	2.11	5.41	3.98	6.01	5.69	3.34
	N = 96							
Factor IV)	Range	-3.0-12.0	35.00-51.00	31.00-104.00	5-22	8-31	6-27	0-15
	Mean	-.06	44.77	43.79	11.97	17.90	15.36	4.50
	Sigma	1.74	2.28	9.48	4.02	4.95	4.40	3.39
	N = 70							

TABLE 24

INFERENTIAL STUDY GROUP (T_{12}): PERINATAL SOCIAL CLASS SCORES, AND WEIGHT

AT BIRTH, TWELVE, TWENTY FOUR, THIRTY SIX, FORTY EIGHT, SIXTY, AND SEVENTY TWO MONTHS

SUBJECTS		Perinatal Social Class Score	Birth Weight (lb.)	12th Month Weight (lb.)	24th Month Weight (lb.)	36th Month Weight (lb.)	48th Month Weight (lb.)	60th Month Weight (lb.)	72nd Month Weight (lb.)
CONTROLS	Range	16-84	5.50-12.00	17.30-30.00	22-37	22.50-46.00	24-51	27-63	25-75
	Mean	53.90	7.26	22.50	28.33	31.83	36.09	41.62	46.53
	Sigma	15.47	1.07	2.33	3.42	3.70	4.30	5.49	6.46
	N 177								
EXPERIMENTALS									
(Factor I)	Range	16-84	4.90-10.50	17.60-29.00	21-36	24-41	25-50	30-63	32-72
	Mean	53.90	7.10	22.11	21.73	31.85	35.25	41.27	46.24
	Sigma	15.47	1.00	2.61	3.76	4.20	4.30	6.57	7.69
	N 75								
(Factor III)	Range	16-78	2.10-10.00	34.82	21-43	20-57	23-50	30-60	34-82
	Mean	48.19	6.95	46.94	28.25	31.65	35.72	41.91	46.89
	Sigma	16.89	1.66	2.98	3.98	4.91	4.79	5.70	8.00
	N 91								

TABLE 25

NFERENTIAL STUDY GROUP (T_{12}): LENGTH AT BIRTH, TWELVE, TWENTY FOUR, THIRTY SIX, FORTY EIGHT, SIXTY, AND SEVENTY TWO MONTHS

UBJECTS		Birth Length (in.)	12th Month Length (in.)	24th Month Length (in.)	36th Month Length (in.)	48th Month Length (in.)	60th Month Length (in.)	72nd Month Length (in.)
CONTROLS	Range	16-23	25-36	26-38	33.50-49.90	34-47.30	35-43.50	40.50-50.[illegible]
	Mean	19.87	29.78	33.84	38.07	40.79	43.50	46.28
	Sigma	1.34	1.49	2.23	1.84	1.85	1.85	1.81
EXPERIMENTALS								
(Factor I)	Range	16-22	26-33	25-37	32-41.30	32-43.50	35.50-47.50	41-49
	Mean	19.52	29.54	32.55	37.52	40.38	43.28	45.87
	Sigma	1.10	1.44	2.84	1.66	1.95	2.03	1.89
(Factor III)	Range	16-23	25-50.00	26-39	31.50-50.50	31-44.50	34-47	41-50
	Mean	19.71	29.54	33.96	37.78	40.27	43.21	46.03
	Sigma	1.47	2.02	2.24	2.15	2.10	2.36	2.00

TABLE 26

INFERENTIAL STUDY GROUP (T_{12}): TEST DELAY AND CRITERION VALUES AT SEVENTY TWO MONTHS (N=370)

UBJECTS		Test Delay (wks)	Length (in.)	Weight (lb.)	Head Circumf. (cm.)	Denver Articulation Test	Wepman Auditory Discrim	PPVT	Mixed Lateral Dom(%)	Disabili Rating Scale
ONTROLS	Range	0-31	40.50-50.00	28-75	41.70-56.50	8-30	0-33	36-87	.46	.22
	Mean	1.07	46.28	46.35	51.49	28.25	7.22	56.21		
	Sigma	2.81	1.81	6.46	3.72	2.70	5.84	8.23		
	N = 190									
XPERIMENTALS										
FACTOR I)	Range	-3-+17	41-49	32-72	48-54.50	13.30	0-30	33-71	.47	.32
	Mean	1.17	45.87	46.24	51.70	27.79	7.61	54.19		
	Sigma	2.43	1.89	7.69	1.37	3.31	6.10	7.84		
	N = 84									
Factor III)	Range	0-17	41-50	34-82	47.40-56.80	20-30	0-21	33-[illegible]	.41	.13
	Mean	.68	46.03	46.89	52.19	29.05	5.83	57.97		
	Sigma	2.15	2.00	8.00	1.89	1.99	4.38	7.13		
	N = 96									

TABLE 27

INFERENTIAL STUDY GROUP (T_{13}): PERINATAL SOCIAL CLASS SCORES, AND WEIGHT AT BIRTH, TWELVE, TWENTY FOUR, THIRTY, FORTY TWO, FIFTY FOUR, SIXTY SIX, AND SEVENTY EIGHT MONTHS

Subjects		Perinatal SES Score	Birth Weight (lb.)	12th Month Weight (lb.)	24th Month Weight (lb.)	30th Month Weight (lb.)	42nd Month Weight (lb.)	54th Month Weight (lb.)	66th Month Weight (lb.)	78th Mon Weight (lb.)
CONTROLS	Range	16-84	5.50-9.80	16-30	21-36	24-37	25-50	26-61	30-72	31-86
	Mean	54.60	7.29	22.51	27.80	29.51	33.75	38.55	43.50	48.39
	Sigma	14.14	.90	2.70	3.40	3.05	4.19	5.32	6.30	7.68
	N = 173									
EXPERIMENTALS										
Factor II	Range	24-78	5.60-8.60	16.60-30.00	22-32	23.50-29.00	25-39	30-45	35-49	40-56
	Mean	61.07	7.08	22.73	25.77	25.37	31.62	36.09	41.30	45.65
	Sigma	12.82	.76	4.00	3.64	2.10	3.80	4.01	3.79	4.68
	N = 13									
Factor III	Range	20-81	2.50-9.70	17.10-30.10	21-37	27.20-37.20	35.50-42.00	38.30-45.80	35.00-49.50	36-65
	Mean	50.52	6.70	22.19	27.32	35.21	38.90	41.77	44.28	46.47
	Sigma	14.93	1.53	2.73	3.47	1.19	1.51	1.75	2.10	6.14
	N = 96									
Factor IV	Range	24-81	1.90-11.50	17.50-27.70	21-40	24.00-35.50	27.50-60.00	29-78	31-99.90	33-110
	Mean	55.31	6.54	21.23	27.87	28.17	34.26	38.67	44.33	49.39
	Sigma	15.28	1.70	2.33	4.30	3.15	5.38	6.77	10.11	11.22
	N = 70									

TABLE 28

INFERENTIAL STUDY GROUP (T_{13}): LENGTH AT BIRTH, TWELVE, TWENTY FOUR, THIRTY, FORTY TWO, FIFTY FOUR, SIXTY SIX, AND SEVENTY EIGHT MONTHS

Subjects		Birth Length (in.)	12th Month Length (in.)	24th Month Length (in.)	30th Month Length (in.)	42nd Month Length (in.)	54th Month Length (in.)	66th Month Length (in.)	78th Month Length (in.)
	Range	16-22	24-34,	27-40	34-40	33-44	32.50-48	39-53	32-54
CONTROLS	Mean	20.00	29.76	34.28	35.81	39.23	41.96	44.82	47.23
	Sigma	1.10	1.69	1.89	2.21	1.75	1.98	2.19	2.42
	N = 173								
EXPERIMENTALS									
	Range	17-21	17-30	27-35	34-35	37-42	38-46	41-49	43-52.50
Factor II	Mean	19.00	28.25	32.33	34.55	38.80	41.43	43.75	46.43
	Sigma	1.22	1.56	2.10	.28	1.44	1.91	1.91	2.36
	N = 13								
	Range	14-23	26-34	26-37	33-35.20	35.50-38.90	38.30-45.80	35.00-49.50	42.50-56.00
Factor III	Mean	19.23	29.81	33.47	35.21	38.90	41.77	44.28	46.90
	Sigma	1.65	1.61	2.57	1.19	1.51	1.75	2.10	2.10
	N = 96								
	Range	16-23	28-34	20-39	29.50-39.20	33.20-46.50	39.30-53.00	35-51	44-53
Factor IV	Mean	19.30	29.77	33.89	35.18	39.47	42.21	44.82	47.44
	Sigma	1.63	1.47	2.48	2.08	1.93	2.14	2.30	1.99
	N = 70								

TABLE 29

INFERENTIAL STUDY GROUP (T_{13}): TEST DELAY AND CRITERION VALUES AT SEVENTY EIGHT MONTHS

Subjects		Test Delay (wks.)	Length (in.)	Weight (lb.)	PPVT (B)	Wepman Discrim. X Score	WRAT Reading Score	Mixed Lateral Dom.%	Disability Screening Total
CONTROLS	Range		32-54	31-86	9-73	0-22	0-63		0-2
	Mean	.36	47.23	48.39	57.19	5.80	26.67	46	.21
	Sigma		2.42	7.68	8.25	3.59	8.74		.48
	N = 173								
EXPERIMENTALS									
Factor II	Range		43.00-52.50	40-56	45-62	3-15	19-55		0-1
	Mean	.84	46.48	45.65	51	6.84	26.69	15	.30
	Sigma		2.36	4.68	5.75	3.18	8.80		.46
	N = 13								
Factor III	Range		42.50-56.00	36-65	26.89	0-24	15-68		0-2
	Mean	.31	46.90	46.47	59.06	5.67	29.02	42	.16
	Sigma		2.10	6.14	9.67	3.77	10.15		.49
	N = 96								
Factor IV	Range		44-53	33-110	34-74	0-30	10-46		0-3
	Mean	-1-+8	47.44	49.39	57.40	6.22	24.87	37	.35
	Sigma	.38	1.99	11.22	7.37	5.04	6.27		.67
	N = 70	1.19							

TABLE 30

REGRESSION MODELS USED AT 36 MONTHS

	Model*	Explanation
1.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + e$	Full Model
2.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 (x_2 + x_3 + x_4) + e$	Collapses membership vectors
3.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 (x_2 + x_3) + e$	Collapses experimental membership vectors
4.	$Y_{1-n} = a_o u + a_1 x_2 + a_2 x_3 + a_3 x_4 + e$	Deletes SES scores

Y_{1-n} = criterion series

*x_1 = social class scores

e = error vector

x_2 = Factor I group membership (prenatal complications)

x_3 = Factor III group membership (neonatal complications)

x_4 = Control group membership

TABLE 31

COMPARISON OF REGRESSION MODELS OF PHYSICAL GROWTH AT 36 MONTHS (T_6)

Model	Criterion	R^2	F	P
1.		.03		.01*
	(1) Weight		5.80	.01
2.		.01		.10*
1.		.03		.01*
	(1) Weight		4.85	.02
3.		.01		.01*
1.		.03		.01*
	(1) Weight		2.41	.02
4.		.02		.12*
1.		.07		.00002*
	(2) Height		11.04	.0009
2.		.04		.001*
1.		.07		.00002*
	(2) Height		4.90	.02
3.		.05		.00006*
1.		.07		.00002*
	(2) Height		8.43	.003
4.		.03		.004*

*Significance of the difference from zero.

