The Relevance of Neurocognitive Differences To Social Maladaptation

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THE RELEVANCE OF NEUROCOGNITIVE DIFFERENCES TO SOCIAL MALADAPTATION

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By

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THE RELEVANCE OF NEUROCOGNITIVE DIFFERENCES TO SOCIAL MALADAPTATION

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Abstract

The relationship between neurocognitive differences (NCD) and maladaptation was explored by comparing a group of adolescents from a continuation high school to a matched group from a regular high school. Quantitative and qualitative methods were used which proved complementary. Quantitative measures included demographic data, psychoeducational tests, and Piagetian Tasks. Qualitative measures consisted of interviews and clinical observations. School records were examined from both quantitative and qualitative vantage points.

Three hypotheses were proposed and confirmed. The study group was found to have a larger number of neurocognitive differences, a greater incidence of attention-deficit hyperactivity disorder, and more subjects unable to function on the level of Concrete Operations. Furthermore, the data revealed a different pattern of experience between the two groups, highlighting difficulties that NCD children encounter. The social environment was found to be an intervening variable that can either hinder or facilitate an adaptation to the NCD.

By using the broader category of NCD the study demonstrated that it is possible to pick up considerable variations in cognitive functioning that do not qualify as diagnosable learning disabilities yet contribute to unsuccessful academic and social adjustment.

Implications of the study point to the need to consider the possible presence of NCD when behavior in school is observed to be maladaptive. Piagetian tasks can offer a simple, efficient diagnostic tool in discovering a need for clinical intervention geared to compensation of special difficulties.

This study could contribute to the growing realization that regular programs need to be adapted to accommodate a wider range of variations in functioning.

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To my husband

Vladimir V. Shkurkin

whose love, enthusiastic support,

and inordinate amount of help

made this study possible

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CHAPTER I. INTRODUCTION

All societies have norms for behavior and those who do not conform are considered deviant or maladaptive and may be devalued by the society. Social norms are expressed through the social institutions which support the society's various functions. The family, church, government, school, health and welfare system and correctional system are examples of major social institutions in our society. My study concerns itself with the school system and with youth who cannot meet its standards. These youth find themselves in difficulty not only in the learning situation but in the society at large. The resources of the regular school are overtaxed and special schools are needed to handle this deviant population. In extreme cases the behavior may be judged delinquent and the youth are excluded from the society through incarceration.

Research indicates that a considerable number of these adjudicated juvenile delinquents have diagnosable learning disabilities. The five year "Link" Study (1977-1981) has shown that learning disabilities clearly predispose an adolescent to juvenile delinquency. Yet many socially maladaptive youth who are not adjudicated juvenile delinquents also have learning disabilities. They may in addition have many other learning problems which, although not officially diagnosable as learning disabilities, seriously interfere with their

ability to function in the mainstream and might reflect some kind of difference in their neurocognitive system.

My study addresses itself to this broader category of neurocognitive differences and their relationship to social maladaptation.

BACKGROUND

SOCIAL MALADAPTATION

Social maladaptation among youth must be considered a critical social problem. The number of arrested juveniles in 1975 is reported as two million (Berman 1978). Add to this the adolescents in group homes, residential treatment centers (designed for adolescents with severe acting out behavior), and continuation high schools, and the extent of dislocation resulting to families and communities is obvious.

In the past the problems causing these situations have been alternately attributed to psychological factors or to environmental factors. Poor parenting, poor teaching methods, and cultural deprivation have been blamed. Solutions, therefore, were geared toward psychotherapeutic treatment, addressing primarily the psychopathology of the child and the family and toward environmental manipulation aimed at changing or altering the child's living and learning situations. These assumptions and interventions were often valid and led to some positive results.

LEARNING DISABILITIES AND JUVENILE DELINQUENCY

However, recent research (Murray 1976, Podboy and Mallory 1978, Swanstrom et al. 1979, Crawford 1982a, and Dunivant 1982) has shown that among adjudicated juvenile delinquents the proportion of learning-disabled individuals is significantly greater than in the adolescent population at large.[1]

If this is the case, intrapsychic and/or environmental change would provide only partial solutions. At least the direction and emphasis of the psychotherapeutic work and environmental manipulation should be different. In fact, when applied in the traditional manner, both of the approaches have met with only limited success.

LEARNING DISABILITIES DEFINED

The definition of learning disability has been the object of extensive discussions and writings in the field. Since it is not a well-established, medically verifiable diagnostic category, many definitions have evolved with slightly different emphasis.

The official definition contained in the Education and Handicapped Act of 1975 (Public Law 94-142), which mandated

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[1] The numbers vary from 10% to 22% in the population at large, and from 27% to 75% within the delinquent population. Variations in the estimated number of learning disabled in the general population are due to demographic differences (i.e. rural vs. inner city [Crawford 1982b, Sikorski and McGee 1986]), and the variation in the number within the delinquent groups is due to the differing definitions of learning disabilities used in the particular studies.

Special Education, described the disorder as involving psychological processes basic to the use or understanding of spoken or written language, possibly affecting the ability to listen, speak, read, write, spell or perform mathematical calculations. Such conditions as perceptual handicaps, brain injury or dysfunction, dyslexia, and developmental aphasia were included but not those primarily resulting from visual, hearing, or motor handicaps; mental retardation; or environmental, cultural, or economic disadvantage.

The condition was further defined in 1978 when the Department of Health, Education, and Welfare (HEW) stated that it exists when a child does not achieve at levels commensurate with age and ability levels in the above-mentioned skills, as well as listening, reading comprehension, and math reasoning. Emotional disturbance was added to the exclusionary clause.

The definition underwent further revisions in 1983. The concept of discrepancy between ability and performance remained central, but other relevant information could also be considered in measuring a subject's functioning (1983 Amendment to PL 94-142).

The development of a definition of learning disability has been a lengthy process because it is such a complicated concept. The definition still suffers from vagueness and leads to inconsistencies in the identification process, which is influenced by professional and administrative factors as

much as by the attributes of the child (Keogh 1988, G. Morrison et al. 1985).

NEUROCOGNITIVE DIFFERENCES

The recently conceptualized category "neurocognitive differences" is used in this study as more inclusive and conceptually appropriate than the narrow category of diagnosable learning disabilities. Neurocognitive differences (NCD) are defined here as any difference from the norm in perceiving, integrating, and using academic and social information that significantly interferes with the person's ability to partake of mainstream education, employment, and social interaction. This concept describes a much wider range of differences than the officially defined category of learning disabilities.[2]

Within the broader category of NCD diagnosable learning disabilities are a legally defined subcategory, as well as a quantitative extreme.

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[2] The term "neurocognitive differences" was borrowed from an article by Self-Psychologist Joseph Polombo (1984). Levine (1987) used the term "neurodevelopmental differences" to describe a continuum of variation from the norm. Myklebust (1983) and O. Thompson (1985c) expanded the concept of learning disabilities to include a wider range than defined by law but still refer to them as learning disabilities. "Neurocognitive differences" seems more precise and better reflects the emphasis of this dissertation.

ATTRIBUTES OF THE LEARNING DISABLED AND CRITICAL ISSUES

Learning disabilities are known to affect males at least three times as often as females, with some estimates of ratios running as high as 6:1 (Masland 1981).

The exclusion of environmental and cultural influences as acceptable causal factors in the evaluation of learning disabilities presents a special challenge to diagnosticians since research has shown that socioeconomic status (SES) factors do indeed contribute to learning disabilities (Amante et al. 1977, Deutsch 1964).

Verbal learning disabilities are the best known and probably most prevalent. These include reading problems (dyslexia), and problems in oral language, written language, and several areas of mathematics (Johnson 1987).

Nonverbal problems are described by Myklebust (1975), Wiig (1985), Johnson (1987), and Thompson (1985a). They affect orientation, concepts of time and space, body image, facial recognition, interpretation of gestures, and various visual spatial-motor processes. Nonverbal problems are often the most debilitating because of their impact on social maturity and independence (Johnson 1987). The affected individual has particular difficulty with "inner language" and with "acquisition of meaning" (Myklebust 1983, O. Thompson 1985b).

Attention-deficit hyperactivity disorder (ADHD), often associated with learning disabilities, is described by Levine (1988) and Goldstein (1985). Individuals with ADHD have

problems in selectively focusing on academic or social tasks, show impulsiveness, have short attention span, and sometimes exhibit hyperactivity. Organization of their work, living space, and schedules can also cause them difficulties (Levine 1988). Verbal and nonverbal learning disabilities overlap each other and ADHD and all three contribute to problems with social adjustment.

My study addresses nonverbal and attention problems as a primary focus, within the broader context of NCD.

Literature in the LD field abounds with works on social aspects of learning disabilities that clearly show that the learning disabled adolescent might be vulnerable to social maladaptation (Kronick 1981; Osman 1979, 1982; Sikorski 1985; Sikorski and McGee 1986).

To my knowledge no specific research has addressed the converse question: within the broader category of socially maladapted youth, what percentage might be learning disabled? Nor am I aware of any specific research on the relationship between maladaptation and the broader area of NCD, which includes those who could be diagnosed as learning disabled as well as those who could have significant difficulties in particular areas but do not fit the narrow definition of learning disabled. My project relates these two broader categories: the category of maladapted youth to the category of youth with NCD.

Another facet of my study is based on a finding by Wiig (1984a) that at least some learning disabled adolescents could not perform Concrete Operational Tasks in the system developed by Piaget. They were unable to fully grasp the concepts of seriation and classification, and as a result could not go beyond the directly observable and could not coordinate several observations. All of these competencies should be acquired at least by age 11. I tried to replicate these findings within the broader context of NCD.

Placing the neurocognitively different adolescents within the Piagetian framework sheds further light on the nature of the difficulties that might have been encountered both in the area of academics and in the social arena as they tried to negotiate the high school curriculum and the social world of an adolescent. The adolescent who could not generalize a rule from one situation to the next was clearly predisposed to academic failure as well as to social maladaptation.

The aim of my research is not to minimize in any way the familial and cultural influences on development, but rather to draw attention to how neurocognitive differences interplay with the environment and produce significant differences in functioning.

Literature on the study of the brain describes recent discoveries in the areas of neurology and neuropsychology that have brought new understanding to the deep differences between individuals (Luria 1973, Geschwind and Galaburda 1985, Diamond

1985). Such discoveries have raised important issues about the relevance of these inborn differences to areas of learning disabilities and to other variations in patterns of neurocognitive functioning. As the evidence mounts that difficulties in both academic and social learning reflect profound inborn differences, the concept that these differences represent variations on the norm rather than defects becomes especially important. This idea was expressed by neurologist Geschwind (1984b), by LD specialist Kronick (1983), and by pediatrician Levine (1987).

If the idea is accepted that considerable variations from the norm are part of the normal human condition, systems and institutions geared to the norm would need to make changes to accommodate these variations so that difficulties are prevented. Such a perspective could pave the way for novel interventions with the adolescents and their families, as well as suggest the kind of adaptations and allowances needed by the institutions that work with these adolescents, such as schools, vocational training services, and recreational services.

PURPOSE AND STATEMENT OF THE QUESTION

It has been shown that juvenile delinquency is significantly associated with learning disabilities and seems to be also associated with the broader category of NCD (O. Thompson 1985b). My intent here is to ask whether or not

other forms of social maladaptation among youth are also associated with NCD. Although such a connection has not yet been shown, current literature suggests this association (O. Thompson 1985b).

The possibility of such a connection led me to ask: Is maladaptation one of the possible results of a long-standing pattern of difficulties in coping with social and academic learning which reflects NCD?

To throw light on the relationship between NCD and social maladaptation in adolescents, I compared a specified group of maladapted adolescents, who are not adjudicated juvenile delinquents, with a comparable group of adolescents who have never been defined as maladapted.

Maladapted in this study refers to adolescents who, because of their behavior, have come to the attention of school authorities and have been ordered to participate in specially mandated educational and/or treatment services. The types of behavior that usually lead to such placement include repeated disciplinary problems and truancy coupled with lack of academic performance.

Since much of the research deals with the significant numbers of learning disabled among adjudicated delinquents, there seems to be a good rationale for looking at a group that is maladapted but not adjudicated.

HYPOTHESES

My hypotheses were:

1. The study group will have a significantly higher proportion of adolescents with neurocognitive differences as defined by psychoeducational tests. Some of these differences will fit the legal definition of learning disabilities, while others will represent a significant difference from the norm but will not fall into the official learning disability category.[3] The preponderance of these differences is in the nonverbal category.

2. The study group will have a larger proportion of adolescents with attention-deficit hyperactivity disorder, as determined through interviews, from the examination of school records, and from clinical observation.

3. The study group will have a significantly higher proportion of adolescents who have not reached, in part or in full, the developmental stage of Concrete Operations as determined by their performance of Piagetian Tasks.

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[3] For the purpose of diagnosis of learning disabilities, the State of California Administrative Code (1986), Title 5, Section 3030j(4)(A), defines the discrepancy between ability scores and achievement scores as being significant if it measures at least 1.5 standard deviation. For the purpose of this study a discrepancy measuring one S.D. will be considered significant and would define an adolescent as neurocognitively different.

The increased vulnerability to maladaptation and to delinquency of the learning disabled (LD) adolescent is beginning to be widely recognized in the LD field. What my study adds to existing findings is threefold:

First, it extrapolates the findings about juvenile delinquents to other groups of maladapted adolescents.

Second, it corroborates the findings that call attention to specific patterns of learning and behavior and are related to problems with nonverbal learning and with attention. These patterns have been described by Myklebust (1975), O. Thompson (1985a, 1985b), Johnson (1987), and Levine (1988), who point out that such a pattern can be disabling even for those adolescents who cannot be officially diagnosed as learning disabled.