TABLE 32

COMPARISON OF REGRESSION MODELS OF MOTORIC GROWTH AT 36 MONTHS (T_6)

Model	Criterion	R^2	F	P
1.		.08		.0001*
	(3) PAR *Ambulation*		5.30	.02
2.		.06		.00002*
1.		.08		.00001*
	(3) PAR *Ambulation*		.95	.32
3.		.07		.00001*
1.		.08		.00001*
	(3) PAR *Ambulation*		16.64	.00006
4.		.03		.004*
1.		.01		.32*
	(4) PAR *Manipulation*		3.45	.06
2.		.00001		.06*
1.		.01		.32*
	(4) PAR *Manipulation*		.05	.75
3.		.0008		.23*
1.		.01		.32*
	(4) PAR *Manipulation*		.11	.73
4.		.008		.70*
1.		.05		.0006*
	(5) PAR *Physical*		7.63	.0006
2.		.02		.007*
1.		.05		.0006*
	(5) PAR *Physical*		.61	.43
3.		.05		.002*
1.		.05		.0006*
	(5) PAR *Physical*		6.70	.01
4.		.03		.004*

*Significance of the difference from zero.

TABLE 33

COMPARISON OF REGRESSION MODELS OF COGNITIVE GROWTH AT 36 MONTHS (T_6)

Model	Criterion	R^2	F	P
1.		.23		<.00001*
	(6) PAR *Communication*		8.66	.00002
2.		.19		<.00001*
1.		.23		<.00001*
	(6) PAR *Communication*		12.80	.0004
3.		.20		<.00001*
1.		.23		<.00001*
	(6) PAR *Communication*		59.53	.00001
4.		.09		<.00001*
1.		.12		<.00001*
	(7) PPVT		5.30	.02
2.		.11		<.00001*
1.		.12		<.00001*
	(7) PPVT		.75	.38
3.		.12		<.00001*
1.		.12		<.00001*
	(7) PPVT		34.85	.004
4.		.09		<.00001*

*Significance of the difference from zero.

TABLE 34

REGRESSION MODELS USED AT 42 MONTHS

	Model	Explanation
1.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + e$	Full model
2.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 (x_4 + x_5) + e$	Tests x_2 Factor II subjects as discrete vector
3.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_4 + a_4 (x_3 + x_5) + e$	Tests x_4 Factor III subjects as discrete vector
4.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_5 + a_4 (x_3 + x_4) + e$	Tests x_5 Factor IV subjects as discrete factor
5.	$Y_{1-n} = a_o u + a_1 x_2 + a_2 x_3 + a_3 x_4 + a_4 x_5 + e$	Delete social class scores

Y_{1-n} = criterion series

x_1 = social class scores

x_2 = controls

x_3 = Factor II group membership (delivery complications)

x_4 = Factor III group membership (neonatal complications)

x_5 = Factor IV group membership (multiple complications)

TABLE 35

COMPARISON OF REGRESSION MODELS OF PHYSICAL GROWTH AT 42 MONTHS (T_7)

Model	Criterion	R^2	F	P
1		.05		.0002*
	(8) Weight		3.33	.06
2.		.03		.003*
1.		.05		.0002*
	(8) Weight		1.16	.28
3.		.04		.001*
1.		.05		.0002*
	(8) Weight		.007	.93
4.		.05		.0007*
1.		.05		.0002*
	(8) Weight		7.07	.008
5.		.02		.02*
1.		.03		.01*
	(9) Height		3.08	.07
2.		.02		.03*
1.		.03		.01*
	(9) Height		.03	.84
3.		.03		.007*
1.		.03		.01*
	(9) Height		.59	.44
4.		.03		.01*
1.		.03		.01*
	(9) Height		4.58	.03
5.		.02		.06*

*Significance of the difference from zero.

TABLE 36

COMPARISON OF REGRESSION MODELS OF MOTORIC GROWTH AT FORTY TWO MONTHS (T_7): CRITERIA (10), (11), AND (12)

Model	Criterion	R^2	F	P
1.		.08		<.00001*
	(10) PAR *Ambulation*		.12	.71
2.		.08		<.00001*
1.		.08		<.00001*
	(10) PAR *Ambulation*		.09	.76
3.		.08		<.00001*
1.		.08		<.00001*
	(10) PAR *Ambulation*		.01	.91
4.		.08		<.00001*
1.		.08		<.00001*
	(10) PAR *Ambulation*		29.19	<.00001
5.		.03		.008*
1.		.01		.40*
	(11) PAR *Manipulation*		2.63	.10
2.		.004		.71
1.		.01		.40*
	(11) PAR *Manipulation*		.98	.32
3.		.009		.38*
1.		.01		.40*
	(11) PAR *Manipulation*		.01	.91
4.		.01		.26*
1.		.01		.40*
	(11) PAR *Manipulation*		.75	.38
5.		.009		.35*
1.		.02		.08*
	(12) PAR *Physical*		1.75	.18
2.		.01		.09*
1.		.02		.08*
	(12) PAR *Physical*		.01	.91
3.		.02		.04*
1.		.02		.08*
	(12) PAR *Physical*		.38	.53
4.		.02		.04*
1.		.02		.08*
	(12) PAR *Physical*		5.46	.01
5.		.008		.43*

*Significance of the difference from zero

TABLE 37

COMPARISON OF REGRESSION MODELS OF COGNITIVE GROWTH AT FORTY TWO MONTHS (T_7): CRITERIA (13) and (14)

Model	Criterion	R^2	F	P
1.		.12		<.00001*
	(13) PAR *Communication*		3.01	.08
2.		.11		<.00008*
1.		.12		<.00001*
	(13) PAR *Communication*		.16	.68
3.		.12		<.00001*
1.		.12		<.00001*
	(13) PAR *Communication*		1.91	.16
4.		.12		<.00001*
1.		.12		<.00001*
	(13) PAR *Communication*		39.96	<.00001
5.		.02		.06*
1.		.18		<.00001*
	(14) PPVT		1.05	.30
2.		.18		<.00001*
1.		.18		<.00001*
	(14) PPVT		.16	.68
3.		.18		<.00001*
1.		.18		<.00001*
	(14) PPVT		.96	<.32
4.		.18		<.004*
1.		.18		<.00001*
	(14) PPVT		68.01	<.00001
5.		.01		.08*

*Significance of the difference from zero

TABLE 38

REGRESSION MODELS USED AT 48, 60 AND 72 MONTHS

	Model	Explanation
1.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + e$	Full model
2.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 (x_2 + x_3 + x_4) + a_5 x_5 + e$	Tests significance of data on classification as Controls, Factor I, and Factor III subjects.
3.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 (x_3 + x_4) + a_4 x_5 + e$	Tests Controls as a discrete vector versus Factor I and Factor III subjects as a discrete vector
4.	$Y_{1-n} = a_o u + a_1 x_2 + a_2 x_3 + a_3 x_4 + a_4 x_5 + e$	Deletes social class scores
5.	$Y_{1-n} = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + e$	Deletes vector representing testing delay

Y_{1-n} = criterion series

$a_o u$ = unit vector

x_1 = social class scores

x_2 = controls

x_3 = Factor I group membership (gestation complications)

x_4 = Factor III group membership (neonatal complications)

x_5 = Testing delay in weeks

e = error vector

TABLE 39

COMPARISON OF REGRESSION MODELS OF PHYSICAL AND MOTORIC GROWTH AT 48 MONTHS (T_8) . CRITERIA (15, (16), AND (:7)

Model	Criterion	R^2	F	P
1.		.007		.64*
	(15) Weight		.84	.43
2.		.002		.66*
1.		.007		.64*
	(15) Weight		.09	.76
3.		.006		.49*
1.		.007		.64*
	(15) Weight		.71	.39
4.		.005		.61*
1.		.02		.04
	(16) Height		4.29	.01
2.		.004		.47*
1.		.02		.04
	(16) Height		.54	.46
3.		.02		.03*
1.		.02		.04
	(16) Height		1.42	.23
4.		.02		.03*
1.		.14		<.000001*
	(17) Copy Forms		.17	.84
2.		.14		<.000001*
1.		.14		<.000001*
	(17) Copy Forms		.25	.61
3.		.14		<.000001*
1.		.14		<.000001*
	(17) Copy Forms		39.26	<.000001
4.		.02		.06*

*Significance of the difference from zero.

TABLE 40

COMPARISON OF REGRESSION MODELS OF COGNITIVE GROWTH AT FORTY EIGHT MONTHS (T_8): CRITERIA (18), (19), AND (20)

Model	Criterion	R^2	F	P
1.		.08		<.00001*
	(18) $PI_{(1)}$ Responsiveness		1.81	.16
2.		.07		<.00001*
1.		.08		<.00001*
	(18) $PI_{(1)}$ Responsiveness		2.35	.12
3		.07		<.00001*
1.		.08		<.00001*
	(18) $PI_{(1)}$ Responsiveness		31.50	<.00001
4.		.004		.69*
1.		.18		<.00001*
	(19) $PI_{(2)}$ Vocabulary		.001	.98
2.		.18		<.00001*
1.		.18		<.00001*
	(19) $PI_{(2)}$ Vocabulary		.001	.96
3.		.18		<.00001*
1.		.18		<.00001*
	(19) $PI_{(2)}$ Vocabulary		65.24	<.00001
4.		.03		<.006*
1.		.11		<.00001*
	(20) $PI_{(3)}$ Numerical		.38	.68
2.		.11		<.00001*
1.		.11		<.00001*
	(20) $PI_{(3)}$ Numerical		.36	.54
3.		.11		<.002*
1.		.11		<.00001*
	(20) $PI_{(3)}$ Numerical		31.97	<.00001*
4.		.04		.002*

*Significance of the difference from zero

TABLE 41

COMPARISON OF REGRESSION MODELS OF COGNITIVE GROWTH AT FORTY EIGHT MONTHS (T_8):

CRITERIA (21), (22), and (23)

Model	Criterion	R^2	F	P
1.		.25		<.00001*
	(21) $PI_{(4)}$ Sensory		.07	.93
2.		.24		<.00001*
1.		.25		<.00001*
	(21) $PI_{(4)}$ Sensory		.09	.75
3.		.25		<.00001*
1.		.25		<.00001*
	(21) $PI_{(4)}$ Sensory		103.43	<.00001*
4.		.03		.01*
1.		.22		<.00001*
	(22) PI_{Total}		.48	.61
2.		.22		<.00001*
1.		.22		<.00001*
	(22) PI_{Total}		.47	.49
3.		.22		<.00001*
1.		.22		<.00001*
	(22) PI_{Total}		91.27	<.00001
4.		.02		<.01*
1.		.16		<.00001*
	(23) Boehm		.17	.84
2.		.16		<.00001*
1.		.16		<.00001*
	(23) Boehm		.24	.62
3.		.16		<.008*
1.		.16		<.00001*
	(23) Boehm		54.21	<.00001
4.		.03		<.00001*

*Significance of the difference from zero

TABLE 42

REGRESSION MODELS USED AT 54 AND 66 MONTHS

	Model	Explanation
1.	$Y_{1-n} = a_o u + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 + e$	Full model
2.	$Y_{1-n} = a_o u + a_1x_1 + a_2x_2 + a_3x_3 + a_4(x_4 + x_5) + a_5x_6 + e$	Tests x_2 Factor II subjects as discrete vector
3.	$Y_{1-n} = a_o u + a_1x_1 + a_2x_2 + a_3x_4 + a_4(x_3 + x_5) + a_5x_6 + e$	Tests x_4 Factor III subjects as discrete vector
4.	$Y_{1-n} = a_o u + a_1x_1 + a_2x_2 + a_3x_5 + a_4(x_3 + x_4) + a_5x_6 + e$	Tests x_5 Factor IV subjects as discrete vector
5.	$Y_{1-n} = a_o u + a_1x_2 + a_2x_3 + a_3x_4 + a_4x_5 + a_5x_6 + e$	Deletes social class scores
6.	$Y_{1-n} = a_o u + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + e$	Deletes vector representing testing delay
7.	$Y_{1-n} = a_o u + a_1x_1 + a_2x_2 + a_3x_6 + e$	Deletes group membership information

Y_{1-n} = criterion series

x_1 = social class scores

x_2 = controls

x_3 = Factor II group membership (delivery complications)

x_4 = Factor III group membership (neonatal complications)

x_5 = Factor IV group membership (multiple complications)

x_6 = Testing delay in weeks

e = Error vector

u = Unit vector

TABLE 43

COMPARISON OF REGRESSION MODELS OF PHYSICAL AND MOTORIC GROWTH AT 54 MONTHS (T_9)
CRITERIA (24), (25), AND (26)

Model	Criterion	R^2	F	P
1.		.03		.04*
	(24) Weight		.80	.37
2.		.02		.03*
1.		.03		.04*
	(24) Weight		1.36	.28
3.		.02		.04*
1.		.03		.04*
	(24) Weight		.41	.51
4.		.02		.28*
1.		.03		.04*
	(24) Weight		6.56	.01
5.		.01		.01
1.		.02		.04*
	(25) Height		1.15	.28
2.		.01		.13*
1.		.02		.14*
	(25) Height		.36	.54
3.		.02		.09*
1.		.02		.14*
	(25) Height		.006	.93
4.		.02		.08*
1.		.02		.14*
	(25) Height		5.38	.02
5.		.008		.58*
1.		.20		<.000001*
	(26) Copy Forms		5.27	.02
2.		.19		<.000001*
1.		.20		<.000001*
	(26) Copy Forms		2.44	.11
3.		.19		<.000001*
1.		.20		<.000001*
	(26) Copy Forms		.18	.66
4.		.20		<.00001*
1.		.20		<.000001*
	(26) Copy Forms		75.05	<.000001
5.		.03		.01*

*Significance of the difference from zero

TABLE 44

COMPARISON OF REGRESSION MODELS OF COGNITIVE DEVELOPMENT AT 54 MONTHS (T_9): CRITERIA (27), (28), AND (29)

Model	Criterion	R^2	F	P
1.		.14		<.000001*
	(27) $PI_{(1)}$ Responsiveness		10.65	.0001
2.		.11		<.000001*
1.		.14		<.000001*
	(27) $PI_{(1)}$ Responsiveness		2.76	.09
3.		.13		<.000001*
1.		.14		<.000001*
	(27) $PI_{(1)}$ Responsiveness		.001	.97
4.		.14		<.00001*
1.		.14		<.000001*
	(27) $PI_{(1)}$ Responsiveness		42.96	<.000001
5.		.03		.008*
1.		.19		<.000001*
	(28) $PI_{(2)}$ Vocabulary		9.06	.002
2.		.17		<.000001*
1.		.19		<.000001*
	(28) $PI_{(2)}$ Vocabulary		.28	.59
3.		.19		<.000001*
1.		.19		<.000001*
	(28) $PI_{(2)}$ Vocabulary		.95	.32
4.		.19		<.000001*
1.		.19		<.000001*
	(28) $PI_{(2)}$ Vocabulary		70.65	<.000001
5.		.03		.009*
1.		.25		<.000001*
	(29) $PI_{(3)}$ Numerical		8.61	.003
2.		.23		<.000001*
1.		.25		<.000001*
	(29) $PI_{(3)}$ Numerical		.40	.52
3.		.25		<.000001*
1.		.25		<.000001*
	(29) $PI_{(3)}$ Numerical		.70	.40
4.		.24		<.000001*
1.		.25		<.000001*
	(29) $PI_{(3)}$ Numerical		97.76	<.000001
5.		.04		<.000001*

*Significance of the difference from zero

TABLE 45

COMPARISON OF REGRESSION MODELS OF COGNITIVE DEVELOPMENT AT 54 MONTHS (T_9):

CRITERIA (30), (31), AND (32)

Model	Criterion	R^2	F	P
1.		.15		<.000001*
	(30) $PI_{(4)}$ Sensory		4.09	.04
2.		.14		<.000001*
1.		.15		<.000001*
	(30) $PI_{(4)}$ Sensory		3.05	.08
3.		.14		<.000001*
1.		.15		<.000001*
	(30) $PI_{(4)}$ Sensory		.57	.45
4.		.15		<.000001*
1.		.15		<.000001*
	(30) $PI_{(4)}$ Sensory		56.19	<.000001*
5.		.02		.10*
1.		.24		<.000001*
	(31) PI_{Total}		10.64	.001
2.		.22		<.000001*
1.		.24		<.000001*
	(31) PI_{Total}		2.04	.15
3.		.24		<.000001*
1.		.24		<.000001*
	(31) PI_{Total}		.03	.84
4.		.24		<.000001*
1.		.24		<.000001*
	(31) PI_{Total}		97.36	.000001
5.		.03		<.006*
1.		.19		<.000001*
	(32) Boehm		5.04	.02
2.		.18		<.000001*
1.		.19		<.000001*
	(32) Boehm		.25	.61
3.		.19		<.000001*
1.		.19		<.000001*
	(32) Boehm		.38	.53
4.		.19		<.000001*
1.		.19		<.000001*
	(32) Boehm		75.39	<.000001
5.		.02		.04*

*Significance of the difference from zero

TABLE 46

COMPARISON OF REGRESSION MODELS OF PHYSICAL DEVELOPMENT AT SIXTY MONTHS (T_{10}): CRITERIA (33) AND (34)

Model	Criterion	R^2	F	P
1.		.01		.24*
	(33) Weight		.28	.59
2.		.01		.14*
1.		.01		.24*
	(33) Weight		.04	.82
3.		.01		.14*
1.		.01		.24*
	(33) Weight		.07	.77
4.		.01		.14*
1.		.01		.24*
	(33) Weight		1.87	.17
5.		.01		.31*
1.		.01		.24*
	(33) Weight		3.84	.05
6.		.004		.66*
1.		.02		.03*
	(34) Height		1.64	.20
2.		.02		.03*
1.		.02		.03*
	(34) Height		3.49	.06
3.		.02		.08*
1.		.02		.03*
	(34) Height		.15	.69
4.		.02		.01*
1.		.02		.03*
	(34) Height		.008	.92
5.		.02		.01*
1.		.02		.03*
	(34) Height		5.73	.01
6.		.01		.22*

*Significance of the difference from zero.

TABLE 47

COMPARISON OF REGRESSION MODELS OF COGNITIVE DEVELOPMENT AT SIXTY MONTHS (T_{10}): CRITERIA (35) AND (36)

Model	Criterion	R^2	F	P
1.	(35) Digit Span	.008	.002	.50*
				.95
2.		.008		.34*
1.	(35) Digit Span	.008	2.27	.50*
				.13
3.		.002		.79
1.	(35) Digit Span	.008	1.33	.50*
				.24
4.		.005		.57*
1.	(35) Digit Span	.008	.02	.50*
				.86
5.		.008		.34*
1.	(35) Digit Span	.008	.36	.50*
				.54
6.		.007		.39*
1.	(36) Auditory Association	.19	.008	<.000001*
				.92
2.		.19		<.000001*
1.	(36) Auditory Association	.19	.23	<.000001*
				.62
3.		.19		<.000001*
1.	(36) Auditory Association	.19	.21	<.000001*
				.64
4.		.19		<.000001*
1.	(36) Auditory Association	.19	78.29	<.000001*
				<.000001
5.		.02		.01*
1.	(36) Auditory Association	.19	.61	<.000001*
				.43
6.		.19		<.000001*

*Significance of the difference from zero

TABLE 48

COMPARISON OF REGRESSION MODELS OF COGNITIVE DEVELOPMENT AT SIXTY MONTHS (T_{10}): CRITERIA (37) AND (38)

Model	Criterion	R_2	F	P
1.		.11		<.000001*
	(37) Vocabulary		.27	.60
2.		.11		<.000001*
1.		.11		<.000001*
	(37) Vocabulary		.97	.32
3.		.10		<.000001*
1.		.11		<.000001*
	(37) Vocabulary		1.54	.21
4.		.10		<.000001*
1.		.11		<.000001*
	(37) Vocabulary		33.34	<.000001
5.		.03		.004*
1.		.11		<.000001*
	(37) Vocabulary		.32	.57
6.		.11		<.000001*
1.		.06		.0001*
	(38) Adjustment		3.49	.06
2.		.06		.0002*
1.		.06		.0001*
	(38) Adjustment		.36	.54
3.		.06		.00005*
1.		.06		.0001*
	(38) Adjustment		4.39	.03
4.		.05		.0003*
1.		.06		.0001*
	(38) Adjustment		10.46	.001
5.		.03		.005*
1.		.06		.0001*
	(38) Adjustment		.05	.81
6.		.06		.00004*

*Significance of the difference from zero

TABLE 49

COMPARISON OF REGRESSION MODELS OF PHYSICAL DEVELOPMENT
AT SIXTY SIX MONTHS (T_{11}); CRITERIA (39) AND (40)

Model	Criterion	R^2	F	P
1.		.02		.16*
	(39) Weight		.001	.96
2.		.02		.09*
1.		.02		.16*
	(39) Weight		.02	.88
3.		.02		.09*
1.		.02		.16*
	(39) Weight		.005	.94
4.		.02		.09*
1.		.02		.16*
	(39) Weight		2.94	.08
5.		.01		.29*
1.		.02		.16*
	(39) Weight		1.64	.08
6.		.02		.11*
1.		.02		.16*
	(39) Weight		2.94	.08
7.		.01		.29*
1.		.03		.02*
	(40) Height		-.04	1.00
2.		.03		.01*
1.		.03		.02*
	(40) Height		-.05	1.00
3.		.03		.01*
1.		.03		.02*
	(40) Height		.06	.79
4.		.03		.01*
1.		.03		.02*
	(40) Height		5.01	.02
5.		.02		.11*
1.		.03		.02*
	(40) Height		2.27	.13
6.		.02		.03*
1.		.03		.02*
	(40) Height		1.87	.13
7.		.01		.03*

*Significance of the difference from zero.

TABLE 50

COMPARISON OF REGRESSION MODELS OF COGNITIVE DEVELOPMENT AT 66 MONTHS (T_{11}): CRITERIA (41) AND (42)

Model	Criterion	R^2	F	p
1.		.007		.77
	(41) Digit Span		.001	.97
2.		.007		.63
1.		.007		.77
	(41) Digit Span		.01	.97
3.		.006		.64
1.		.007		.77
	(41) Digit Span		.03	.85
4.		.006		.64
1.		.007		.77
	(41) Digit Span		.80	.37
5.		.004		.78
1.		.007		.77
	(41) Digit Span		1.19	.27
6.		.003		.85
1.		.007		.77
	(41) Digit Span		.16	.91
7.		.005		.36
1.		.23		<.00001*
	(42) Audit. Assoc.		.002	.96
2.		.23		<.00001*
1.		.23		<.00001*
	(42) Audit. Assoc.		.02	.87
3.		.23		<.00001*
1.		.23		<.00001*
	(42) Audit. Assoc.		.72	.39
4.		.23		<.00001*
1.		.23		<.00001*
	(42) Audit. Assoc.		97.58	<.00001*
5.		.02		.08
1.		.23		<.00001*
	(42) Audit. Assoc.		2.23	<.00001*
6.		.22		<.00001*
1.		.23		<.00001*
	(42) Audit. Assoc.		.81	.48
7.		.22		<.00001*

*Significance of the difference from zero

TABLE 51

COMPARISON OF REGRESSION MODELS OF COGNITIVE DEVELOPMENT AND ADJUSTMENT AT SIXTY SIX MONTHS (T_{11}): CRITERIA (43) AND (44)

Model	Criterion	R^2	F	P
1.		.21		<.00001*
	(43) Vocabulary		.0008	.97
2.		.21		<.00001*
1.		.21		<.00001*
	(43) Vocabulary		.01	.91
3.		.21		<.00001*
1.		.21		<.00001*
	(43) Vocabulary		1.13	.28
4.		.21		<.00001*
1.		.21		<.00001*
	(43) Vocabulary		83.41	<.00001
5.		.03		.01*
1.		.21		<.00001*
	(43) Vocabulary		1.41	.23
6.		.21		<.00001*
1.		.21		<.00001*
	(43) Vocabulary		2.26	.08
7.		.20		<.00001*
1.		.08		.00001*
	(44) Adjustment		.003	.95
2.		.08		.00001*
1.		.08		.00001*
	(44) Adjustment		.02	.87
3.		.08		.00001*
1.		.08		.00001*
	(44) Adjustment		1.44	.23
4.		.07		.00001*
1.		.08		.00001*
	(44) Adjustment		23.51	<.00001*
5.		.01		.12
1.		.08		.00001*
	(44) Adjustment		2.95	.08
6.		.07		.00001*
1.		.08		.00001*
	(44) Adjustment		.94	.42
7.		.07		.00001*