Finally, it demonstrates that performance on Piagetian Tasks can be used as a reliable indicator of NCD.

* * * * *

CHAPTER II. LITERATURE REVIEW

INTRODUCTION

The present-day understanding of specific learning disability is the result of a lengthy evolution of the concept. An ever-growing body of research lends new insights into the critical issues in the field and into the different attributes of groups of the learning disabled. The study of social impairment, which is a frequent aspect of learning disabilities and which can lead to social maladaptation, has gained new prominence since the revelation of a relationship between juvenile delinquency and learning disabilities. The concept of NCD resulted from a response in the field to the need for a broader category of differences from the norm. Theories of brain development can help in understanding the neurophysiological substrata of these NCD, and Piaget's theories add another dimension to the explanation of variation in brain functioning.

The history of the construct of learning disability reveals a lengthy struggle for understanding of this complex phenomenon on the part of several disciplines such as neurophysiology, psychology, and education and reflects the influences of various historical and philosophical trends.

This review addresses the critical issues that continue to be involved in the diagnosis, distribution, and definition of learning disability. Recent research has addressed itself to the description of subgroups such as verbal and nonverbal problems and ADHD. A brief discussion of this research is followed by a summary of the voluminous literature on social impairments of the learning disabled. The new awareness of this aspect of learning disabilities and their possible connection to social maladaptation has gained increased importance subsequent to research in the 1970s establishing a clear link between learning disabilities and juvenile delinquency.

The construct of NCD is described as the response in the field to concern about inherent problems in the official definition of learning disability. The advantage of a broader, more inclusive category related to interference with functioning in the mainstream is explored.

Several theories of brain development and functioning are described to facilitate the understanding of the neurophysiological substrata of NCD. The work of neuropsychologist Luria offers a theory of both normal and deviant functioning of the brain. Neurobiologist Geschwind's theory of faulty brain cell migration and assembly during intrauterine development offers a possible explanation of differences in neurocognitive functioning. Neurologist Yakovlev and psychiatrist Malerstein both proposed that myelination of dif-

ferent parts of the brain is related to specific stages of cognitive development. Neurologist Holmes integrated the work of Luria, Piaget, and Yakovlev.

Piaget's theory of cognitive development is described and reference is made to research that applied the Piagetian scheme of development to neurocognitively different children and adolescents. Finally, Piaget's concept of moral development and its relationship to social cognition is discussed, and mention is made of the work on moral development by Kohlberg and Selman.

LEARNING DISABILITIES

THE CONSTRUCT DEVELOPMENT HISTORY

Our present understanding of learning disabilities owes its early beginning to two 19th century European neurologists. Studies by Broca (1861) and Wernicke (1874) were early precursors to later discoveries in the areas of language development and learning disabilities. Broca, a French neurologist, discovered that the motor part of speech is located in a specific portion of the frontal lobe, now called Broca's area. Wernicke, a German neurologist, discovered a decade later that comprehension of written and spoken language is controlled by another region of the brain, a part of the temporal gyrus, now known as Wernicke's area.

Early efforts to explain the etiology of special reading difficulty included the work of Freud (1891), who felt that in aphasia no lesion needed to be assumed and that the symptoms could be attributed to an alteration of a physiological constant. Morgan (1896) described "congenital word-blindness," which he felt was most probably due to defective development of the area of the angular gyrus. Hollingworth (1918) wrote about special disability in spelling and expressed the opinion that this handicap is the far end of the normal distribution, rather than representing the result of a lesion. Orton (1928) and his student Bender (1957) explained learning disabilities as the result of a maturational lag and of mixed dominance. Each of these early theoreticians dealt with one or more aspects which all proved to be important in our present understanding of learning disabilities.

Parallel trends during the first half of this century advocated conflicting points of view. L. Thompson (1973) in his excellent review states that even into the 1970s there was still resistance to recognition of specific learning disabilities. Those who recognized the condition held that the cause must lie either in brain damage or in the way the child was reared or taught. Flesch's popular book (1950) Why Johnny Can't Read attributed learning problems to the method of teaching. In the 1930s the very influential psychoanalytical literature ascribed reading disability to

unconscious factors. In 1932 Strachey, writing in the International Journal of Psychoanalysis, postulated that in the child's unconscious, reading may have special significance and be related to "oral" and "anal" impulses that are poorly repressed. Sadism, special hostilities, and ego development was cited as reasons for dyslexia by other writers (L. Thompson 1973). The late neurologist Geschwind noted during his last workshop (1984b) that much promising work at the beginning of the century was not seriously pursued because of the influence of psychoanalysis which held that learning disabilities as well as most of the other symptoms were due to familial influences.

By the late 1970s there was general recognition in the field of the condition of specific learning disability. Primarily because of advances in neurophysiology and extensive research in psychology and education, it became increasingly clear that learning disabilities represented a complex interaction of a different constitutional and neurological substrata with the particular make-up and dynamics of the family, influenced and molded by the school, the peer group, and the wider community.

The exact definition of learning disability continued to be the object of extensive discussions and writing. Vaughan and Hodges (1973) reflected this difficulty by providing ten different definitions for learning disability. Some of these stressed problems with organization, integra-

tion, generalization of information, spatial orientation, and social skills. Appendix A lists definitions adapted from their work.

The Education and Handicapped Act (Public Law 94-142) was passed in 1975, mandating Special Education. It provided a descriptive definition of learning disability and enumerated the exclusions. The concept of discrepancy between ability and performance was introduced. The unamended 1975 Public Law 94-142 stated in part:

> "The term, children with learning disabilities, means those children who have a disorder in one or more of the basic psychological processes involved in understanding or in using language spoken or written, which disorder may manifest itself in imperfect ability to listen, speak, read, write, spell or to do mathematical calculations..." (Sikorski and McGee 1986, 3).

The definition included such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. It did not include conditions that are primarily the result of visual, hearing, or motor handicaps; of mental retardation; or of environmental, cultural, or economic disadvantage.

Later definitions by HEW put more emphasis on processes such as reading comprehension and mathematical reasoning than on specific skills. The 1978 definition states that "a learning disability exists when a child does not achieve commensurate with his/her age and ability levels and a se-

vere discrepancy exists between achievement and intellectual ability (as defined by psychoeducational tests) in the above mentioned skills, as well as listening, reading comprehension, and math reasoning." Emotional disturbance was added to the exclusionary clause.

In 1983 an amendment added to Public Law 94-142 stated that alternative measures of the student's functioning can be used in addition to or even in lieu of the standardized tests. These measures included information provided by the parent or teacher, work samples, and any other relevant data. In 1985 the State of California amended portions of its Administrative Codes to bring California regulations in line with the amended Public Law 94-142.

By 1986 the Association for Children and Adults with Learning Disabilities (ACLD) developed a comprehensive definition that included presumed neurological origin as well as social aspects:

> Specific learning disability is a chronic condition of presumed neurological origin which selectively interferes with the development, integration, and/or demonstration of verbal and/or nonverbal abilities. Specific learning disabilities exist as a distinct handicapping condition and varies in its manifestations and in degree of severity. Throughout life, the condition can affect self-esteem, education, vocation, socialization, and/or daily living activities.

The definition of learning disability still suffers from vagueness; the placement of students into special classes is often determined by geographical and administrative constraints as much as by characteristics of the child (Keogh 1988).

OTHER ISSUES IN DIAGNOSIS, DISTRIBUTION, AND DEFINITION OF LEARNING DISABILITY

Gender

Learning disabilities are known to affect males at least three times as often as females, with some estimates running as high as six to one; the evidence strongly indicates that inherent characteristics in boys cause them to be more prone to have learning disabilities rather than the latter being caused by upbringing and expectation differences. Recent anatomical studies have shown structural differences in the brains of males and females which are assumed to be the result of the action by sex hormones on the developing nervous system (Masland 1981, ix, x).

Geschwind and Galaburda (1985) described how the male hormone testosterone slows the development of the left hemisphere, which is predominantly responsible for the development of language. They believe this to be one possible cause of learning disabilities.

Finucci et al. (1981). found the learning disabled male-to-female ratio was found to be 3:1 in elementary schools and 15:1 in high schools. They propose that this

increase probably represents the interaction of neurophysiological and environmental factors aggravated by the cumulative effect of prolonged failure. McGuiness (1981) concludes that males seem more affected by negative environmental factors which might reflect their greater constitutional vulnerability.

Socioeconomic Status

According to HEW "a child cannot be identified as having a specific learning disability if the severe discrepancy between ability and achievement is primarily the result of . . . environmental, cultural, or economic disadvantage." This clause presents a special dilemma to the diagnostician since research has shown that neurocognitive functioning is impacted by SES (Amante et al. 1977). Many more children are diagnosed as learning disabled in the low SES groups and particularly in some ethnic groups. Several possible explanations exist:

(1) Neuropsychological deficit that leads to diagnosable learning disabilities is caused by environmental factors such as malnutrition, poor obstetric and pediatric care, and lack of exposure and stimulation at critical periods of development (Amante 1975, Amante et al. 1977, Deutsch 1964). This explanation is encountered primarily in the pre-1980 literature and is in direct contradiction to one of the exclusionary clauses of the official learning

disability definition. This explanation represents a variant view.

(2) The greater numbers of diagnosed learning disabled in the low SES groups and especially among ethnic minorities is an artifact of the tests used (Turner 1986). Since most psychoeducational tests were developed and normalized on children well socialized in the predominantly white, middle-class Anglo-Saxon culture, they inherently discriminate against children who live and function in a black or Hispanic ghetto. Research has shown that black children have a different approach to learning and different referents for verbal expression (Rivers 1978, Turner 1986). In all SES groups a prevalence of a different cognitive style has been observed in black children (Waber et al. 1984).

(3) A third explanation seems to synthesize elements of the first two. The finding of greater incidence of learning disabled in the low SES groups reflects a complex interrelationship between brain dysfunction, the effects of socioeconomic disadvantage, and the process of defining learning disability (G. Morrison et al. 1985).

(4) Some recent research is beginning to show that it might be possible to discriminate better between the effects of low SES and the effects of neuropsychological deficit. D. Morrison and Hinshaw (1988) found that in a sample of learning disabled children performance on neuropsychological tests was not correlated to SES, whereas intelligence and

achievement were. Morrison and Hinshaw note that the linear association between SES and perceptual performance found in other studies which were done on normal populations belies the complexity of the actual relationship.

ATTRIBUTES RELATED TO GROUPS OF LEARNING DISABILITIES

Verbal Learning Disabilities

Verbal learning disabilities are the most prevalent in the learning disabled population and the best known to the layman (Johnson 1987). They impede the acquisition, use, and comprehension of both oral and written language, including the ability to read, and most aspects of mathematics (Johnson and Myklebust 1967). They most frequently interfere with academic achievement and tend to be recognized early in life. They represent a cognitive-linguistic processing deficit which can be auditory or visual or both (Myklebust 1975). Difficulty in conversion from the auditory to the visual mode leads to problems in reading and spelling (Heilman 1978). Verbal learning disabilities hinder symbol manipulation and understanding of complicated grammatical structures. Dysnomia, a selective impairment of semantic memory characterized by difficulty in finding a word, is also frequently associated with verbal learning disabilities (Wiig 1984b).

As a result the individual with verbal learning disabilities might have deficits in oral and written syntax,

name- and word-finding difficulties, and reduction in verbal fluency. Written language production and comprehension also becomes a problem and contributes to delayed concept formation (Wiig 1984b).

Nonverbal Learning Disabilities

Whereas the verbal learning disabilities deal in great measure with the form and structure of language, nonverbal learning disabilities deal with meaning. They are not academic problems in the usual sense, although they can affect performance in indirect ways. They are often much harder to detect in the school population.

The individual is unable to comprehend the significance of many aspects of his environment. Orientation in space and time, visual spatial motor processes, interpretation of facial expressions, gestures and prosody (tone of voice) are affected. This leads to a deficit in social perception which makes it difficult to grasp the basic rules of social behavior (Johnson 1987). Primary bases of interpersonal relationships are nonverbal (Myklebust 1975, 1983).

Wiig (1984b) described how the average child is already an effective communicator by the 4th grade: they use appropriate rituals, greetings, introductions, and availability responses, with a variety of expressions, affection, approval, disapproval, and increasing evidence of being able to take the other person's point of view. People with non-

verbal problems frequently cannot make the proper inferences from observing the environment (Johnson 1987), do not make proper judgments regarding the intent and purpose of actions of others (Myklebust 1975), and are negatively affected in their ability to make socially appropriate responses as well as life decisions. Myklebust pointed out that deficits in verbal processes do not seriously violate the experience itself. On the other hand deficits in nonverbal processes lead to distortions of experience itself. Children with this type of learning disability are hence immature and unable to make many of the routine judgments necessary to everyday living (Myklebust 1975).

A high verbal and reading ability often masks nonverbal problems in elementary school. In junior high school when understanding of complex verbal language based on spatial relationship and the management of time and space become important, the disability is exacerbated. These students often have extreme difficulty with such simple reality tasks as telling time, keeping track of a schedule, finding their way around town, and following the sequence of the months and days of the week (O. Thompson 1985a). The acquisition of basic adaptive behavior is impeded, which impacts social maturity and independence (Johnson 1987). Many of them, although appearing highly intelligent, are not able to leave home as young adults (O. Thompson 1985a).

Johnson (1967) states that the usage of words and sentences has an "empty" quality, which an experienced teacher would detect. The form may be correct, but the experience underlying the meaning is distorted. Luria (1973) has described nonverbal problems as the inability to relate or synthesize incoming information from the various sensory systems: vision, hearing, kinesthetic and tactile, in any combination. Using the work of Luria, Thompson (1985a) states that adolescents with nonverbal problems cannot fit the individual elements of an incoming impression into a single structure.