*Significance of the difference from zero

TABLE 52

COMPARISON OF REGRESSION MODELS OF PHYSICAL ATTAINMENT AT SEVENTY TWO MONTHS (T_{12}): CRITERIA (45), (46), AND (47)

Model	CRITERION	R^2	F	P
1		.01		.34*
	(45) Weight		1.32	.26
2		.004		.40
1		.01		.34*
	(45) Weight		.10	.74
3		.01		.22*
1		.01		.34*
	(45) Weight		1.28	.27
4		.01		.27*
1		.01		.34*
	(45) Weight		.74	.38
5		.01		.29*
1		.009		.47*
	(46) Height		.08	.92
2		.009		.18*
1		.009		.47*
	(46) Height		.13	.71
3		.009		.33*
1		.009		.47*
	(46) Height		.88	.34
4		.007		.44*
1		.009		.47*
	(46) Height		.42	.13
5		.003		.73*
1		.04		.001*
	(47) Circumference		1.38	.25
2		.03		.007*
1		.04		.001*
	(47) Circumference		.59	.44
3		.04		.0008*
1		.04		.001*
	(47) Circumference		.06	.79
4		.04		.0006*
1		.04		.001*
	(47) Circumference		13.73	.0002
5		.01		.29*

nificance of the difference from zero.

TABLE 53

COMPARISON OF REGRESSION MODELS OF LINGUISTIC ATTAINMENT AT SEVENTY TWO MONTHS (T_{12}): CRITERIA (48), (49), AND (50)

Model	CRITERION	R^2	F	P
4.1		.04		.004*
	(48) Articulation		2.82	.06
2		.02		.009*
1		.04		.004*
	(48) Articulation		4.88	.02
3		.02		.01*
1		.04		.004*
	(48) Articulation		4.62	.03
4		.02		.01*
1		.04		.004*
	(48) Articulation		.41	.52
5		.03		.002*
1		.12		<.00001
	(49) PPVT		.76	.46
2		.12		<.00001
1		.12		<.00001
	(49) PPVT		1.37	
3		.12		<.00001
1		.12		<.00001
	(49) PPVT		41.30	<.00001
4		.02		.01*
1		.12		<.00001
	(49) PPVT		.50	.47
5		.12		<.0001*
1		.02		.08*
	(50) Auditory Discrimination		1.97	.13
2		.01		.11*
1		.02		.08*
	(50) Auditory Discrimination		2.76	.09
3		.01		.14*
1		.02		.08*
	(50) Auditory Discrimination		1.73	.18
4		.01		.09*
1		.02		.08*
	(50) Auditory Discrimination		1.02	.31
5		.01		.06*

ficance of the difference from zero.

TABLE 54

COMPARISON OF REGRESSION MODELS OF MOTORIC AND DISABILITY CRITERIA AT SEVENTY TWO MONTHS (T_{12}): CRITERIA (51) AND (52)

Model	Criterion	R^2	F	P
1		.008		.54*
	(51) Mixed Dominance		.79	.45
2		.004		.47*
1		.008		.54*
	(51) Mixed Dominance		1.48	.22
3		.004		.65*
1		.008		.54*
	(51) Mixed Dominance		1.64	.20
4		.003		.69*
1		.008		.54*
	(51) Mixed Dominance		.69	.40
5		.006		.49*
1		.03		.009*
	(52) Disability Score		.97	.37
2		.03		.003*
1		.03		.009*
	(52) Disability Score		1.88	.17
3		.03		.008*
1		.03		.009*
	(52) Disability Score		7.82	.005
4		.01		.12*
1		.03		.009*
	(52) Disability Score		.05	.81
5		.03		.003*

*Significance of the difference from zero.

TABLE 55

COMPARISON OF REGRESSION MODELS OF PHYSICAL GROWTH AT 78 MONTHS (T_{14})
CRITERIA (53) AND (54)

Model	Criterion	R^2	F	P
1.		.02		.20*
	(53) Weight		5.44	.02
2.		.005		.76*
1.		.02		.20*
	(53) Weight		2.13	.14
3.		.01		.27*
1.		.02		.20*
	(53) Weight		.06	.80
4.		.02		.75*
1.		.02		.20*
	(53) Weight		3.40	.06
5.		.01		.45*
1.		.02		.20*
	(53) Weight		.29	.58
6.		.01		.13*
1.		.02		.20*
	(53) Weight		2.36	.07
7.		.0006		.88*
1.		.02		.21*
	(54) Height		2.83	.09
2.		.01		.38*
1.		.02		.21*
	(54) Height		1.63	.20
3.		.01		.24*
1.		.02		.21*
	(54) Height		.16	.68
4.		.01		.14*
1.		.02		.21*
	(54) Height		3.40	.06
5.		.01		.45*
1.		.02		.21*
	(54) Height		.11	.74
6.		.01		.13*
1.		.02		.21*
	(54) Height		1.33	.26
[illegible]		.008		.21*

[illegible]gnificance of the difference from zero

TABLE [illegible]

COMPARISON OF REGRESSION MODELS OF HEAD CIRCUMFERENCE, AND ACHIEVEMENT SCORES AT 78 MONTHS (T_{14}): CRITERIA (55) AND (56)

Model	Criterion	R^2	F	P
1.		.02		.07*
	(55) Circumference		.64	.42
2.		.02		.05*
1.		.02		.07*
	(55) Circumference		.47	.49
3.		.02		.05*
1.		.02		.07*
	(55) Circumference		.11	.73
4.		.02		.04*
1.		.02		.07*
	(55) Circumference		5.97	.01
5.		.01		.41*
1.		.02		.07*
	(55) Circumference		.15	.69
6.		.02		.04*
1.		.02		.07*
	(55) Circumference		1.45	.22
7.		.01		.06*
1.		.17		<.00001*
	(56) WRAT *Reading*		5.50	.01
2.		.16		<.00001*
1.		.17		<.00001*
	(56) WRAT *Reading*		1.78	.18
3.		.17		<.00001*
1.		.17		<.00001*
	(56) WRAT *Reading*		.01	.91
4.		.17		<.00001*
1.		.17		<.00001*
	(56) WRAT *Reading*		63.12	<.00001
5.		.02		.03*
1.		.17		<.00001*
	(56) WRAT *Reading*		.56	.45
6.		.17		<.00001*
1.		.17		<.00001*
	(56) WRAT *Reading*		2.00	.11
7		.16		<.00001*

ificance of the difference from zero

TABLE 57

COMPARISON OF REGRESSION MODELS OF COGNITIVE LINGUISTIC SCORES AT 78 MONTHS (T_{14}): CRITERIA (57) AND (58)

Model	Criterion	R^2	F	P
1.		.14		<.00001*
	(57) PPVT		.32	.56
2.		.14		<.00001*
1.		.14		<.00001*
	(57) PPVT		4.70	.03
3.		.12		<.00001*
1.		.14		<.00001*
	(57) PPVT		6.27	.01
4.		.12		<.00001*
1.		.14		<.00001*
	(57) PPVT		44.33	<.00001
5.		.03		.02*
1.		.14		<.00001*
	(57) PPVT		.01	.91
6.		.14		<.00001*
1.		.14		<.00001*
	(57) PPVT		2.14	.09
7.		.12		<.00001*
1.		.02		.14*
	(58) Auditory Discrimination		.43	.51
2.		.02		.09*
1.		.02		.14*
	(58) Auditory Discrimination		.18	.66
3.		.02		.08*
1.		.02		.14*
	(58) Auditory Discrimination		.62	.43
4.		.02		.10*
1.		.02		.14*
	(58) Auditory Discrimination		4.83	.02
5.		.009		.49*
1.		.02		.14*
	(58) Auditory Discrimination		1.96	.16
6.		.01		.18*
1.		.02		.14*
	(58) Auditory Discriminaton		.37	.77
7.		.02		.02*

ificance of the difference from zero

TABLE 58

COMPARISON OF REGRESSION MODELS OF MULTIPLE DISABILITY AND MIXED DOMINANCE SCORES AT 78 MONTHS (T_{14}): CRITERIA (59) AND (60)

Model	Criterion	R^2	F	P
1.		.03		.05*
	(59) Disability		4.04	.04
2.		.01		.13*
1.		.03		.05*
	(59) Disability		.21	.64
3.		.03		.02*
1.		.03		.05*
	(59) Disability		.35	.55
4.		.03		.03*
1.		.03		.05*
	(59) Disability		5.34	.02
5.		.01		.22*
1.		.03		.05*
	(59) Disability		.007	.93
6.		.03		.02*
1.		.03		.05*
	(59) Disability		1.55	.19
7.		.01		.04*
1.		.05		.05*
	(60) Mixed laterality		1.96	.16
2.		.0		.009*
1.		.05		.05*
	(60) Mixed laterality		1.00	.
3.		.05		.
1.		.05		.05*
	(60) Mixed laterality		.07	
4.		.0		
1.		.05		.05*
	(60) Mixed laterality		12.22	.
5.		.0		.
1.		.05		.05*
	(60) Mixed laterality		.007	.
6.		.10		
1.		.05		.05*
	(60) Mixed laterality		..85	.
7.		.0		.

*Significance of the difference from zero

TABLE 59

MATRIX OF INTERCORRELATIONS FOR $T_{(6)}$ GROUP AT 36 MONTHS (N = 380)

	36 Month Height	36 Month Weight	Ambulation	Manipulation	Physical	Communication	PPVT	SES[1]
36 Month Length		.44**	-.16**	-.05	-.05	.18**	.12*	-.19**
36 Month Weight			.24**	.007	.18**	-.18**	-.04	.11*
Ambulation				.02	.92**	-.16**	.05	.22**
Manipulation					.02	.18**	.10	.005
Physical						-.08	.08	.16**
Communication							.43**	-.41**
PPVT								-.32**

*p = <.05

**p = <.01

[1]Low McGuire and White (1955) SES scores mean <u>high</u> status.