Attention-Deficit Hyperactivity Disorder

Attention-deficit hyperactivity disorder is believed to be the most common of childhood disorders (Goldstein 1985) and is often referred to as the "low severity, high prevalence" syndrome (Levine 1988). It is presumed to reflect a cognitive dysfunction but is not officially classified as a learning disability. Individuals with ADHD have problems in selectively focusing on academic or social tasks, show impulsiveness, have short attention span, and sometimes exhibit hyperactivity. They also have spatial and temporal problems (Levine 1986).

ADHD, diagnosed learning disabilities, and conduct disorders consistently overlap, which raises the question whether or not they represent different manifestations and

variations of a more general underlying neurodevelopmental difficulty (Goldstein 1985). The dichotomy between ADHD and learning disabilities is probably due to a historical accident, since traditionally physicians diagnosed ADHD and educators diagnosed learning disabilities (Stark 1989). By the time the child is referred for clinical evaluation, he or she is apt to present a complex intertwining of neurodevelopmental and emotional factors (Goldstein 1985).

Goldstein (1985) described how in the last decade the emphasis has shifted from over-activity to inattention. As pointed out by Levine (1988), ADHD children cannot selectively focus. They have difficulty screening out distracting stimuli whether coming from their bodies or the environment, making it hard to concentrate on a task and to finish it. It also makes it difficult to listen continuously and to follow directions. Levine mentioned too that because of spatial and temporal problems the ADHD children do not do well with organization of their work, room, and schedules. (Here they obviously overlap with other learning disabled groups.)

Children with ADHD are described as having been very bothersome infants with a lot of crying, little sleep, eating problems, and difficult to comfort. They seem to have a very hard time overall and their impact on their environment is powerful (Goldstein 1985). Levine (1988) states that they seem to be extremes of common problems. Many of them

turn into hyperactive preschoolers who seem fearless, in that they do not exercise normal caution (might run out in front of an auto) and the threat and even the administration of punishment does not seem to deter them (Goldstein 1985).

Whereas most kids shift from touching to looking, children with ADHD do not. They grab and push, even into the latency years. The parents are puzzled and confused because they assume that the child has attended to directions, not realizing that he has not processed them. This creates an excessive number of negative interactions which, coupled with the negative reactions of siblings to the child's state of heightened arousal and age-inappropriate social behavior, create a constant stream of negative feedback which certainly contributes to low self-esteem and oppositional behavior (Goldstein 1985).

School in the middle years is a negative experience. The child bothers the teachers and the other students because he or she is immature and socially incompetent. He might raise his hand in class whether he knows the answer or not, blurt out the wrong answer, and in general interfere with the smooth functioning of the class. The teacher is apt to become more intense and controlling in her interactions with the child, which in turn leads to the intensification of dysfunctional behavior (Goldstein 1985).

Peer relationships suffer because of impulsiveness and inability to postpone gratification. They are poor game

partners and often try to influence outcomes through forceful control. Their lack of social judgement leads them to fighting, teasing, interrupting, and saying inappropriate and uncomplimentary things. They are eager to interact and are usually perplexed as to why others will not play with them (Goldstein 1985).

This description by Goldstein is consistent with the postulated absence of an adequate system of self-regulation and self monitoring for those with ADHD. They have defective "sieves": they are not selective in picking up feedback from the environment, nor are they selective in their responses. They tend to focus on details rather than see the whole picture, therefore do not generalize from one situation to the next. This, coupled with their tendency not to focus or filter before they act, makes it difficult to consider consequences of their own behavior, or to learn from experience. (Levine 1988.)

According to Levine, the ADHD child often manifests an extreme gap between apparent ability and performance which is a great frustration for parents and teachers who suspect willful inattention or emotional problems. The tendency to over-focus on a special task which might be peripheral to the required activity and the inconsistency of performance which is inherent to the syndrome, add to the conviction that the child "attends when he wants to." The ADHD child also might give the impression that he is more capable than

he actually is because of frequent good verbal capacity and poorly filtered verbiage. He might also understand the concept but not be able to deliver because of memory problems, difficulty in sustained attention, and difficulty in organization of thought and action--"can't keep it all together." (Levine 1988.)

Many of the attributes described are influenced by easy cognitive fatigue and extreme arousal which are typical of the ADHD group. This is believed to reflect a sleep-arousal imbalance mediated by the reticular activating system of the brain stem, which modulates the degree of arousal of the whole nervous system (Levine 1988). The beneficial effect of stimulants has been explained by their activating the reticular system by producing more dopamine. According to Levine the shortage of the neurotransmitters dopamine and norepinephrine in the reticular activating system is implicated in the latest research as possibly being the root cause of ADHD (1988).

Additionally, it has been found that children with ADHD have lower skin conductance and less nonspecific galvanic skin response (GSR) activity (Satterfield and Dawson, 1971 as cited by Goldstein 1985, 25). Skin conductance is one of the manifestations of the autonomic nervous system that controls the response to fear (Mednick 1983). Satterfield's study was similar to a study by Mednick and Christiansen (1976) in Denmark where it was found that delinquent child-

ren reared in a non-criminal milieu had low skin conductance, whereas children without a criminal record but reared in a "criminogenic" milieu had high skin conductance.

Mednick reasons that since low skin conductance means slow response of the autonomous nervous system to fear and slow recuperation from the response, the inhibitory social forces (parental and teachers' anger and punishment; possibility of arrest, etc.) would work very slowly if at all. Mednick (1983) cites several studies that confirmed his results.

The etiology of ADHD might include both chemical and structural impairments, compounded by faulty learning. It is highly probable that we are dealing with a group of entities (Bloomingdale 1984, 53). This is a complicated disorder that overlaps and interrelates with both learning disabilities and psychiatric disorders. It is difficult to ascertain whether these three diagnostic entities should or could be separated in the ADHD child, or whether they are part and parcel of the syndrome or syndromes (Goldstein and Goldstein 1986). There also seems to be a definite familial pattern, in that very often a father, brother, or uncle also had ADHD (Bloomingdale 1984, 8; Goldstein 1985, 24).

Kronick (1986) and Denckla (1986) both felt that ADHD might be the extreme of the "difficult temperament" child as described by Chess and Thomas (1987). Chess and Thomas, in their longitudinal study on differences of temperament fol-

lowed the behavioral development of 133 subjects from early infancy to early adult life. Among others they isolated such characteristics as attention span, frustration tolerance, and adaptability to change, studying the influence of these traits on normal and deviant psychological development. They found that 10 percent of the subjects could be classified as having a "difficult temperament" which was discernible from the beginning of life, was not created by the environment, and impacted the environment in a negative way. The ADHD child is probably the far extreme of the difficult temperament child (Chess and Thomas 1987, 31-36).

In summary, the literature presents examples showing that verbal and nonverbal learning problems and ADHD often overlap, and many children present a mixture of traits that apply to two or all three of the categories: verbal, nonverbal, and ADHD.

SOCIAL MALADAPTATION

SOCIAL IMPAIRMENT

Social impairments are a part of the whole picture of learning disabilities (Kronick 1981, Osman 1985). Although the literature is not specific on this point, persons with nonverbal problems and with ADHD seem to be affected more severely. Nonverbal problems and ADHD seem to be the intervening variables, while social impairment seems to be the

consequence. Verbal problems seem to have a somewhat weaker relationship to social impairment (Stark 1989).

Doreen Kronick states that PL 94-142 (the Education and Handicapped Act discussed above) defined learning disability strictly in academic terms, somehow not realizing that people who are disabled linguistically, motorically and spatially--people whose attention span, memory system, processing ability, and expressive ability are affected--experience considerable difficulty with the life process, irrespective of their ability to read, spell, and compute.

The omission of social disabilities from PL 94-142 led to serious misconceptions: remediation was expected to take care of the child's problems and prepare him for life. Contrary to expectations of parents and teachers, a vast number of young adults with learning disabilities remained largely unable to function in society as adults.

Social information is harder to "read" than academic information, and cannot be "re-read" (Kronick 1986). The context changes from situation to situation, but form remains the same. Much is implicit and is picked up automatically. We are only beginning to learn how to teach this social information.

Osman (1985) stated that social difficulties (as she prefers to call them) are much more of a handicap than the academic ones since there is no calculator, no word processor to help. They are intrinsic to the learning disability

itself, and become apparent in groups of 3- to-5-year-olds (casting serious doubt on the assumption that they are the result of low self-esteem damaged by years of school failure). The pattern persists through the years and is further aggravated by the tendency of teachers and probably parents to avoid a child who is difficult to relate to.

D. Morrison (1987) cites evidence that children identified with or at risk for learning disabilities also demonstrate more behavior problems than comparable non-learning disabled groups. Morrison did a longitudinal study which started in 1984 of a sample of kindergarten children identified as being at risk for learning disabilities by the SEARCH instrument (developed by Silver and Hagin). Those unable to "pass SEARCH" also showed conduct disorders and had trouble attending.

Most learning disabled youngsters (although those with primarily verbal problems seem to be affected less) have problems with processing social cues expressed either verbally or by tone of voice, body language, and facial expression. They cannot sort out salient information from extraneous information, classify situations, measure degree of appropriate involvement, or classify a person according to age and role. They cannot understand multiplicity of roles, change of roles in the same person, sub-roles and reciprocity of roles. In the area of language (even with a good vocabulary) they suffer from conceptual distortions,

take meaning too literally, don't get the context, and don't realize that social situations have a multilevel structure (Kronick 1981).

The preceding description of the social problems of learning disabled children clearly describes a person stuck at the Preoperational level within the Piagetian model of psychological and cognitive development. Wiig (1978, 1985) developed this concept more fully while describing the grave problems adolescents with language learning disabilities encountered when entering junior high school and high school. The teachers often assumed that the learning problems had been remediated and attributed any lack of success to lack of motivation.

Often the learning disabled adolescent enters high school with a plateau in concept and strategy development, at levels commensurate with expectations for the late Preoperational and early Concrete Operational stages (Wiig 1984a). The social verbal communication repertoire is also often severely delayed. Word meanings are still tied to concrete actions, functions, and experiences. The quality of interpretations suggests a dependence on concrete meanings and on experiential or contextual likelihood, tying the performance to the late Preoperational or early Concrete Operational cognitive stages. Twelve-year-olds interpreted on the level of 5-to-6-year olds (Wiig 1984a).

Wiig (1984b) stated that the normal system of rules used in verbal interpersonal interaction includes: setting of the interaction, character of the participant, topic of conversation, and the goals and objectives for the interaction. This rule system appears to elude learning disabled adolescents. Normals are effective communicators by the 4th grade. The process of acquiring communication competence is described by Wiig as a categorization and strategy development process which occurs in stages that coincide with the attainment of major cognitive operations. The learning disabled adolescent often has difficulty categorizing the controlling factors in verbal communication and forming an adequate rule system. His communication strategies fall into the 7-to-9-year-old level, barely into the early stage of Concrete Operations. The secondary school curriculum, however, presupposes formal operational reasoning (Wiig 1984b).

Social cognition is described as a subfunction of general cognition, although somewhat autonomous from it (Kohlberg 1964, Malerstein and Ahern 1982). If this is so, then the social cognition of adolescents with nonverbal problems could be expected to remain on the Preoperational level. This then could explain in large part why the social cognition of individuals with nonverbal problems is immature, i.e. Preoperational as found by Wiig (1984a).

LEARNING DISABILITIES AND JUVENILE DELINQUENCY

From the nature of the information reviewed so far it should come as no surprise that a relationship was found between learning disabilities and juvenile delinquency (JD). During the late sixties and early seventies professionals dealing with JD became aware of a possible connection between it and learning disabilities. These included judges, psychologists, and teachers (Sikorski and McGee 1986).

Judge Holt, quoted by Poremba (1975), stated in 1972 that as he thought back over the 700 or more cases he had heard as juvenile court judge, his gut reaction almost made him physically ill. Eighty percent of the boys and fifty percent of the girls were experiencing difficulty in school. He remarked that the pattern was so obvious he was surprised that professionals who work with disturbed youngsters had not tried to deal with it.

His sentiment was seconded by many professionals and parents who became aware of identifiable precursors in the developmental histories and school cumulative records of children who later came to the attention of the juvenile court authorities (Sikorski and McGee 1986).

This awareness served as a springboard for many studies of the LD/JD relationship. Podboy and Mallory (1978) studied 250 youth held at the Juvenile Detention Facility in Sonoma County, California, and found 49 percent to be learning disabled. Berman (1978) did a controlled, well-matched

study comparing a group of adjudicated juvenile delinquents with a group of students in a public high school. Using the Reitan Neuropsychological Battery he found 70 percent of the delinquent youngsters to be impaired in at least one major area of learning, compared to 23 percent of the control group.

All the studies in the early 1970s seem to show that juvenile delinquents were lower in their adaptive and learning skills than were their nondelinquent counterparts, and that academic skills impairment was more predictive of delinquency than were socioeconomic factors (Sikorski and McGee, 1986).

In response to the mounting evidence that incidence of JD is much higher for the learning disabled than for the non-learning disabled, and in response to pressure from parents and professionals, the National Institute for Juvenile Justice and Delinquency Prevention commissioned Charles Murray of the American Institute for Research to review the empirical evidence relevant to the proposition that specific learning disabilities increase the risk of becoming delinquent.

Murray concluded that previous research (prior to 1975) was not conclusive enough and that a better controlled investigation of the effects of learning disabilities on juvenile delinquency should be undertaken. In response, the National Institute for Juvenile Justice and Delinquency

Prevention funded a research and demonstration project and awarded it to the National Center for State Courts. Two large-scale national studies were undertaken--one age cross-sectional, one longitudinal--of the relationship between learning disabilities and juvenile delinquency.

In 1977 the first part of the age cross-sectional study was performed to determine the prevalence of learning disabilities among adjudicated delinquents and among nondelinquent boys in three geographic urban areas. The results revealed 18.9 percent of the nondelinquent boys were learning disabled, compared to 36.5 percent of the delinquent boys.

In the second part of the study six hypotheses were advanced as to the reason for the difference:

1. School Failure Hypothesis. Learning disabilities lead to school failure, leading to a negative self-image and sense of frustration, leading to anger at society and a wish for retaliation. Failure-induced withdrawal of attachment to the teachers and the school also ensues. All of these lead to delinquent behavior.

2. Susceptibility Hypothesis. The learning disabled possess certain cognitive and personality characteristics that make them more susceptible to juvenile delinquency: lack of impulse control, inability to anticipate the future consequences of actions, poor perception of social cues, irritability, suggestibility, and tendency to act out di-

rectly--all contribute to the development of delinquent behavior.

3. Differential Arrest Hypothesis. The learning disabled have a greater risk of being picked up for comparable levels of delinquent behavior. This is true because many learning disabled are abrasive or awkward, and lack the ability to plan strategies to avoid detection and to answer questions by the police without invoking suspicion. The differential arrest hypothesis could be true even if the delinquent behavior is not increased by learning disabilities.

4. Differential Adjudication Hypothesis. The learning disabled are at greater risk of being adjudicated because of abrasiveness, irritability, and lack of self-control with the intake officer, the probation officer, and the judge. Learning disabled youth also lack effective communication skills to explain "their side of the story" and also often don't understand the proceedings.

5. Socio-Demographic Characteristics Hypothesis. Both learning disabilities and juvenile delinquency are caused by socio-demographic factors, parent education and ethnicity, rather than the cognitive and personality characteristics of the young person.

6. The Response Bias Hypothesis. The difference observed in the incidence of JD of learning disabilities is due to the fact that learning disabled are not able to conceal their antisocial

acts as well as non-learning disabled are able to. The link between LD and JD is a spurious relationship.

Results. The difference between learning disabled and non-learning disabled in incidence of delinquency and probability of adjudication were only slightly reduced after the effects of SES, intactness of the family, the number of children, and ethnicity were controlled statistically. Only a minor portion of the association could be attributed to influence of socio-demographic factors. Hypothesis #5 was rejected. Hypothesis #6--response bias--was not confirmed and was therefore also rejected.

Hypotheses 1 thru 4 were confirmed:

1. Attitude toward school (positive and negative) and school failure correlated with the amount of delinquent behavior.

2. Susceptibility: Some effects of learning disabilities such as impulsiveness seemed to occur directly, without being mediated by school experience. Again, no difference in degree of vulnerability was found for variations in ethnicity and SES.

3. The differential arrest hypothesis was found to be consistent with the results. Learning disabled youth were more likely to be arrested for the same offenses than non-learning disabled youth. The reasons were not investigated.

4. Differential adjudication was strongly supported even when socio-economic variables were controlling. Again, the reasons were not investigated.

The second study (longitudinal) reinterviewed 351 boys of the 973 in the non-delinquent group of the first study, and 57 learning disabled boys from the same study, to determine whether increases over time in delinquent behavior (and adjudication) were greater for the learning disabled group.

Again the increases in delinquent behavior and in adjudication were significantly greater for the learning disabled boys. White and middle-class boys showed the most increases and seemed to be the most vulnerable to the effects of learning disabilities.

The results of these studies produced statistically reliable evidence that a child with learning disabilities has a significantly greater risk of developing maladaptive behavior which can lead to delinquency.

NEUROCOGNITIVE DIFFERENCES

THE CONCEPT

The legal definition of learning disability has serious limitations. Public Law 94-142 dictates a medical model of disabilities, whereas learning disabilities cannot be considered a medically verifiable category. The learning disability definition reflects an agreement to dichotomize continuous variables such as aptitude and achievement into cat-

egories of normal and deviant (Gelzheiser 1987). The arbitrary nature of this dichotomy results in great differences in its application. Incongruities exist at every step of the process of identifying the learning disabled, which is influenced by the beliefs and behaviors of the critical individuals involved, such as teachers and psychologists (G. Morrison et al. 1985). The students' attributes were found to be no more important a factor in the diagnosis of learning disabilities than disciplinary or professional perspectives, workloads, the kind of techniques and measures used, and the availability of special services (Keogh 1987).

A different approach to the identification process is advocated by Myklebust (1983) and O. Thompson (1985c). They focused on the degree to which the apparent deficit or difference in cognitive functioning interferes in the living pattern of the individual. In their description of nonverbal problems they state that both social perception and academic success are deeply affected, whether or not the individuals fit the narrow definition of learning disabled. Thompson defines these differences as an "inability to perform, which interferes to a marked degree in the living pattern of the affected individual or in the performance of skills which are considered everyone's legacy" (1985c, 4-5).

Levine (1987) and Richardson (1985) both stress the tremendous range of variations in brain function within the normal continuum and advocate that an assessment be made

with a view towards the necessary interventions rather than diagnoses of disability. Levine (1988) contends that a central nervous system variation can have a considerable impact on the individual's success and happiness in life. It does not necessarily need to become a disability if recognized and properly compensated (Levine 1987, 3).

NEUROPHYSIOLOGICAL SUBSTRATA

To facilitate understanding of the neurophysiological substrata of NCD several theories of brain development and functioning are described.

Neuropsychologist Luria (1973) developed a comprehensive theory to explain both normal and deviant functioning of the brain.

He proposed the existence of three functional "units" (not necessarily localized), the participation of which is necessary for any type of mental activity. The first unit is for regulating tone or wakefulness. The second is for obtaining, processing, and storing information. The third is for programming.

Each unit consists of a hierarchal structure containing three cortical "zones": the primary zone receives information (basic senses); the secondary zone processes information and prepares programs within the systems; and the tertiary zone is responsible for complex forms of mental activity requiring participation of many cortical zones.

During a child's development the primary zones develop first, and need to be working properly for the secondary zones, which are involved with direct synthesis within a specific mode, to develop. The same is true of the development of tertiary zones (synthesis among several modes), which cannot take place without the integrity of the secondary zones.

Within Luria's framework, ADHD would be related to irregularities of functional unit I (regulating tone and waking), while nonverbal problems would be related to lack of full development of functional units II (obtaining, processing, and storing) and III (programming). ADHD and nonverbal problems can also be viewed as difficulty with simultaneous synthesis (Luria 1973) which involves proper development of tertiary zones (see Appendix B).

Neurologist Norman Geschwind developed a theory of faulty migration and assembly of brain cells during the intrauterine development of the brain, causing differences in neurocognitive functioning attributable to differences in brain anatomy.

Geschwind and Galaburda (1985) found patterns of abnormal cell migration and cell assembly in the brains of seven dyslexics at autopsy, and formulated a theory of a mechanism that slows the intrauterine development of the left hemisphere.

This theory contends that the intrauterine level of male hormones prevents migrating cells from reaching their intended destinations and produces irregularities, mainly in the left hemisphere, and causes overdevelopment of the right hemisphere (Geschwind 1984b, audio cassette 5A). This leads to problems of language but at the same time produces high right-hemisphere talents. This phenomenon therefore represents a mechanism of both deficit and giftedness (Geschwind 1984a, audio cassette 4A).

Geschwind (1984a,b) hypothesized that since "faulty" migration of cells is found in as many as 15 percent of all brains and that this condition seems to produce giftedness as well as deficit, it might be nature's way of assuring diversity rather than representing pathology (Geschwind 1984a, audio cassette 4B).

Neurologist Yakovlev (Yakovlev and Lecours 1967) and psychiatrist Malerstein (1986) both developed theories pointing out that the myelination of different parts of the brain has to reach a certain level before the child can reach specific stages of development.

Yakovlev developed a myelination schedule related to the development of Luria's zones. Apparently the corpus callosum (junction between the two hemispheres) becomes fully myelinated around age 6 or 7; the posterio-parietal association areas finish myelination around age 8 or 9. The frontal systems become available around age 10 to 12 (Yakov-

lev and Lecours 1967, cited by Holmes 1986b). Frontal lobes apparently do not complete myelination until late adolescence or even young adulthood (Yakovlev and Lecours 1967).

Malerstein (1986) proposed that the completion of myelination of different neural tracts allowed the child to pass from one developmental stage to the other in the Piagetian system. Focusing specifically on the visual system, Malerstein hypothesized how the completion of myelination of the geniculocalcarine tract (the last segment to be myelinated of the major tract connecting the retina to the primary visual area of the brain) could assist differentiation of one object from another, which has its onset in stage 4 of the sensorimotor period.

The works of Luria, Yakovlev, and Piaget were compared by Holmes (1986a), who suggested that the development of the different zones described by Luria is reminiscent of Piaget's developmental stages, and seemed also to be related to the myelination schedule developed by Yakovlev.

Appendix B is a short description of the structure and function of the brain.

PIAGET'S THEORY AND RELATED RESEARCH

PIAGET'S THEORY OF COGNITIVE DEVELOPMENT

Over many years the eminent biologist, psychologist, and researcher Jean Piaget investigated the process by which human beings come to know what they know. From his careful

observation of children and his knowledge of biological structure and processes he formulated a theory of cognitive development.

Piaget believed that biological development was due to maturation and also to variables in the environment to which the organism had to adapt. He also concluded that mental development is an extension of the biological development. He became concerned with uncovering developmental changes in cognitive functioning from birth through adolescence (Wadsworth 1971, 3, 5).

Piaget evolved a clinical descriptive technique of systematic observation, description, and analysis of children's behavior in order to discover the nature and level of development of the concepts children are using. He maintained that intellectual activity cannot be separated from the total functioning of the organism but rather represents a special form of biological activity. He saw cognitive acts as the result of organization and adaptation to the perceived environment and developed four basic concepts to explain the process: Scheme, Assimilation, Accommodation, and Equilibrium (Wadsworth 1971).

Piaget concluded that the mind has a structure in the same way as other parts of the body. He gave the term **scheme** to these cognitive structures by which individuals adapt to and organize the environment. Schemes organize events as they are assimilated by the organism at that par-

ticular time. A child's responses are assumed to reflect the nature of the child's schemes at that time. Schemes change and develop, and each is coordinated with all others. The cognitive schemes of an adult evolve from the sensorimotor schemes of the child (Wadsworth 1971, 10).

The processes responsible for this amazing evolution are called assimilation and accommodation. **Assimilation** is the cognitive process by which a person takes new events into existing schemes and makes them grow. If the new event or perception does not fit into the existing schemes the old structures have to be modified or a new one created. This happens through the process of **accommodation.** Once accommodation occurs, the stimulus can be assimilated and growth and development proceed. For efficient interaction of the developing child with his environment the two above processes have to be in **equilibrium.** This allows orderly growth. The interaction of these two processes produces a mode of intellectual functioning that interacts with the environment and according to Piaget is a biological given (Wadsworth 1971, 15-19, 20).

Intelligence according to Piaget has three components: (1) Content: observable intellectual behavior of the child acting on the environment; (2) innate functional invariants: the process of assimilation and accommodation; and (3) structures: schemes. Piaget concerned himself mostly with the last category.

According to Wadsworth, Piaget states that motivation is from within the organism: cognitive structures, once developed and functioning, perpetuate themselves by more functioning. Cognitive development, he felt, is a coherent process of successive qualitative changes of schemes (Piaget 1952 as cited by Wadsworth 1971, 24).

Successive schemes do not replace prior ones; they incorporate them in a qualitative change (Wadsworth 1971, 25). To conceptualize cognitive growth Piaget divided intellectual development into four fixed and continuous periods through which every person must pass, although the rate will vary:

1. Sensorimotor Period (0-2 years)
2. Preoperational Period:
   Symbolic (2-4 years)
   Intuitive (5-7 years)
3. Period of Concrete Operations (7-11 years)
4. Period of Formal Operations

The Sensorimotor Period has six stages. In the first stage (0-1 months) a child practices reflex activity. In the second stage (1-4 months) the child repeats sensorimotor schemes that had been adventitously aroused. Coordination of vision and hearing with praximal schemes (touch and grasping) occur in the third stage (4-8 months). During the fourth stage (8-12 months) the child begins to develop object scheme separation. In the fifth stage (12-18 months)

the child uses experimentation to develop new means to solve problems. He extends his know-how of separateness of objects. In the sixth stage (18 to 24 months) the child becomes able to internally represent objects and develops object permanency (Wadsworth 1971, 61-62). Malerstein and Ahern cite Piaget as speaking of thought beginning at this stage. As interpreted by Malerstein and Ahern, prior to the end of this stage perception and thought were undifferentiated. Now the child has a mental image separate from perception and has achieved some separation of self from an object (Malerstein and Ahern 1982, 51).

Preoperational Period, Symbolic Phase (2 to 4 years). Now the child shifts from a sensorimotor mode to a conceptual symbolic mode (Wadsworth 1971, 64). He is less dependent on direct sensorimotor actions since the events can now be played out in his head. The child develops language and constructs a system for handling attributes of objects and events (amount, color, morality). Although the child can now construct representations, the separation between object and symbol, self and object, and object and part are not clear. Symbol is indistinguishable from the event it represents. Qualities as applied to one object are not differentiated from the application to another object. Reasoning is transductive, that is, from part to part. Two objects having one common property are seen as the same and if a change is made in one of the objects it is seen as a com-

pletely different object. The child's concepts are sometimes too general or too specific. There is a tendency for wish to distort thought (Malerstein and Ahern 1982).