TABLE 60

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT 36 MONTHS

Predictor	Physical Domain		Motoric Domain			Cognitive Domain	
	(1)Weight	(2)Height	(3)Ambulation	(4)Manipulation	(5)Physical	(6)Communication	(7)PPVT
Group Membership	.01	.0009	.02	-	.006	.00002	.02
Experimental Groups	.02	.02	-	-	-	.0004	-
Social Class	-	.003	.00006	-	.01	.00001	.00001

TABLE 61

MATRIX OF CORRELATIONS FOR $T_{(7)}$ GROUP AT 42 MONTHS (N = 337)

	42 Month Height	42 Month Weight	PAR Ambulation	PAR Manipulation	PAR Physical	PAR Communication	PPVT	SES
42 Month Height		.49**	.09	.11*	.07	.05	.09	.10
42 Month Weight			.07	.20**	.09	.07	.19**	.13*
Ambulation				.38**	.53**	.006	-.17**	-.29**
Manipulation					.40*	.33**	.14*	.05
Physical						.13*	-.05	-.11*
Communication							.48**	.42**
PPVT								-.43**

*p = <.05

**p = <.01

TABLE 62

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT 42 MONTHS

Predictor	Physical Domain		Motoric Domain			Cognitive Domain	
	(8) Weight	(9) Height	(10) Ambulation	(11) Manipulation	(12) Physical	(13) Communication	(14) PPVT
Factor II	-	-	-	-	-	-	-
Factor III	-	-	-	-	-	-	-
Factor IV	-	-	-	-	-	-	-
Social Class	.008	.03	.00001	-	.01	<.00001	<.00001

TABLE 63

MATRIX OF CORRELATIONS FOR $T_{(8)}$ GROUP AT 48 MONTHS (N = 359)

	SES	Delay	Weight	Height	Boehm	$PI_{(1)}$	$PI_{(2)}$	$PI_{(3)}$	$PI_{(4)}$	Total	Copy Forms
SES		.17**	-.06	-.06	-.39**	-.27**	-.42**	-.32**	-.49**	-.47**	-.38**
Delay			-.003	-.007	-.15**	-.05	-.13**	-.15**	-.10*	-.12*	-.06
Weight				.55**	.07	.07	.16**	.03	.11	.11*	.07
Height					.03	.05	.12*	.02	.07	.07	.06
Boehm						.62**	.63**	.59**	.67**	.73**	.50**
$PI_{(1)}$							.62**	.54**	.62**	.83**	.45**
$PI_{(2)}$								.48**	.67**	.82**	.49**
$PI_{(3)}$									.55**	.70**	.44**
$PI_{(4)}$										.89**	.66**
PI_{Total}											.64**

*p = <.05

**p = <.01

TABLE 64

RE-EXAMINATION OF FACTOR II EFFECTS AT 54 MONTHS
FOR CRITERIA (26), (27), (28), (29), (30), (31), and (32)

Model	Criterion	R^2	F	P
2.		.19		<.000001*
	(26) Copy Forms		.90	.34
7.		.19		<.000001*
2.		.11		<.000001*
	(27) $PI_{(1)}$		.59	.44
7.		.11		<.000001*
2.		.14		<.000001*
	(28) $PI_{(2)}$		1.60	.22
7.		.14		<.000001*
2.		.23		<.000001*
	(29) $PI_{(3)}$		.03	.84
7.		.23		<.000001*
2.		.17		<.000001*
	(30) $PI_{(4)}$		.10	.74
7.		.17		<.000001*
2.		.22		<.000001*
	(31) PI_{Total}		.29	.59
7.		.22		<.000001*
2.		.18		<.000001*
	(32) Boehm		.01	.89
7.		.18		<.000001*

*Significance of the difference from zero.

TABLE 65

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT 48 MONTHS

Predictor	Physical Domain		Motor Domain	Cognitive Domain					
	(15 Weight	(16 Height	(17) Copy Forms	(18) $PI_{(1)}$*	(19) $PI_{(2)}$*	(20) $PI_{(3)}$*	(21) $PI_{(4)}$*	(22) PI_{Total}	(23) Boehm
Group Membership	-	.01	-	-	-	-	-	-	-
Experimental Groups	-	-	-	-	-	-	-	-	-
Social Class	-	-	<.000001	<.00001	<.00001	<.00001	<.00001	<.00001	

*$PI_{(1)}$ = Preschool Inventory Personal-Social

*$PI_{(2)}$ = Preschool Inventory Concept Activation-Sensory

*$PI_{(3)}$ = Preschool Inventory Concept Activation-Numerical

*$PI_{(4)}$ = Preschool Inventory Associative Vocabulary

TABLE 66

MATRIX OF CORRELATIONS FOR $T_{(8)}$ GROUP AT 54 MONTHS (N = 358)

	54 Month Weight	$PI_{(1)}$	$PI_{(2)}$	$PI_{(3)}$	$PI_{(4)}$	PI_{Total}	Boehm	SES	Copy Forms
54 Month Height	.77**	.12*	.13**	.09	.10*	.14**	.08	-.10**	.11*
54 Month Weight		.08	.11*	.13**	.09	.13**	.10*	-.13**	.14**
$PI_{(1)}$			.66**	.56**	.64**	.84**	.55**	-.33**	.46**
$PI_{(2)}$				.53**	.60**	.81**	.59**	-.41**	.47**
$PI_{(3)}$					.59*	.78*	.64*	-.48**	.53**
$PI_{(4)}$						.86**	.62**	-.37**	.62**
PI_{Total}							.71**	-.47**	.62**
Boehm								-.42**	.55**
SES									-.42**

*p = <.05

**p = <.01

TABLE 67

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT 54 MONTHS

	Physical Domain		Motoric Domain	Cognitive Domain					
	(24) Weight	(25) Height	(26) Copy Forms	(27) $PI_{(1)}$	(28) $PI_{(2)}$	(29) $PI_{(3)}$	(30) $PI_{(4)}$	(31) PI_{Total}	(32) Boehm
Factor II	-	-	-	-	-	-	-	-	-
Factor III	-	-	-	-	-	-	-	-	-
Factor IV	-	-	-	-	-	-	-	-	-
Social Class	.01	.02	<.000001	<.000001	<.000001	<.000001	<.000001	<.000001	<.000001

*$PI_{(1)}$ = Preschool Inventory Personal-Social

*$PI_{(2)}$ = Preschool Inventory Associative-Vocabulary

*$PI_{(3)}$ = Preschool Inventory Conceputal-Numerical

*$PI_{(4)}$ = Preschool Inventory Conceptual-Sensory

TABLE 68

MATRIX OF CORRELATIONS FOR INFERENTIAL STUDY GROUP AT SIXTY MONTHS (N = 383)

	E_ISS	E_{III}SS	SES	Delay	Wt.	Ht.	Digit Span	Audit. Assoc.	Vocab.	Adjustm.
Controls	-	-	-.06	-.01	.02	.09	.05	.01	.003	-.04
E_ISS		-	.31**	.13**	-.03	-.02	.03	-.14**	-.14**	.16**
E_{III}SS			-.22**	-.10*	.003	-.08	-.08	.11*	.13**	-.10*
SES				.21**	-.06	.02	.03	-.43**	-.32**	.21**
Delay					.08	-.10*	.04	-.05	-.10*	.06
Weight						.62**	.03	.13**	.12*	-.04
Height							.01	.09	.09	.02
Digit Span								.23**	.18**	-.05
Audit. As.									.56**	-.17**
Vocab.										-.15**
Adjustment										

*p = <.05

**p = <.01

TABLE 69

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT SIXTY MONTHS

Predictor	Physical Domain		Cognitive Domain			General Domain
	(33) Weight	(34) Neight	(35) Digit Span	(36) Audit.Assoc.	(37) Vocabulary	(38) Adjustment
Factor I Group	-	-	-	-	-	-
Factor III Group	-	-	-	-	-	-
Social Class	-	-	-	<.000001	<.000001	<.0001

TABLE 70

MATRIX OF CORRELATIONS FOR INFERENTIAL STUDY GORUP AT SIXTY SIX MONTHS (N = 362)

	E_I	E_{III}	E_{IV}	SES	Delay	Wt.	Ht.	Digit Span	Audit. Assoc.	Vocab.	Adjustm.
Controls	-	-	-	.04	.06	.06	.09	.04	-.05	-.03	.06
E_I		-	-	.10*	-.03	.04	-.06	-.003	-.06	-.06	.07
E_{III}			-	-.13*	-.06	-.09	-.09	-.01	..13*	.16**	-.10*
E_{IV}			-	..05	.005	.04	.02	-.02	-.04	-.10	-.002
SES					.06	-.07	-.10*	-.04	-.47**	-.44**	.25**
Delay						.04	.08	.05	.03	.02	-.06
Weight							.94**	.06	.07	.06	.007
Height								.06	.15**	.13**	-.02
Digit Span									.21**	.12*	-.09
Aud.Assoc.										.57**	-.27**
Vocab.											-.28**

*p = <.05

**p = <.01

TABLE 71

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT SIXTY SIX MONTHS

Predictor	Physical Domain		Cognitive Domain			Behavioral Domain
	(39) Weight	(40) Height	(41) Digit Span	(42) Audit.Assoc.	(43) Vocabulary	(44) Adjustment
Factor II Group	-	-	-	-	-	-
Factor III Group	-	-	-	-	-	-
Factor IV Group	-	-	-	-	-	-
Social Class	-	.02	-	<.00001	<.000001	.0001

TABLE 72

MATRIX OF CORRELATIONS FOR SEVENTY TWO MONTH INFERENTIAL STUDY GROUP (N=370)

	E_1	E_{111}	SES	Delay	Wt.	Ht.	Head Circumf.	Denver Artic.T.	Aud. Discr.T.	Disabil. Score	PPVT	Mixed Domin.
Controls			-.05	.03	-.003	.08	-.08	-.03	.04	.003	.0003	.01
E_1			.29**	.03	-.02	-.07	-.003	-.11*	-.06	.10*	.13**	.02
E_{111}			-.22**	-.07	.02	-.02	.09	.14**	-.11*	-.10*	-.13**	-.04
SES				.01	-.05	-.05	-.02	-.15**	.09	.17**	-.35**	-.05
Delay					.07	.04	-.19**	-.04	-.04	.02	.02	-.04
Weight						.62**	.19**	.07	-.03	-.07	.16**	.03
Height							.16**	.12*	-.13**	-.09	.15**	-.03
Head Circumference								.07	-.02	-.003	.10*	.10*
Articulation									-.41**	-.67**	.21**	.03
Aud. Discrim.										.33**	-.29**	.05
Disability											.26**	-.03
PPVT												.05

*$p<.05$
**$p<.01$

TABLE 73

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT SEVENTY TWO MONTHS

Predictor	Physical Domain			Linguistic Domain			Motor Domain	Disabil Domair
	(45)Weight	(46)Height	(47)Head Circ.	(48)Articulation	(49)PPVT	(50)Auditory Discrim.	(51)Mixed Dominance	(52)DSI
Group Membership	-	-	-	-	-	-	-	-
Controls-vs-Experimentals	-	-	-	.02	-	-	-	-
Social Class	-	-	-	.03	<.0001	-	-	.00!

TABLE 74

MATRIX OF CORRELATIONS FOR T_{12} GROUP AT 78 MONTHS (N=352)

	E_{II}	E_{III}	E_{IV}	SES	Delay	Wt.	Ht.	Circumf.	Audit. Discr.	Reading	PPVT	Mixed Lateral.	Disa-bility
Controls	-	-	-	.04	.005	.05	.03	.09	-.02	-.03	-.03	.01	-.03
E_{II}		-	-	.09	.05	-.05	-.05	-.05	.04	-.005	-.14**	.009	.02
E_{III}			-	-.13*	-.02	-.11*	-.06	-.06	-.03	.14**	.11*	.06	-.07
E_{IV}			-	.04	.004	.08	.06	-.01	.04	-.11*	-.006	-.09	.11*
SES					.03	-.01	-.09	-.05	.12*	-.40**	-.35**	-.18**	.13*
Delay						-.01	.01	.01	-.06	-.04	-.02	.00	.001
Weight							.64**	.34**	.06	.03	.01	-.11*	.13*
Height								.33**	-.09	.05	.12*	.08	-.06
Circumference									-.09	.05	.12*	.08	-.06
Auditory Discr.										-.21**	-.27**	-.04	.27*
Reading											.34**	.12*	-.11*
PPVT												.12*	.25**
Mixed Laterality													-.41**

*p = <.05
**p = <.01

TABLE 75

SUMMARY OF SIGNIFICANT RELATIONSHIPS BY PROBABILITY LEVEL AT SEVENTY EIGHT MONTHS

Predictor	Physical Domain			Cognitive-Linguistic		Achievement	Disability	Psychomotor
	(53)Weight	(54)Height	(55)Circumference	(56)Wepman	(57)PPVT(B)	(58)WRAT	(59)DSI	(60)Dominance
Factor II Group	.02	-	-	-	-	.01	.04	-
Factor III Group	-	-	-	-	.03	-	-	-
Factor IV Group	-	-	-	-	.01	-	-	-
Social Class	-	-	.01	.01	<.00001	<.00001	.02	.0005

TABLE 76

CONTRIBUTION OF SOCIAL CLASS DATA BY R^2 VALUE AND MEAN R^2 TO PREDICTION OF CRITERIA* IN SIX DOMAINS AT EIGHT AGES

DOMAIN	36 Months	42 Months	48 Months	54 Months	60 Months	66 Months	72 Months	78 Months	$\overline{M}^2$
Physical	(1) .01 (2) .03	(8) .03 (9) .01	(15) .002 (18) .06	(24) .02 (25) .01				(55) .01	.02
Psychomotoric	(3) .05 (4) .009 (5) .02	(10) .00 (11) .001 (12) .012	(17) .12	(26) .17				(60) .03	.054
Cognitive-Linguistic	(6) .14 (7) .03	(13) .10 (14) .17	(18) .076 (19) .22 (20) .07 (21) .15 (22) .13 (23) .13	(27) .11 (28) .16 (29) .21 (30) .13 (31) .21 (32) .17	(36) .17 (37) .08	(42) .21 (43) .18	(48) .01 (49) .10	(57) .11 (58) .01	.13
Adjustment					(38) .03	(44) .07			.05
Disability							(52).02	(59) .C2	.02
Achievement								(56) .15	.15
$\overline{M}^1$	.041	.046	.10	.13	.07	.04	.06		.06

*(n) = criterion number in preceding tables.