Imitation of the environment which started during the Sensorimotor Period now becomes internal imitation. Once mental symbols are formed the child assimilates them into the schemes already available which gives them personal meaning. The child in this stage is not able to follow a clear and consistent rule to sort and classify objects. Instead he constructs graphic collections which are small partial alignment or interesting forms. Boundaries between self and other objects, both human and nonhuman are not clear, and he/she doesn't have a clear, unified identity of self that includes the past (Malerstein and Ahern 1982). Morally, the child does not really understand the rules although he/she imitates them and might abide by them (Piaget 1932, 16).

Preoperational Period, Intuitive Phase (5-7 years). In this phase the child differentiates between objects, between the symbol and the object, and between the object and its different attributes. The child is able to sort and classify objects but fails at comprehending the generality of categories. The child is unable to reverse operations and to follow transformations. His/her perception is centered and egocentric; conceptualization of a value or attribute is bound to his/her immediate view. Whereas the symbolic rea-

sons from part to part, the intuitive reasons from the end to the premise. What looks bigger is bigger. In the moral area the child uses the same reasoning: he/she focuses on the dimensions perceived in front of him/her: punishment or amount of damage defines the severity of the crime. He/she does not take into account intent and cannot comprehend differences of point of view. He/she has to center on the observable part and ignore the whole. The child in this stage seems to know the rules and considers them sacred, but easily consents to their modification, when suggested by an adult or "knowledgeable" peer. He/she does not understand the essence of the rules as separate from the situation and the people involved (Malerstein and Ahern 1982).

Concrete Operational Period (ages 7-11). The child develops understanding of seriation, degree, and amount even when appearance of objects changes. He/she is no longer perception bound: he/she decenters and can attend to transformations, and understands reversibility of operations. Cooperative, nonegocentric communication with real exchange of information evolves, as well as logical processes that can be applied to concrete problems. When faced with a discrepancy between thought and perception the child makes cognitive and logical decisions. Socialization that started with simple imitation now seeks validation and verification. Considering the point of view of others is now possible. Accommodation plays a major role. Social behavior is struc-

tured with common adherence to firm rules and with a collective spirit of real competition. The child can separate act from intent and degree from absolute. He drops the concept of immanent justice (Malerstein and Ahern 1982; Wadsworth 1971).

Period of Formal Operations: The child's cognitive structures reach maturity during this period; he/she develops the ability to solve all classes of problems, including hypothetical and verbal problems, and he/she can use scientific reasoning. Schemes typically reach maximum qualitative development by about age fifteen. According to Piaget, there is no further structural improvement in the cognitive apparatus and the adolescent can think "as well" as adults. That does not mean that the thought is "as good", only that the potential of full development is now achieved. Structures of intelligence do not improve after this period, but content and function do. The implementation of formal thought in adolescence is initially egocentric. Objectivity of thought with respect to conflicting issues is attained when the adolescent assumes adult roles in the real world and can differentiate the many possible points of view (Malerstein and Ahern 1982, Wadsworth 1971).

RESEARCH RELATED TO GROUPS OF NEUROCOGNITIVELY DIFFERENT CHILDREN

Piaget's work, rooted in biology, conveniently lends itself to explaining variation in brain function.

D. Morrison (1985) explains how the disruption in development caused by sensory and perceptual dysfunction may result in a child experiencing an extended period of Pre-operational thought.

Wiig (1984a) found that some learning disabled adolescents could not perform Concrete Operational Tasks: they could not go beyond the directly observable and could not coordinate several observations.

Brekke and Williams (1977) reported on several studies of the effect of learning disabilities, emotional disturbance, and social deviance on the ability to "conserve weight," one of the competencies of Concrete Operations. The results showed that among the learning disabled at age 12 only slightly more than 50 percent were "conservers." Only 33 of the socially deviant between age 13 and 16 were "conservers." The majority of the emotionally disturbed mastered conservation after age 14.

Chabot (1977) reported on the use of four Piagetian Tasks (seriation, transitivity, equivalence, and conservation of numbers) with groups of normal and learning disabled 2nd and 3rd grade boys. The learning disabled boys encountered serious problems in mastering Concrete Operational thinking. The author noted that performance on Piagetian Tasks related to the child's ability to learn much more directly than IQ measures and should be used by educators in planning intervention.

Delaney and Fitzpatrick (1976) advocated the use of Conservation Tasks with seriously disturbed adolescents as a measure of cognitive ability and as a guide for appropriate intervention. They as well as Lerner and Lehrer (1972) found that only a minority of seriously disturbed institutionalized adolescents were capable of Concrete Operational thinking at age 18.

Some contradictory evidence is reported by White (1985), who found no difference in performance between learning disabled and normal adolescents on Tasks of Conservation of Volume. Chabot and Delaney and Fitzpatrick expressed the opinion that performance on Piagetian Tasks is an essential adjunct to IQ measures and to the psychiatric diagnoses, allowing the planning of intervention to be more precise and realistic.

PIAGET'S THEORY OF MORAL DEVELOPMENT

Piaget proposed that the moral development of children paralleled the development of other thought processes, although the stages of moral development were more subject to cultural influences than were the stages of cognitive development (Piaget 1932, cited by Malerstein and Ahern 1982, 67). As interpreted by Malerstein and Ahern, the child in the Symbolic phase of the Preoperational Period does not have a concept of right and wrong that is split off from a particular object or action. Reasoning is from part to

part, and morality is part of a particular object or situation. There is no unifying force yet; generalization is not possible. The child therefore cannot really understand the essence of rules; he only imitates or parrots them from situation to situation. The child in the Intuitive phase of the Preoperational Period does not understand rules separate from a specific situation, and cannot appreciate the intent of the rules. At the Period of Concrete Operations the child has a moral code that includes a hierarchy of values; it functions regardless of the specific situation. The child can separate the act from the intent, and admits other points of view (Malerstein and Ahern 1982, 67-72).

In The Moral Judgment of the Child Piaget (1932) describes his investigation of the attitudes of children of various age groups toward the origin, legitimacy, and alterability of rules based upon a game of marbles. He also presented children with hypothetical situations in the form of stories describing clumsiness, lying, and stealing, in order to examine criteria upon which the child made moral judgments. The aim was to discover whether the child paid more attention to the motive or to the material results (Piaget 1932, 116).

On the basis of his study of the game of marbles and the study of children's responses to his stories Piaget defined four stages of moral development: motor, egocentric, cooperation, and codification of rules. Between stage 2

(egocentric) and stage 3 (cooperation) the child makes the transition from Preoperational to Operational thinking (Piaget 1932, 16).

Kohlberg (1964) used Piaget's cognitive developmental system and findings to make even more refined distinction within an extended sequence of moral developmental stages. Using hypothetical moral dilemmas and Piagetian procedures Kohlberg defined six stages of moral development, under three major categories: the preconventional, the conventional, and the principled levels. The preconventional level parallels the Piagetian "egocentric" stage and Preoperational functioning.

Selman (1971) explored the relationship between role taking ability and moral reasoning of children. Sixty children were administered Kohlberg's moral judgment measures, two role-taking tasks devised by Selman, and the Peabody Picture Vocabulary Test (PPVT), which controlled for intelligence. The results indicated that the development of reciprocal role-taking skills related to the development of conventional moral judgement.

CONCLUDING REMARKS

This review focuses on how neurocognitive differences influence a person's development, functioning, behavior, and interaction with the environment. These variations from the norm are seen as existing on a continuum from very mild to

severe, and their impact on a person's life is determined not only by the degree of severity but also by the environmental response to the difference.

The legal definition of the category of specific learning disability was historically necessary in order to draw attention to an unmet need and to make special help possible. Inadvertently too much emphasis was put on disability. The law does not make provision for the newly recognized continuum of differences. The concept of NCD generalizes the problem of variation from the norm and puts the emphasis on interference with specific areas of functioning, rather than on pathology.

Some understanding of the underlying concepts of brain structure and function is needed to appreciate the construct of NCD and its implications. With that aim, a brief discussion of theories of brain development and functioning has been offered.

Familiarity with Jean Piaget's theory of cognitive development and its application to NCD allows us to examine the effect of these variations from a different perspective. It offers us a different access to potential impact on cognitive as well as social functioning.

* * * * *

CHAPTER III. METHODS AND PROCEDURES

INTRODUCTION

Both quantitative and qualitative methods were used in this investigation in an effort to use a syncretic approach, which according to Polkinghorne unites and reconciles both methodologies to produce a deeper and fuller understanding of the topic under consideration. Each system of inquiry is able to detect and describe some aspects of the experience and misses others. The combined result is fuller than the result gained from either data type when used by itself. Whether linguistic data, numerical data, or a combination is used should be determined by which data type is most likely to provide the kind of information that would answer the question the researcher is asking about the human realm (Polkinghorne 1983).

The research was designed to test the hypothesis that NCD are an important factor in the makeup of maladapted adolescents. A population of maladapted adolescents was compared with a matched group of normal adolescents of the same approximate age and social status.

Three hypotheses were tested:

1. The study group will have a significantly higher proportion of adolescents with neurocognitive differences as defined by psychoeducational tests. Some of these differences will fit the

legal definition of learning disabilities, while others will represent a significant difference from the norm but will not fall into the official learning disability category.[1] The preponderance of these differences is in the nonverbal category.

2. The study group will have a larger proportion of adolescents with attention-deficit hyperactivity disorder, as determined through interviews, from the examination of school records, and from clinical observation.

3. The study group will have a significantly higher proportion of adolescents who have not reached, in part or in full, the developmental stage of Concrete Operations as determined by their performance of Piagetian Tasks.

Five major sources of data were used to facilitate comparison between the two groups of adolescents:

1. A battery of standardized psychoeducational tests
2. Piagetian Tasks designed to measure the subject's capacity to perform Operational Tasks as defined by Jean Piaget
3. School records

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[1] For the purpose of diagnosis of learning disabilities, the State of California Administrative Code (1986), Title 5, Section 3030j(4)(A), defines the discrepancy between ability scores and achievement scores as being significant if it measures at least 1.5 standard deviation. For the purpose of this study a discrepancy measuring one S.D. will be considered significant and would define an adolescent as neurocognitively different.

4. Semistructured interviews with
    a. a subsample from each group of adolescents
    b. a subsample of parents
5. Observations

Table 1 displays these relationships.

A sixth data source, the Demographic Data Sheet (see Appendix F), served as an adjunct in normalizing the subject selection by providing a measure of SES comparability.

The demographic sheet, the psychoeducational tests, the Piagetian Tasks, and the school records provided numerical data regarding the student's characteristics and performance, which lent itself to quantitative measures.

The interviews, my observations, and the school records from a different vantage point provided linguistic and nonverbal data which lent itself to qualitative measures.

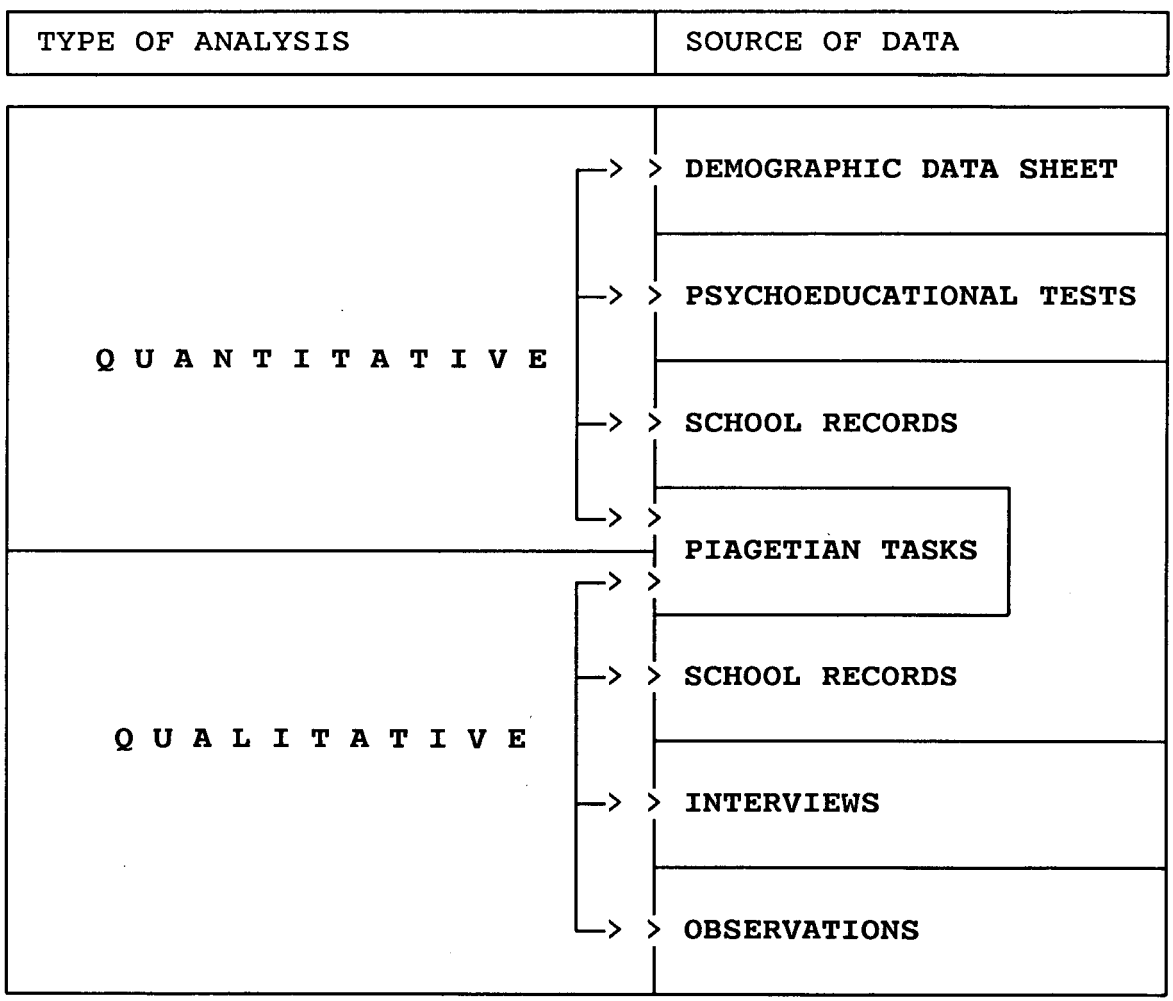
The quantitative measures contributed information about the characteristics of the groups and the differences between them. The qualitative measures put this information into the context of the actual situation of each child.

Table 2 illustrates these relationships.

TABLE 1. HYPOTHESES and DATA SOURCES

HYPOTHESIS	SOURCE OF DATA FOR ANALYSES
With respect to the control group the study group will have:	
1. More adolescents with NCD in verbal and nonverbal areas and more certified LD	PSYCHOEDUCATIONAL TESTS SCHOOL RECORDS INTERVIEWS
2. More adolescents with ADHD	SCHOOL RECORDS INTERVIEWS OBSERVATIONS
3. More adolescents who have not reached the developmental stage of Concrete Operations	PIAGETIAN TASKS

TABLE 2. COMPARISON OF METHODOLOGIES



SELECTION OF SUBJECTS AND SITE

THE STUDY GROUP

The study group was recruited from Gompers High School, a continuation high school specifically for students who for various reasons cannot remain in regular high school. Although a small number of students are at Gompers because they need to work part time, most are there because of some sort of maladaptation. Permission to conduct the study was granted by the head of secondary education for the Richmond Unified School District (RUSD).

Gompers High School

Description. Gompers High School is housed in an impressive building erected in the beginning of the century. It served as a regular high school, and later as a junior high school for many years. There are still clearly marked separate entrances for boys and girls which now serve as side entrances. It stands in the middle of what used to be downtown Richmond, still a very viable center of the town in the 1950s but now largely abandoned and dilapidated. In the early 1970s Gompers was converted from a junior high school to a continuation high school.

Demographically, Gompers draws from the whole community. The black and Hispanic communities are somewhat overrepresented and the Caucasian community is underrepre-

sented. The percentages are: Blacks 65, Caucasians 22.5, Hispanics 10, Pacific Islanders 0.9, and Filipinos 1.1.

The ages of the students are from 15½ to 18. The ratio of male to female is not available.

The high school operates on a limited schedule, with 3 hours per day of class time. There are two shifts: 8:30 to 11:30, and 12:30 to 3:30. This allows more flexibility in scheduling, and also makes it possible for a student to work.

Criteria for Admission. The criteria for referral and admission to Gompers are spelled out in the State of California Education Code, Titles 48400 and 48402, and adapted by the individual school districts. They are:

1. Working students who might need a very limited schedule (depending on the amount of hours worked, the student can be allowed to attend classes as little as one day per week)
2. Students with severe disciplinary problems
3. Non-achievers with disciplinary problems
4. Students having received 15 or more days of suspension
5. Parental request

The RUSD guidelines (Appendix C) follow the state guidelines, although some adaptations are made:

The state prescribes the age range as 16 to 18. The RUSD will accept a student at 15½ under special circumstan-

ces (e.g. pregnancy, parental request) and will allow an 18-year-old to stay an extra semester if he/she is ready to be graduated that semester.

One criterion I did not find spelled out in the Education Code but which is used at RUSD is prior incarceration of the student. If a student spends some time at a correctional facility he or she cannot return to the high school of residence, but has to be "programmed" into Gompers High School.

The decision process at RUSD involves a meeting of a review board at the adolescent's original high school. The board consists of the principal, the dean, and the counselor. The decision of this board can be appealed to the RUSD school board. My experience has been that each situation is reviewed on a very individual basis and that the official criteria are used in a flexible way.

The criterion that requires decertification of learning disabled students prior to their admission to Gompers (see Appendix C) was not previously known to me. This presented a built-in bias for the study, since by definition no student who is still afflicted by a learning disability should be at Gompers. Since learning disabled students were found at Gompers in spite of their exclusion by law, the assumption is that there would be many more if they were not consciously excluded, which lends further support to the hypotheses.

Criteria for the Selection of Subjects

Study subjects were girls and boys who met the following criteria:

1. Between 15½ and 18 years old, as defined by the age range at Gompers High School.

2. Defined as "maladapted" through the following process: They had come to the attention of educational authorities because of a combination of academic failure and socially maladaptive behavior, and were referred to the special educational facility chosen as the site of this study (Gompers). Such students must have met the criteria for acceptance into this facility, although not all met the study criteria.

3. They must never have been incarcerated.

4. The reason to be at Gompers was not due solely to a need to work, or to pregnancy.

5. They volunteered to be a part of the study.

6. Parental consent was obtained.

Recruitment of the Study Group

Subjects for the study were recruited through the help of one of the teachers who explained to the students in his driving and math classes that the project was a study of learning styles. He said that the investigator was a social worker trying to get her Ph.D., for which she needed to conduct a large study. She chose to study how individual adolescents learn--whether they remember best by listening,

reading, or writing things down. She was looking for volunteers willing to be tested for three hours for which she would compensate them at the rate of $5 per hour.

THE COMPARISON GROUP

Kennedy High School

To recruit a comparison group I enlisted the help of the principal of Kennedy High School, a regular high school within the RUSD, built in the early sixties as a demonstration high school. It has a first-rate building, now somewhat deteriorated, and excellent equipment.

It stands at the crossroads of two worlds: its catchment area extends from the industrial area near San Francisco Bay and the deteriorated downtown with its working poor (predominantly black) and many welfare recipients, to the hills of El Cerrito.

El Cerrito is one of the rare well-integrated towns with a sizeable black middle class. It also has more than its share of highly educated people because of the proximity of the University of California at Berkeley. Clearly Kennedy High School draws from several different worlds. Economically it is very mixed. Racially the proportions are as follows: Black, 70.9%; Caucasian, 12.3%; Hispanic, 9.1%; Asian and Pacific Islander, 6.8%; Filipino 0.8%; Native American and Alaskan, 0.3%.

Compared to Gompers, Kennedy probably has more students from upper-middle-class families and fewer from welfare families, although by admission criteria both schools have the full range of SES. Racially Kennedy has more black students and fewer white students than Gompers (Caucasians are underrepresented at both schools in comparison to the racial distribution within the entire district). Kennedy students would be (and often are) referred to Gompers if academic failure and social maladaptation (see criteria for admission to Gompers) were observed.

Recruitment of the Comparison Group

The principal of Kennedy High School explained the project in several classes, with the same request on behalf of the investigator as was used at Gompers and the same compensation offer of $5 per hour. It was clarified with the principal that only juniors and seniors without a record of significant truancy or other discipline problems should be approached. (This satisfies the criteria of a 15½ to 18 year age range and assures that they could not be described as maladapted.)

After receiving the information from the principal about the volunteers, I matched gender, race, and residential area, thus minimizing the possible influence of these factors in the study. Because of the known high male-to-female ratio in the learning disabled population it might have been more interesting to study males exclusively. The

principal at Gompers informed me, however, that this might be self defeating, since females are usually much easier to recruit for an undertaking like my study.

It was not possible to match the subjects on the basis of level of intelligence since there was no access to the students' records until initial contact was established and parental permission obtained. The ability of the subjects was considered in the analyses.

SELECTION OF THE SUBJECTS

Both groups of volunteers were given a consent form to take home to their parents and then contacted by telephone to arrange testing appointments.

The study group sample was recruited and tested first. Eighteen of the 38 original volunteers from Gompers were studied. The attrition was due to lack of parental permission, repeated no-shows, unstable living situations, moving away, or medical reasons. The result of this selection was the further loss of some severe cases of very disorganized life, which left the Gompers group less representative of the whole population than it would have been otherwise. (The attrition from the Kennedy group was much smaller: 20 available out of 28, versus 18 available out of 38 for Gompers.) The 18 remaining subjects provided me with a baseline of demographic data.

At Kennedy I asked for subjects who, a priori, would provide a close initial match as a control group, since at that point neither school records nor other detailed information was available. Initially the group consisted of 28 volunteers generally matched with the experimental group by gender, age, grade, ethnicity, and address/neighborhood. Attrition reduced this pool to 20, degrading some of the quality of the match by eliminating two males and two whites needed to round out the control group. Eighteen of the best-match subjects were tested.

Although 18 subjects were tested in each group, the final selection of 17 each was established by eliminating one girl from the Gompers group who was there only because of pregnancy, and one girl from the Kennedy group because permission to examine the school records was denied.

DATA COLLECTION

Prior to data collection there was a careful discussion with each child and a parent (by telephone, in person, or both) about the purpose and nature of the project and the procedure (see Appendix D). Written human subject consents were obtained (see Appendix E). The data was collected in three phases: Testing (including Piagetian Tasks), examination of school records, and interviewing. Demographic data was collected at the testing session. All subjects were tested and all school records were examined. Eighteen stu-

dents and twenty parents were interviewed: seven students and nine parents (representing nine students) from Gompers; eleven students and eleven parents from Kennedy.

TESTING

Subjects were given a battery of standardized psychoeducational tests and a series of Piagetian Tasks (see Appendix H). The testing took place in my office in San Pablo, California, and lasted approximately three hours. Before the tests were administered, I filled out a data sheet with demographic information (see Appendix F). Each subject was assigned a code number to assure confidentiality of the data. (Gompers students were assigned numbers from 1 to 30; Kennedy students were assigned numbers of 40 and up.)

Psychoeducational Testing

Ms. Owinda Thompson of Garden Sullivan Hospital, an educational therapist who has done research in the area of NCD, gave about half of the tests and supervised all of them. I did the other half under her supervision and participated in the scoring and interpretation.

Some of these tests are routinely used by educational psychologists to establish the presence of learning disabilities, such as the PPVT and the Key Math Test. Others might or might not be used in a standard evaluation, but are drawn from a pool of standard tests. They were chosen in consultation with Ms. Thompson, a learning disability spec-

ialist, because of their perceived relevance to nonverbal problems, to social cognition, and to social learning.

Since no standard test or set of tests reflects neuropsychological status, it is common practice in the learning disability field to use tests from different batteries to measure more specifically what one wants to measure. The battery used in this study has been found useful by practitioners because it includes temporal and spatial measures in addition to measures of reading, writing, auditory and visual memory, and because of its relevance to social cognition. Tests in general are chosen not only for reliability and validity, but also for how well they serve the purpose of the specific evaluation.

The tests used measure the following areas:

1. Receptive and expressive verbal and nonverbal language (knowledge of single words as well as connected discourse).

2. The learning systems: auditory, visual, and kinesthetic motor, including the memory systems for each.

3. Academic subjects: decoding within the context of connected language, reading comprehension, the fundamentals of mathematics, written language, and general knowledge.

4. The understanding of nonverbal spatial and temporal concepts, which received particular attention throughout the evaluation. Points 1, 2, and 3 refer to tests of verbal ability, and point 4 refers to tests of nonverbal ability.

There is no universally recognized objective test that measures social impairments and ADHD. The diagnosis is usually made through observation and on the basis of reports by teachers and parents.

The tests are described below.

The PEABODY PICTURE VOCABULARY TEST (PPVT) is used to assess the understanding of single words. The subject is asked to select from a group of four pictures the one that best matches an orally presented stimulus word. The words are arranged in an increasing order of difficulty.

The DURRELL TEST OF LISTENING COMPREHENSION is used to assess the ability to understand and remember language regularly encountered in an academic setting. It comprises seven verbally presented passages each of which has been assigned a grade level. This test measures verbal ability.

The MYKLEBUST PICTURE STORY LANGUAGE TEST is used to assess the ability to express ideas in writing. Three areas of written language are assessed: productivity (length), syntax, and meaning (abstract and concrete).

The KeyMath DIAGNOSTIC TEST measures the ability to understand and apply basic math concepts. Five subtests were given:

1. Measurement subtest, which tests understanding of linear measurement and ability to make estimates and comparisons of heights and weights.

2. Time subtest, which measures ability to estimate time.

3. Money subtest, which measures the ability to make change and to solve money word problems.

4. Computation subtest, which measures the ability to do simple arithmetic operations.

5. Missing elements subtest, which measures the ability to determine which element of the data needed to solve each given problem is missing.

Subtests 3, 4, and 5 test verbal ability, while 1 and 2 test nonverbal ability.

The DETROIT TEST OF LEARNING APTITUDE was utilized to the extent of three subtests:

1. The orientation subtest was used to evaluate the ability to follow verbally presented directions related to the understanding of time, space, sense of direction (right and left, with respect to the subject's own person, the evaluator, and particular objects in the testing spaces) and the cardinal directions (north, south, etc.).

2. The pictorial absurdities subtest. The subject is asked to examine a set of 18 pictures and identify a feature that is in conflict with reality. Many of these pictures evaluate the ability to understand certain concepts related to time, space, and sense of direction (e.g. shadows, the seasons, as well as the understanding of right and left).

3. The oral directions subtest is used to evaluate the ability to follow verbally presented directions. The subject is asked to listen to a set of directions while viewing material directly associated with the test. Particularly strong demands are placed upon the immediate auditory memory system and the understanding of spatial language is also tested.

All of the subtests measure nonverbal ability.

The WIIG-SEMEL TEST OF LINGUISTIC CONCEPTS is used to assess the understanding of complex linguistic concepts within a simple format, testing verbal ability. One example is of comparative relationships/passive relationships (John was hit by Eric. Was John hit?). For nonverbal ability, examples are of temporal relationships (does noon come after morning?), and spatial relationships (Pat came after James. Was James first?).