$\overline{M}^1$ = column mean

$\overline{M}^2$ = row mean

TABLE 77

PRESCHOOL INTELLECTUAL PERFORMANCE OF HIGH AND LOW GROUPS ON 60/66 MONTHS CRITERION SERIES

VARIABLE	ALL SUBJECTS N=392		WPPSI Vocabulary HIGH GROUP N=57		WPPSI Vocabulary LOW GROUP N=78		ITPA Auditory Association HIGH GROUP N=57		ITPA Auditory Association LOW GROUP N=78		ITPA Digit Span HIGH GROUP N=57		ITPA Digit Span LOW GROUP N=78	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Binet M.A. (2 yrs.)	23.36	6.79	27.50	8.32	21.28	7.12	30.00	6.32	20.00	6.50	25.00	6.49	23.75	6.47
Ammons (2 yrs.)	9.50	3.33	10.40	3.30	8.76	3.33	12.46	4.09	9.50	2.41	5.50	2.43	9.62	3.19
PPVT (3 yrs.)	30.61	12.56	40.76	10.91	23.77	10.78	43.60	9.85	21.37	9.53	32.10	10.67	27.90	17.86
PAR Communic. (3 yrs.)	7.72	2.22	9.27	1.48	6.28	2.13	9.06	1.88	6.22	2.19	8.07	2.07	7.16	2.31
Boehm T. (4 yrs.)	17.13	4.61	20.30	3.62	14.33	4.48	21.46	2.43	13.06	4.24	18.59	3.92	15.17	4.33
Presch.Inv. (4 yrs.)	41.68	11.34	50.84	7.42	31.88	12.47	52.92	5.35	29.34	10.84	45.82	9.31	35.89	11.71

TABLE 78

MATERNAL CHARACTERISTICS OF HIGH AND LOW GROUPS ON 60/66 MONTHS CRITERION SERIES

VARIABLE	ALL SUBJECTS N=392		WPPSI Vocabulary				ITPA Auditory Association				ITPA Digit Span			
			HIGH GROUP N=57		LOW GROUP N=78		HIGH GROUP N=57		LOW GROUP N=78		HIGH GROUP N=57		LOW GROUP N=78	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Married (%)	88		96		90		98		85		82		92	
Delivery Age	25.83	6.64	26.70	6.06	26.14	7.25	27.23	5.07	25.84	7.43	25.98	6.76	26.29	7.05
AFI68	25.87	8.12	21.52	8.34	27.50	7.56	21.01	7.94	28.85	6.19	26.08	9.34	25.41	6.38
Anxiety	5.35	4.27	3.52	3.44	6.47	4.41	3.53	4.04	5.94	4.20	5.14	3.86	5.26	3.92
Intell.Score	38.04	5.88	41.17	4.42	34.78	7.43	42.77	3.88	35.26	6.47	38.60	4.87	36.16	6.81
Educ.Level	2.94	1.04	3.73	1.08	2.50	.95	3.75	.89	2.42	.90	3.14	.95	2.77	.97
Educational Attitude Score	60.71	8.03	57.78	6.14	63.93	10.80	57.05	5.26	63.49	8.89	60.71	8.64	59.62	8.65

TABLE 79

ENVIRONMENTAL CHARACTERISTICS OF HIGH AND LOW GROUPS ON 60/66 MONTHS CRITERION SERIES

VARIABLE	ALL SUBJECTS (N=392)		WPPSI Vocabulary HIGH GROUP N=57		WPPSI Vocabulary LOW GROUP N=78		ITPA Auditory Association HIGH GROUP N=57		ITPA Auditory Association LOW GROUP N=78		ITPA Digit Span HIGH GROUP N=57		ITPA Digit Span LOW GROUP N=78	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Social Risk	1.09	1.57	.41	1.23	1.68	1.73	.19	.60	2.00	1.78	.95	1.53	.91	1.39
Race (B)	.38		.12		.47		.12		.57		.44		.26	
SES	54.25	14.48	42.58	14.36	61.44	10.66	42.49	13.22	63.97	8.17	52.52	14.20	55.03	11.94
STIM	32.93	5.98	36.21	3.49	30.09	6.92	36.60	2.61	28.87	7.07	34.08	4.55	32.33	5.70
Home Density	.99	.38	.80	.28	1.11	.43	.75	.29	1.16	.39	1.02	.38	1.00	.37
Head of House Education	3.16	1.34	4.24	1.43	2.60	1.01	4.39	1.17	2.42	.93	3.30	.45	2.93	.52

TABLE 80

INCIDENCE OF PROBLEMS INDICATED BY THE DISABILITY SCREENING CHECKLIST AT AGE FOUR YEARS

(N = 810)

		Visual Disorders	Hearing Disorders	Mental Retardation	Experiential Deprivation	Motor Disorders	Behavior Disorders	Speech Disorders
	N	%	%	%	%	%	%	%
Control Cases	405	.02	.00	.03	.11	.01	.04	.10
Experimental Factor I Cases (prenatal risk)	101	.00	.01	.02	.21	.01	.04	.08
Experimental Factor II Cases (delivery risk)	12	.08	.00	.00	.33	.00	.00	.17
Experimental Factor III Cases (neonatal risk)	215	.02	.00	.03	.12	.00	.06	.12
Experimental Factor IV Cases (multiple risk)	77	.03	.00	.06	.19	.03	.10	.16
All Cases	810	.02	.00	.03	.14	.01	.05	.11

TABLE 81

MATRIX OF CORRELATIONS FOR DISABILITY SURVEY DATA

	Race (B)	SES	Visual Disorder	Hearing Disorder	Mental Retardation	Experiential Deprivation	Motor Disorder	Behavior Disorder	Speech Disorder
Sex (M)	-.01	-.02	.009	.02	-.02	-.004	-.04	.03	.15**
Race (B)		.57**	.004	-.01	.07*	.36**	.002	-.01	-.07*
SES			.02	.002	.07*	.31**	.03	.04	.04
Visual Disorder				-.009	.13**	.05	.18**	.008	.10*
Hearing Disorder					-.01	-.02	-.006	-.01	.05
Mental Retardation						.18**	.06	.17**	.26**
Experiential Deprivation							.08*	.03	.09*
Motor Disorder								.04	.06
Behavior Disorder									.22**

*p = <.05
*p = <.01

TABLE 82

COMPARISON OF REGRESSION MODELS OF DISABILITY SCREENING INSTRUMENT SCORES(DSI) AT 66 MONTHS

Model	Criterion	R^2	F	P
1.		.04		.01*
	DSI		.0003	.98
2.		.04		.005*
1.		.04		.01*
	DSI		.002	.96
3.		.04		.005*
1.		.04		.01*
	DSI		.21	.64
4.		.03		.005*
1.		.04		.01*
	DSI		11.23	.0008
5.		.01		.55*
1.		.04		.01*
	DSI		.97	.32
6.		.03		.007*
1.		.04		.01*
	DSI		.97	.40
7.		.03		.002*

*Significance of the difference from zero.

TABLE 83

PREDICTORS USED IN AID-4 ANALYSES OF DISABILITIES AT AGE SIX YEARS

Predictor: Birthweight

Level 0	= 2 lb.
" 1	= 3 lb.
" 2	= 4 lb.
" 3	= 5 lb.
" 4	= 6 lb.
" 5	= 7 lb.
" 6	= 8 lb.
" 7	= 9 lb.
" 8	=10 lb.
" 9	=11 lb.
Level 10	=12 lb.

Predictor: Somatype

Level 1	= presence of small somatype
" 2	= absence of small somatype

Predictor: Biological Risk

Level 0	= zero level of risk
" 1	= level 1 of risk *(low)*
" 2	= " 2 " "
" 3	= " 3 " "
" 4	= " 4 " "
Level 5	= " 5 " " *(high)*

Predictor: Apgar Score-Apgar

Level 0	= Apgar score of 1 *(low)*
" 1	= " 2
" 2	= " 3
" 3	= " 4
" 4	= " 5
" 5	= " 6
" 6	= " 7
" 7	= " 8
" 8	= " 9
Level 9	= " 10 *(high)*

Predictor: Sex

Level 1	= male
Level 0	= female

12 Month Development
Predictor: Jordan

Level 0	= score 7
" 1	= " 8
" 2	= " 9
" 3	= " 10
" 4	= " 11
" 5	= " 12
" 6	= " 13
" 7	= " 14
" 8	= " 15
" 9	= " 16
" 10	= " 17
" 11	= " 18
" 12	= " 19
" 13	= " 20
Level 14	= " 21

Life Changes
Predictor: Coddington

Level 0	= Score 1-5
" 1	= " 6-10
" 2	= " 11-15
" 3	= " 16-20
" 4	= " 21-25
" 5	= " 26-30
" 6	= " 31-35
" 7	= " 36-40
" 8	= " 41-45
" 9	= " 46-50
" 10	= " 51-55
" 11	= " 56-60
Level 12	= " 61-64

Predictor: Ethnic group

Level 1	= black
Level 0	= white

Predictor: Social Risk

Level 0	= zero level of risk
" 1	= level 1 of risk *(low)*
" 2	= " 2 "
" 3	= " 3 "
" 4	= " 4 "
Level 5	= " 5 " *(high)*

SES level
Predictor: McGuire & White

Level 0	= score 14-21 *(high)*
" 1	= " 22-29
" 2	= " 30-37
" 3	= " 38-45
" 4	= " 46-53
" 5	= " 54-61
" 6	= " 62-69
" 7	= " 70-77
Level 8	= " 78-84 *(low)*

Predictor: Maternal Education

Level 0	= level 1 (elementary school)
" 1	= " 2 (part high school)
" 2	= " 3 (high school)
" 3	= " 4 (part college)
Level 4	= " 5 (college grad.)

Predictor: Maternal Age at Delivery

Level 0	= age 13
" 1	= " 14
" 2	= " 15
" 3	= " 16
" 4	= " 17
" 5	= " 18
" 6	= " 19
" 7	= " 20
" 8	= " 21
" 9	= " 22
" 10	= " 23
" 11	= " 24
" 12	= " 25
" 13	= " 26
" 14	= " 27
" 15	= " 28
" 16	= " 29
" 17	= " 30
" 18	= " 31
" 19	= " 32
" 20	= " 33
" 21	= " 34
" 22	= " 35
" 23	= " 36
" 24	= " 37
" 25	= " 38
" 26	= " 39
" 27	= " 40
" 28	= " 41
" 29	= " 42
" 30	= " 43
" 31	= " 44

Predictor: Marital Status at Delivery

Level 1	= married
Level 0	= unmarried

TABLE 84

SIGNIFICANCE OF AID-4 REGRESSION MODELS FOR FIVE DISABILITY STATES

Criterion	R^2	F	df_1	df_2	P
1. Total N of disability states	.26	19.22	7	376	<.01
2. Mental retardation	.13	11.01	5	365	<.01
3. Experiential deprivation	.34	38.38	5	364	<.01
4. Speech problems	.05	6.02	3	321	<.01
5. Abnormal behavior	.10	5.97	7	375	<.01

TABLE 85

FREQUENCY OF USE OF PREDICTORS IN AID-4 ANALYSES OF DISABILITY STATES

Predictors	(a) Total Score	(b) Mental Retardation	(c) Experiential Deprivation	(d) Speech Problems	(e) Abnormal Behavior	Σ
Domain - Child Development						
Birthweight				*		1
Somatype						
Biological risk						
Apgar	*	*			*	3
Sex	*				*	2
12 m. Development				*		1
Domain - Social Experience						
Life Changes						
Ethnic group	*	*	*		*	4
Social risk		*	*			2
SES	*	*				2
Domain - Maternal Characteristics						
Education level			*	*	*	3
Delivery age	*	*			*	3
Marital Status - perinatal						