Three subtests of the WOODCOCK READING MASTERY test were used:

1. Letter identification requires the subject to read single letters. The first half of the subtest is presented in manuscript and the latter half in ornate cursive script. The object is to delineate whether there is a tendency to reverse or invert similarly formed letters. It is a test of form constancy.

2. Word identification requires the subject to pronounce several lists of single words.

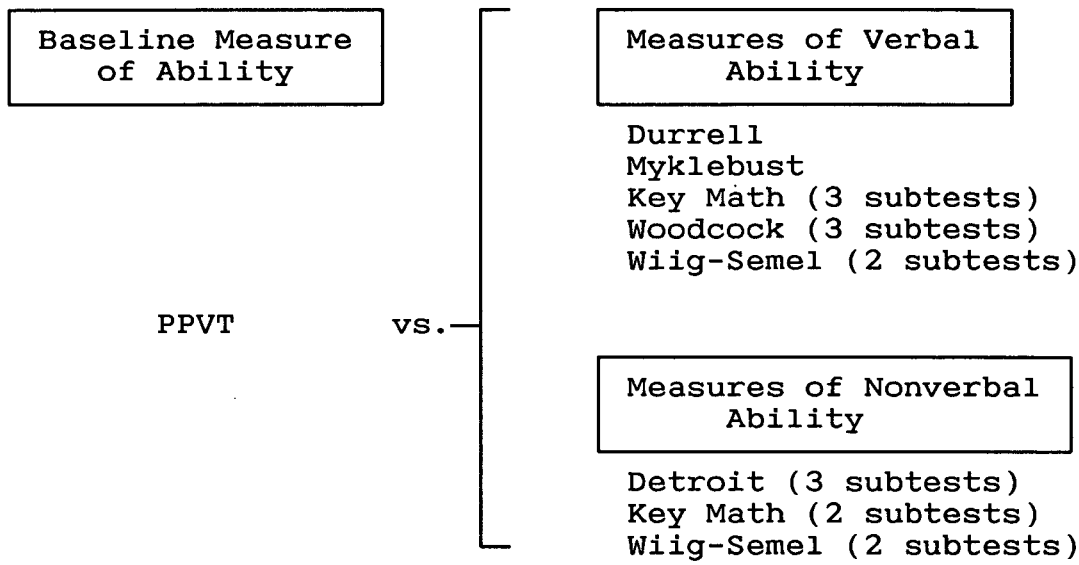
3. Paragraph comprehension evaluates the subject's ability to comprehend connected language read silently.

The whole test measures verbal ability. Copies of the actual tests except for the Wiig-Semel test and of the administrative manuals are available through American Guidance Service, Circle Pines, MN 55014. A copy of the Wiig-Semel Test is provided in Appendix G.

The reliability of these tests varies. The PPVT has very high reliability whereas the Detroit Test of Learning Aptitude, although widely used, is not considered highly reliable. Reliability tables are provided in Appendix G.

The WECHSLER INTELLIGENCE SCALE FOR CHILDREN (WISC) is the standard measure of intelligence used in the field but I was informed at the beginning of my contact with the RUSD that it could not be given because of a recent legal decision that the test is racially and culturally biased and therefore cannot be administered to black students. The PPVT test was used instead because it correlates highly with intelligence. Table 3 depicts the test groupings.

TABLE 3. TEST GROUPINGS



Piagetian Tasks

After the psychoeducational testing I administered and interpreted four Piagetian Concrete Operational Tasks developed by Gilbert Voyat, a follower of Piaget (see Appendix H). These Tasks evaluate the ability to understand the principle of conservation of area, conservation of substance, relationship of movement and speed, and the concept of classification.

Voyat states in the preface to his book (1982) that the major purpose of his Tasks is to provide the educator and clinician with a clinical tool useful in making developmental diagnoses and evaluation of cognitive functioning of children and adolescents.

To test the subjects' ability to function on the level of Concrete Operations in the area of moral development, they were asked to evaluate comparative guilt of the characters in two vignettes (see Appendix H). They were tested on their ability to go beyond the directly perceptible, to coordinate the different aspects of the story, and to evaluate them according to a hierarchy of values. These vignettes (designed by me in close collaboration with Dr. Mary Ahern) are similar to the stories used by Piaget (1932), Kohlberg (1964), and Selman (1971) to determine the level of moral development in children and adolescents. They were adapted to the age (late adolescence) and inner city life experiences of the subjects tested.

EXAMINATION OF SCHOOL RECORDS

The school records were examined with the permission of the parents and the principal and, for Gompers High School, with the assistance of a teacher-psychologist. The purpose of such review was to obtain information that might not be available from other sources, and that might be relevant to ADHD; to corroborate data obtained from the demographic check list; and to help generate questions for the interviews.

A data sheet was developed to record information (see Appendix J) summarizing the subject's educational and social history, with an emphasis on possible problem areas. Items

included were: schools attended, grades repeated, referral to and time spent in special education, any results of testing, academic achievement and behavior in elementary, junior high, and previous high school, and when appropriate, the reason why referred to Gompers High School.

More changes of school than the usual two (elementary to junior high; junior high to high school) seemed to reflect either numerous moves by the family or an effort by the school department to provide a setting where the subject could be more successful. For the two major categories "Academics" and "Behavior" I copied or summarized the information in the records, which was then interpreted for the coding sheet (see Appendix J). The two categories were applied to three levels: elementary school, junior high, and high school, and coded for the following subcategories:

Academics	Code Number
Excellent	5
Good	4
Average or no comment	3
Below average or poor	2
Failing	1
Learning problems noted	X
Behavior	Code Number
Excellent	5
Good	4
Average or no comment	3
Truancy, minor rule breaking	2
Disruptive, impulsive, inattentive	1
Emotional problems noted	X

An additional level for Gompers students was "other high school".

An example of an interpretation of school records for the coding is:

A teacher's comments for a 10th grader read: "Disruptive in class, inattentive, lacks concentration and wastes time." This would be coded "1" in the Behavior category at the high school level. The same student had a notation of "very good to excellent" in academic progress in the 3rd and 4th grades. This would be coded "5" in Academics at the elementary school level.

The criteria used to develop the subcategories for "Behavior" include traits characteristic of the ADHD adolescent and those with nonverbal problems, i.e. impulsiveness, disorganization, etc.

THE INTERVIEW

At the time of the testing subjects were asked if they and one of their parents or guardians would be willing to come back for an interview to talk about the subject's childhood and early school history. Appointments were arranged later by phone for two one-hour interviews either in my office or the subject's home, depending on the wishes of the subject and the parent.

The Subject Interview Guide

Each semi-structured interview was conducted with the aid of an interview guide (see Appendix K). I started the interview by saying that I was interested in the subject's memories of childhood, such as how it was to be a little kid, both at school and at home. I then offered clarification and probing questions as needed (for instance: "What was easy for you?" "What was scary?" "What did you enjoy?") I followed the subject's lead as much as possible while keeping within the general scope of the interviewing guide. The interviews were taped. The guide suggested which topics needed to be covered, yet allowed sufficient flexibility in emphasis and elaboration, with room for new categories if necessary.

The interview was divided into three parts--educational history, self-concept, and relationship with parents--but it dealt with more than one category at once. For instance, when I asked what if anything was difficult in elementary school, one said he had learned math better than reading, and that he had to learn to fight to earn the respect of the other students. I asked questions from any part of the guide, both in an effort to facilitate the course of the interview and to cover all the topics.

Part I: The Educational History. This part of the interview added the subject's own perspective on his/her educational history to the information obtained during the

examination of the school records. For instance, where the school records indicated a repeated grade, there was a chance to ask what that experience had meant to the subject. When the records showed disciplinary action for defiance, it was possible to get his/her version of the incident.

Part II: Self-Concept. The second part of the interview guide encouraged the subject to describe himself/herself as fully as possible. This was accomplished by listening for different themes relating to the way the subject had handled various situations with friends, teachers, parents, and others. Again I asked exploratory questions: if, for instance, a conflict with a teacher was mentioned I pursued it, or if the subject described a move, I asked if he/she found change difficult or if he/she made friends easily. The underlying reason for exploring different situations was to ascertain the subject's strengths and weaknesses and look for particular personality traits that I have observed in my clinical practice, and that had been described in the literature (Cordoni 1985, Denckla 1986, Gardner 1979, Goldstein and Goldstein 1986, Kronick 1983, Levine 1988, Myklebust 1975, Osman 1985, Thompson 1985a).

If these traits were short attention span, impulsiveness, distractibility, and hyperactivity, they relate to ADHD and would probably be observed during the testing and the interviews. If spatial/temporal problems were revealed, as well as difficulty with understanding complex verbal

language, logical ordering, and sequencing (which caused the student to "fall apart" in junior high school), nonverbal problems would be suspected.

Part III: Relationship with Parents. The third section encouraged the subject to describe his/her relationship with the parents and to talk about how they responded to problems. This added a valuable dimension to the information about the subject, and also gave some idea about his/her ability to see events realistically. This data was correlated with the parents' reports and with the school records.

The Parent Interview Guide

The interview with the parent started with a statement that I was interested in the parent's recollection of the subject as a child: "What was his/her disposition, how was he/she to raise..?"

This guide (see Appendix K) elicited historical information about the subject while providing a different perspective. It was also semistructured, suggesting which topics might be covered while allowing open-ended discussion, together with the introduction of new topics. It contained five divisions, covering the development and behavior of the subject in infancy, preschool, elementary school, junior high school, and high school. Four additional categories dealt with the subject's relationship with siblings, parent's perception of his/her relationship with the child,

what remedies had been tried if problems were encountered, and other significant information volunteered about the family.

Again, the goal was to get a description of the subject that would ascertain the presence or absence of impulsiveness, short attention span, distractibility, and hyperactivity, which relate to ADHD, and spatial/temporal problems, difficulties with many aspects of organization, and understanding of complex language, which relate to nonverbal problems.

A few open-ended questions were also asked about the parent's experience in raising this child. Since my clinical observation and the relevant literature (Goldstein and Goldstein 1986, Kronick 1981, Levine 1988, Osman 1985, Thompson 1985a) point to special difficulties parents experience in raising youngsters with ADHD and nonverbal learning problems, it was important to compare the study and comparison groups from that perspective. The traits relating to ADHD and to nonverbal problems often overlap and lead to social impairments such as social inappropriateness and immaturity. This is due to difficulty in reading social cues, measuring appropriate degree of involvement, classifying persons and situations, taking meaning too literally, and not understanding the social context. These traits impact life at home as well as in school.

ANALYSIS--GENERAL PROCEDURES

QUANTITATIVE

Demographic Data

The demographic sheet data allowed the establishment of categories for such attributes as family status, number of siblings, and occupation and income of the family. Supplemented by demographic information obtained from school records, interviews, and direct observation, this data was classified into eight categories. A demographic coding guide was developed to facilitate comparison (Appendix F).

Psychoeducational Tests

Psychoeducational tests were scored and interpreted either by Ms. Thompson or by me with her help and close supervision. Standard method of scoring was used. All tests are standardized in relationship to age and grade level. A test usually starts at an easy level and becomes increasingly complex.

As an example, there may be five parts, each increasingly difficult. If a subject completes the first three and fails the two more complicated ones, his/her performance is related to national norms established for that test. The norms, for instance, may indicate that a subject who completes three parts and fails the fourth is expected to be ten years old and to have completed the fourth grade. These results are then compared to the subject's actual age and

grade in school. The difference from the norms is also standardized, i.e. there are definite criteria about how much deviation is considered significant. The results are compared to the population at large to establish what percentage of the population performs at that level, i.e. what percentile the subject is in.

Comparison and study group scores were tabulated separately. The two groups were compared and the differences examined.

It could be argued that a finding of lower scores in the study group would reflect the lesser exposure to learning since the truancy level was obviously higher in this group. The age ceiling of the great majority of the tests is between ages ten and fourteen. Thus the basic skills as well as most of the content addressed would have been acquired before the onset of truancy, which school records indicate started in late junior high school, or high school.

Test performance was evaluated for discrepancy from the PPVT, which was used as a measure of ability (Table 3, p. 79). Two clusters of comparisons were made for each student. One cluster contains discrepancies of the eight separate measures of verbal ability and performance from the PPVT.

The other cluster compares discrepancies of the seven measures of nonverbal ability. Two composite scores were derived for each student--one for the verbal ability clus-

ter, and one for the nonverbal ability cluster. All comparisons are based on derived age equivalence, or on percentile scores. Standard scores could not be used because not all of the tests provide them.

The two groups were compared and the differences between the discrepancies were examined using the ChiSq test or the sign test for independent groups, also known as the median test.

I use these tests rather than one of the classical ones (such as the t-test) because of the small size of the sample and also because some of the assumptions underlying the classical tests cannot be made about the scores and their distributions (Horowitz 1974).

The classical or parametric tests assume that the scores in the population are normally distributed and that they have equal variances. This cannot be assumed about tests where age scores are used (the difference between ages 6 and 8 is not necessarily equal to the difference between ages 8 and 10).

Also, several of the tests have maximum achievement levels at age or grade considerably below the actual age or grade of the subject, thus creating a curve that would be greatly skewed toward the top scores. The Pictorial Absurdities subtest of the Detroit Test has age 10 as the maximum achievement level. Since the subjects are actually between

16½ and 18 years of age, a "bunching up" of values around age 10 could be expected.

Piagetian Tasks

Measuring ability to do Concrete Operations: The four Tasks developed by Gilbert Voyat are described in detail in Appendix H. Voyat describes the procedure to administer them and then gives three levels of answers and the ages when these are expected. The third, highest level is that of Concrete Operations (Voyat 1982).