FIGURE I

AID-4 TREE FOR INFLUENCES ON SUM OF DISABILITIES OBSERVED AT AGE SIX YEARS

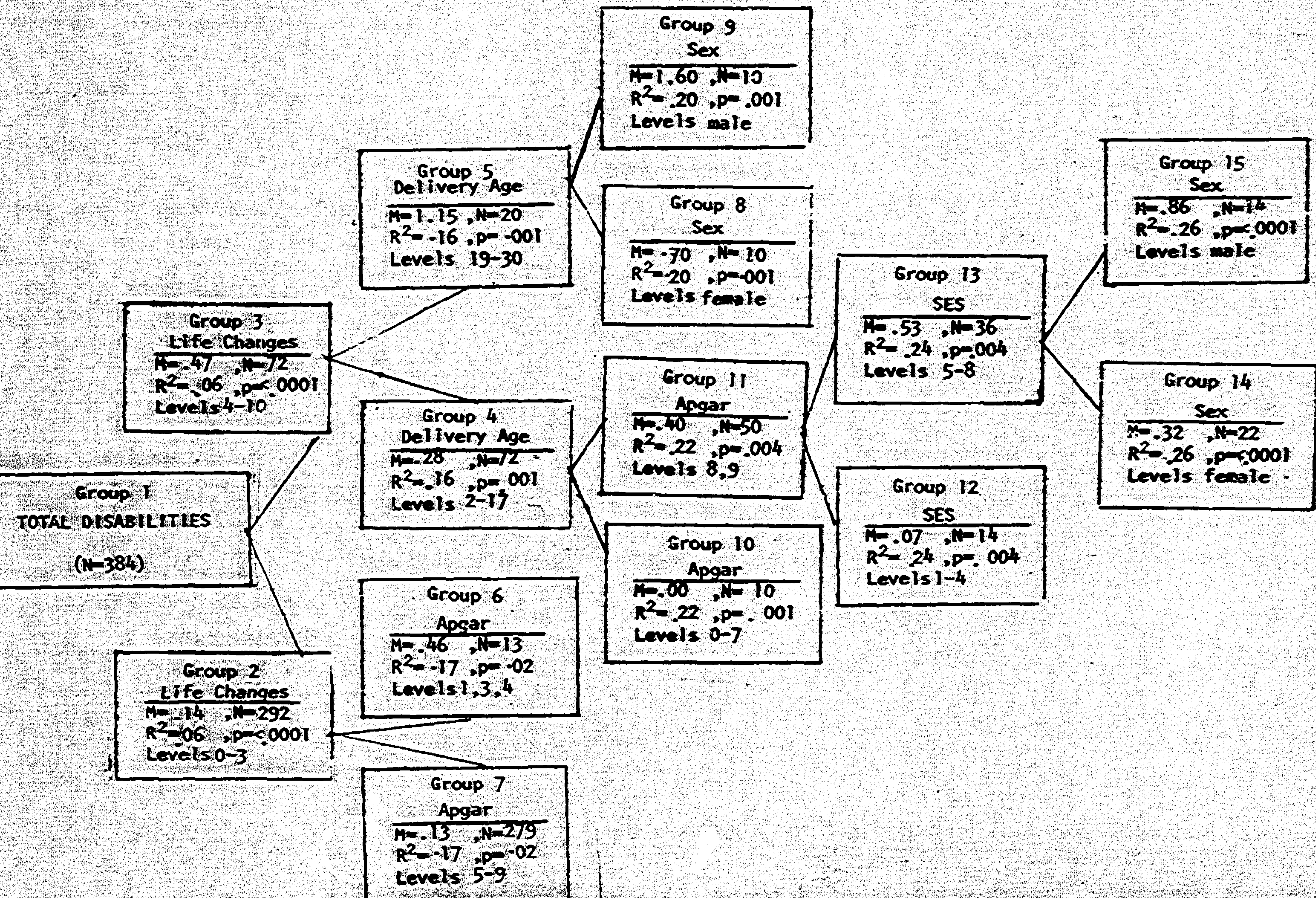


FIGURE 2

AID-4 TREE FOR INFLUENCES ON MENTAL RETARDATION OBSERVED AT AGE SIX YEARS

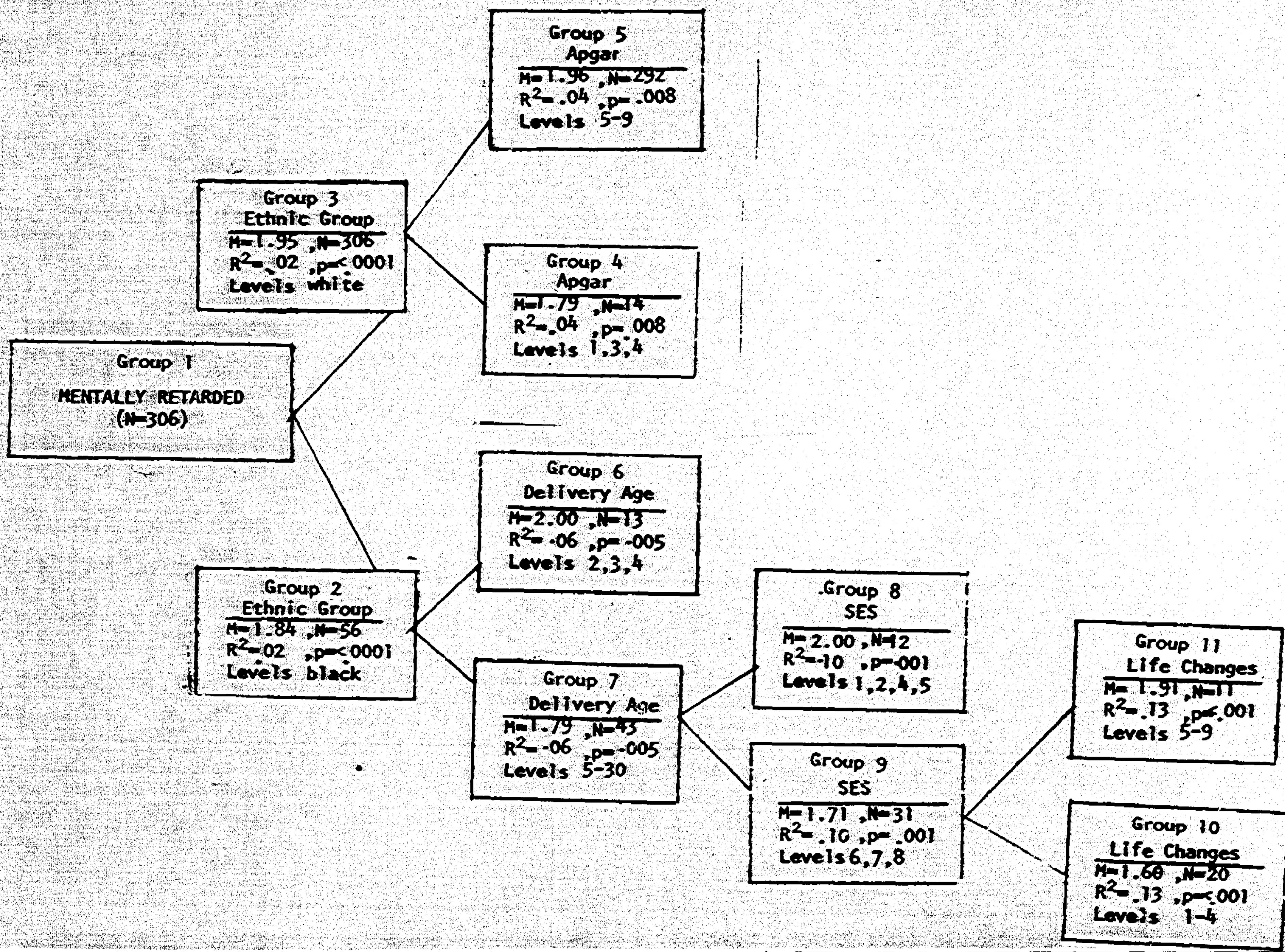


FIGURE 3

AID-4 TREE FOR INFLUENCES ON EXPERIENTIAL DEPRIVATION OBSERVED AT AGE SIX YEARS

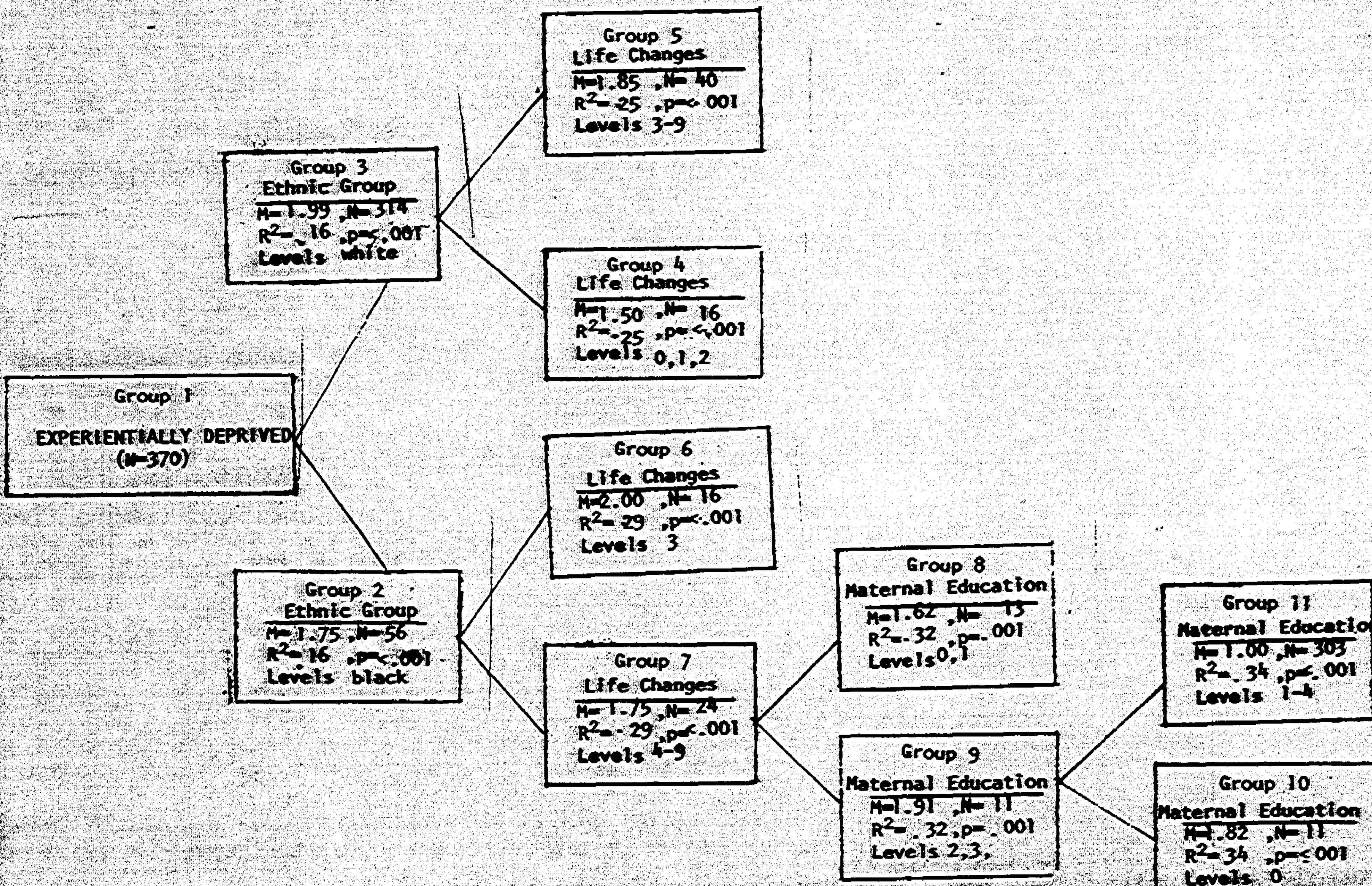


FIGURE 4

AID-4 TREE FOR INFLUENCES ON SPEECH PROBLEMS OBSERVED AT AGE SIX YEARS

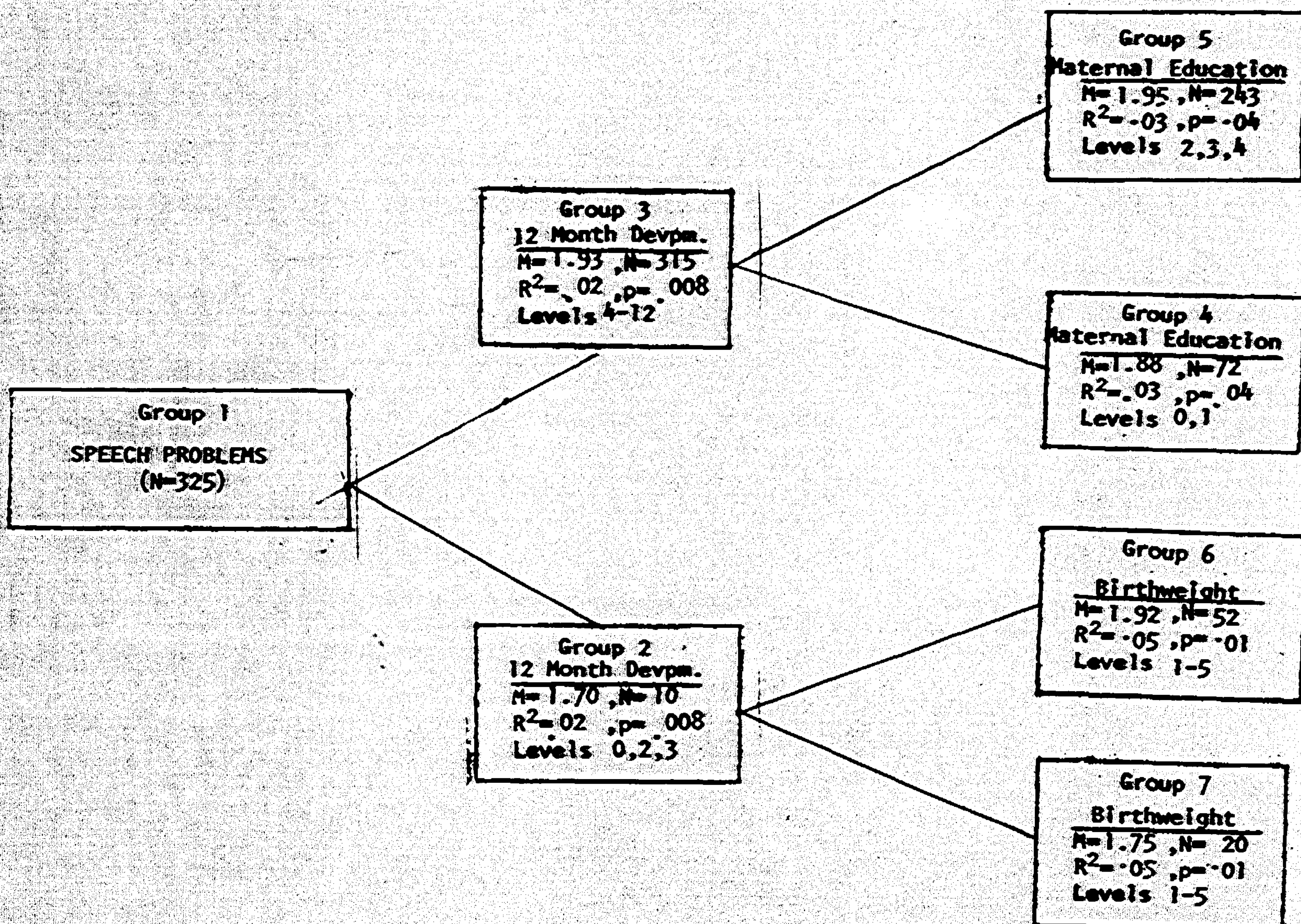
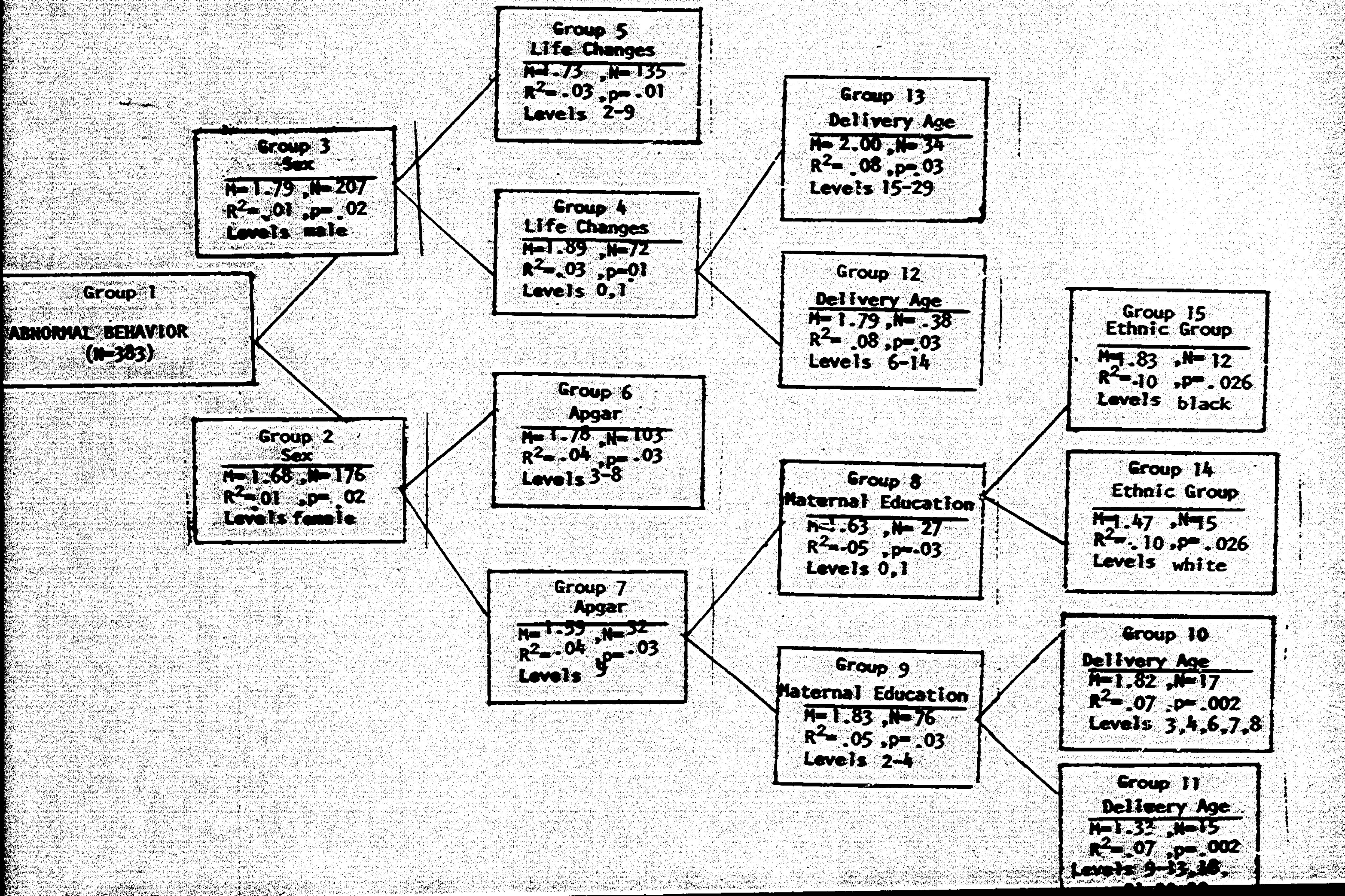


FIGURE 5

AID-4 TREE FOR INFLUENCES ON ABNORMAL BEHAVIOR OBSERVED AT AGE SIX YEARS



No. ______________________

DEGREE OF BIOSOCIAL RISK AT BIRTH

Risk Degree	**BIOLOGICAL*** Risk I Apgar	Risk II B. Wt.	Delivery (0)	Age (U)	Categor- ical	Risk Degree	**SOCIAL**** SES 1 all Ss	SES 2 (>-1σ)	**BIOSOCIAL**** Bios I	Bios II	Risk Degree
1	7	5 - 4.5 lb.	38-39	15		1	62 60th-69th	71-73 0-19th			1
2	6	4.5 - 4	40-41	14		2	63-65 70th	74-75 20-39th			2
3	5	4 - 3.5	42-43	13		3	66-69 80th	76-77 40-59th			3
4	4	3.5 - 3	44-45	12		4	70-73 90th	78 60-79th			4
5	<3	<3 lb.	>45	11		5	74-84 99th	79-84 80-99th			5

*use 1 score, highest

**record 2 scores SUM

Score #1	Score #2	Score #3	Score #4 (1 & 2)	Score #5 (1 & 3)	Score #6

LIFE CHANGES OF CHILDREN

NAME ______________________ EXAMINER ______________ FILE NO. 207

Relationship to Child ______________________ DATE ______________ SCORE ______________

This set of statements will help us learn of any changes in your child's life in the past year. Some items will not apply at all but others will. Please circle yes or no for each question.

STATEMENT

IN THE PAST 12 MONTHS

1. Has there been a death of a parent? YES NO
2. Has there been a divorce? YES NO
3. Has there been a separation of the parents? YES NO
4. Has a parent been sentenced to jail for 1 year or more? YES NO
5. Has there been a remarriage? YES NO
6. Has the child we are studying been hospitalized by illness? YES NO
7. Has the child lost a brother or sister by death? YES NO
8. Has the child acquired an obvious deformity? YES NO
9. Have you or your husband been hospitalized? YES NO
10. Have you had a baby? YES NO
11. Have you begun a job outside the home? YES NO
12. Have you and your husband had more arguments? YES NO
13. Has the child started school for the first time? YES NO
14. Has another adult (grandmother, aunt, etc.) joined your family? YES NO
15. Has one of your children begun to reside somewhere else? YES NO
16. Was the child born with an obvious deformity? YES NO
17. Does the child argue more with you and your husband? YES NO
18. Has there been a change in how well the child gets along with friends? YES NO
19. Has a close friend of your child died? YES NO
20. Has a brother or sister been hospitalized? YES NO
21. Does your husband's work take him away from home more? YES NO
22. Has a parent been sentenced to jail for 30 days or less? YES NO
23. Has the child learned he or she is adopted? YES NO
24. Has the child changed schools? YES NO
25. Has the child lost a grandparent by death? YES NO
26. Has the child done something truly outstanding? YES NO
27. Have you or your husband lost a job? YES NO
28. Does the child argue less with you and your husband? YES NO
29. Do you and your husband argue less? YES NO
30. Has your money situation changed? YES NO

(Coddington)