To adapt the Tasks to the particular testing situation, I developed an additional scoring sheet with some simple directions (see Appendix H). Each Task has several questions all of which had to be answered for the subject to be judged to have attained Concrete Operational thinking in that area. For example, if a subject missed one out of five questions of the Conservation of Area Task, he/she would be judged to still be using Preoperational thinking in that area.

The Task that measured ability to do Concrete Operation in the moral area had two short stories with multiple-choice questions after each. If the subject failed to give one right answer he/she was considered still to be using Preoperational thought. Failure to complete correctly any of the five Piagetian Tasks was considered a sign that the subject had not completely entered the period of Concrete Operation. Malerstein and Ahern (1982) state that level of achievement

has to be consistent in all areas and at all times, and that small evidence of "lower" level function may invalidate occasional higher level functioning. The number of subjects failing the Tasks was compared for the two groups.

School Records

School records were examined and those categories that yielded enough information were coded to provide numerical data for the quantitative analysis. A category was not used if there was insufficient information. The number of schools attended for each student was recorded and the results compared for the two groups.

The category "Grades Repeated" was a simple counting of how many subjects within each group had repeated a grade. The sums were compared for the two groups.

The "Special Education" category also provided a simple sum of subjects who were diagnosed as learning disabled at any time in their school career.

The "Testing Available" category related to evaluation for learning disabilities and for mentally gifted. Achievement tests were first considered but were subsequently eliminated because of insufficient data available.

The categories "Academics" and "Behavior" were subdivided and coded as we have seen above (p. 81).

Again, each occurrence within each subcategory was totaled and tabulated in matrix form on a work sheet. A school records coding guide is contained in Appendix J.

QUALITATIVE

School Records

The school records were also used as a source of qualitative data. The linguistic data, i.e. the teacher's comments, were examined for evidence of character traits such as impulsiveness, short attention span, distractibility, inability to finish tasks, and hyperactivity, which relate to ADHD; and disorganization and spatial/temporal problems, which relate to nonverbal problems.

Interviews

The tape recordings of the interviews were transcribed and the narrative data examined. Initially the responses were categorized using the headings of the interview guides. Some categories proved not to be useful and were deleted, and new ones were added where new trends emerged.

Each student's interview transcript was examined for positives and negatives, and then the whole group was looked at from that vantage point. "Positives" here mean traits and behavior that contribute to social and educational adjustment, whereas "negatives" are those that tend to prevent social and educational adjustment.

The next step was to compare the two groups in relation to common trends as well as patterns of differences. The parent interviews were used to provide additional information as well as to compare to the adolescents' information.

COORDINATION

Each source of information (psychoeducational test results, Piagetian Tasks, interview transcripts, and school records) was designed to facilitate comparison between the two groups and to begin to answer the basic question of the research. That made it possible to relate results from all four sources and find them consistent with each other.

A student who has not reached the level of Concrete Operations as demonstrated by his/her performance on the Piagetian Tasks might also show a significant discrepancy between nonverbal test scores and PPVT ability scores. He or she also might show symptoms of ADHD and of social impairment as gathered from the interviews, school records, and observation during the testing and the interviews.

On the other hand, a student who shows capacity to do Concrete Operations was predicted to likely have little discrepancy between ability and the nonverbal scores. He or she was expected to show few signs of ADHD and/or of social impairments in the school records or from observation and interviews.

In order to correlate the results from all four sources, the results of the Piagetian Tasks analysis were tabulated and compared to the presence of the other attributes under study: identified learning disabilities, NCD, and ADHD. The expectation was that those who failed the Piagetian Tasks would also much more likely show the above at-

tributes. This would give concurrent validity to the findings.

RELIABILITY

Reliability concerns repeatability, i.e. the extent to which measures give consistent results. In the case of the psychoeducational tests reliability data can be found in the test manuals and is offered in Appendix G for the tests used.

The exact procedures described by Voyat (1982) for the Piagetian Tasks were followed to assure repeatability. Appendix H contains the description of the Tasks and the recommended procedures, as well as a simple scoring sheet which I used during the testing.

A simple format for the two Tasks assessing ability in the moral area was designed by me and reviewed by Dr. Ahern. The vignettes were read verbatim and the student responded with a choice of two one-word answers. The procedure is simple, repeatable, and could be easily followed by another investigator.

The Data Sheet of Demographic Information provides for simple questions and answers. The same applies to the majority of sections of the Data Sheet for School Records summary. The category "Behavior" was a simple recording or summary of any information contained in the school record for a particular child who fits this category. For the

coding sheet this data was interpreted according to subcategories indicated in Appendix J.

The interview guides were constructed with the help of Dr. Sylvia Sussman of the research faculty of the California Institute for Clinical Social Work and reviewed by her. Detailed categories and subcategories were developed that would allow repeatability by another interviewer with the training and experience of a clinical social worker. However, the interviewer's knowledge of the group identity of each subject introduced a possible bias and represents a weakness in the method.

To objectify the analysis of subjective data as much as possible, the description of the results of analysis of the interviews contains sample excerpts from the interviews. These excerpts illustrate the criteria used to make decisions regarding placing of data into specific categories either precoded or newly formed. In this way the researcher's interpretive logic can be judged.

The same procedure was used in the analysis of school records for the category "Behavior." Criteria for putting data into subcategories was illustrated with samples from the data.

VALIDITY

The primary consideration in appraising validity is whether the test adequately serves the purpose for which it has been developed.

Validity measures for the psychoeducational tests are provided in the manuals. Excerpts of these are offered in Appendix G.

The validity of the Piagetian Tasks would be determined by their appropriateness in evaluating ability to do Concrete Operations. This issue was reviewed with Dr. Ahern. The validity of the interview guides can be judged by the completeness in eliciting relevant information. To this end the categories and subcategories were carefully discussed and reviewed with Dr. Sussman.

The School Record Summary sheet was reviewed with the same consideration.

Concurrent validity is the correlation of a test with another test or other related criterion. All four data collection procedures address themselves to one or more of the hypotheses of the study. Each procedure represents a different perspective. Therefore, the results obtained by the different techniques or procedures would be expected to support each other.

* * * * *

CHAPTER IV. FINDINGS

INTRODUCTION

Research conducted at Gompers High School (study group) and Kennedy High School (control group), both in the Richmond Unified School District, tested the following hypotheses by comparing a group of maladapted adolescents with a matched group of normal adolescents:

1. The study group will have a significantly higher proportion of adolescents with neurocognitive differences as defined by psychoeducational tests. Some of these differences will fit the legal definition of learning disabilities, while others will represent a significant difference from the norm but will not fall into the official learning disability category.[1] The preponderance of these differences is in the nonverbal category.

2. The study group will have a larger proportion of adolescents with attention-deficit hyperactivity disorder, as determined through interviews,

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[1] For the purpose of diagnosis of learning disabilities, the State of California Administrative Code (1986), Title 5, Section 3030j(4)(A), defines the discrepancy between ability scores and achievement scores as being significant if it measures at least 1.5 standard deviation. For the purpose of this study a discrepancy measuring one S.D. will be considered significant and would define an adolescent as neurocognitively different.

from the examination of school records, and from clinical observation.

3. The study group will have a significantly higher proportion of adolescents who have not reached, in part or in full, the developmental stage of Concrete Operations as determined by their performance of Piagetian Tasks.

Data sources used to compare the two groups included standard psychoeducational tests, Piagetian tasks, school records, interviews, personal observation, and a demographic measurement of socioeconomic status. The relationship of hypotheses and data sources is set forth in Table 1 above (p. 63).

OVERALL IMPRESSION OF THE STUDENTS AND THEIR FAMILIES

With both the Gompers study group and the Kennedy control group, I had the distinct impression that I got the "cream of the crop" of the student body. During my many hours at Gompers, inspecting records and contacting students, I observed the students interacting with the teachers and with each other. A great many of them were grossly inappropriate and very poorly controlled. Only a few of those I tested could be described that way.

I am familiar with the Kennedy student body not only from observation during my study, but also through my practice and personal contact: I know many students who go

there. Again, my impression is that the group I tested were representative only of the better side of Kennedy.

The reasons for this selection are probably similar for the two groups. It seemed to me that both principals and the teacher who helped me at Gompers had a vested interest in showing me their best, and because of that might have been somewhat selective in the groups they talked to about the testing.

The other reason is probably self-selection. One needs some degree of responsibility and motivation to be willing to be tested for three hours and to be able to follow through with the arrangements. In spite of the tremendous amount of time I spent in arranging the appointments, I still feel that if it weren't for the basic willingness of the students to follow through I could not have completed my work.

My guess is that if the selection were completely random I would have seen more students at Gompers with severe learning problems and the combination of personality traits that characterize ADHD, such as impulsiveness and inability to wait for rewards, to consider consequences, and to learn from experience.

QUANTITATIVE ANALYSIS

DEMOGRAPHIC DATA

Statistical Analysis

The match of basic demographic attributes was successful for gender, age, and ethnicity, showing no significant statistical differences between the two groups. The grade level was lower (although age was not) for the Gompers group. The results of both the sign (median) test and the regular ChiSq test showed an identical significant difference [$n = 34$, $ChiSq = 7.2$, $p < 0.01$].[2]

The rest of the demographic data was classified into eight categories on the basis of information obtained during testing, interviews, and examination of school records, and as the result of some direct observation of the subjects' homes. See Appendix F.

The data and their comparisons are summarized in the following tabulations.

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[2] These values correlate well with the "Grades Repeated" category in the school records summary [$n = 34$, $ChiSq = 8.82$, $p < 0.005$].

TABLE 4. SUBJECT ATTRIBUTE SUMMARY

Comparison of 17 Gompers (G) and 17 Kennedy (K) Subjects

Gender		G	K
1	Male	6	4
2	Female	11	13

Age (Rounded off)	G	K
15	0	1
16	7	7
17	8	5
18	2	4

Ethnicity		G	K
1	Black	12	14
2	White	4	2
3	Filipino	1	0
4	Hispanic	0	1

Grade	G	K
9	0	1
10	6	0
11	9	8
12	2	8

TABLE 5. DEMOGRAPHIC DATA SUMMARY

Living Situation[1] (Family Status)	G	K
1 Lives with both natural parents	3	10
2 Lives with one parent and one stepparent	3	5
3 Lives with single parent	5	2
4 Lives with single parent + grandparent	2	0
5 Lives with grandparent or other relative	4	0
6[2] Orphaned (in conjunction with other data)	4	0

Number of Siblings Living in Same House[3]	G	K
1 None	2	3
2 One or two	7	12
3 Three or more	8	2

Employment Status of Parents or Guardians[4]	G	K
1 Welfare or disability income only	4	0
2 Disability income + gainful employment	1	3
3 Gainful employment for one parent/guardian	7	3
4 Gainful employment for both parents/guardians	5	11

Occupation of Parents/Guardians[5]	G	K
1 No outside employment at present	3	0
2 Unskilled occupation	1	2
3 Skilled laborer	7	8
4 Semi-professional, professional, or own business	6	7

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[1] Sign test: [n = 34, ChiSq = 4.28, $p < 0.05$]. Regular ChiSq test: [n = 34, ChiSq = 9.95, $p < 0.01$].

[2] This category was not included as data in any statistical comparison.

[3] Sign test: [n = 34, ChiSq = 9.4, $p < 0.01$]. Regular ChiSq test: [n = 34, ChiSq = 5.1, $p < 0.03$].

[4] Sign test: [n = 34, ChiSq = 6.0, $p < 0.025$]. Regular ChiSq test: [n = 34, ChiSq = 3.63, not significant].

[5] Sign test: [n = 34, ChiSq = 3.1, not significant]. Regular ChiSq test: [n = 34, ChiSq = 0.5, not significant].

Table 5. (continued)

Income Level[6]	G	K
1 Poverty level	2	0
2 Barely adequate	5	1
3 Adequate	3	6
4 Comfortable	7	10

Residence[7]	G	K
1 Very poor area and housing; near-slum conditions	2	1
2 Poor area but housing adequate	4	3
3 Area and housing average	6	4
4 Better area and above-average housing	5	9

Subject Employed[8]	G	K
1 Yes	2	7
2 No	15	10

Female Subject Has Child n = 24	G	K
1 Yes	3	0
2 No	8	13

[6] As determined from a variety of sources: Interviews, reports of parents and subjects, school records, and subjective interpretation. The sign test could not be performed because the median was the highest value. The regular ChiSq test yielded ChiSq = 1.05, not significant.

[7] Determination of the residence area is based on my personal knowledge of the geographical area.
Sign test: [n = 34, ChiSq = 2.3, not significant].
Regular ChiSq test: [n = 34, ChiSq = 1.14, not significant].

[8] Both tests: [n=34, ChiSq = 4.2, $p < 0.05$].

TABLE 6. ATTRIBUTE COMPARISON

Good Match (no significant difference)

- Gender
- Age
- Ethnicity
- Occupation of Parents or Guardians
- Income Level

Somewhat Different (marginal statistical significance)

- Employment Status of Parents
- Subjects Employed

Considerably Different (statistically significant difference)

- Living Situation (Family Status)
- Number of Siblings Living in Same House

Summary of Demographic Data Analysis

In summary, the two groups turned out well matched for gender, age, ethnicity, income level, residence, and occupation of parent/guardians. The other attributes were matched less successfully. Employment status of parents and the number of subjects employed in each group were found to be somewhat different. The living situation (family status) and the number of siblings living in same house were found to be considerably different in the two groups.

At closer examination it is clear that the first cluster--gender, age, ethnicity, income level, residence, and occupation of parents--represents objective attributes that could easily be matched in a research endeavor. The attributes of the second--actual employment status of parent, living situation (family status), number of siblings living in same house, and number of subjects employed--are more difficult to discern at the time the subjects are recruited.

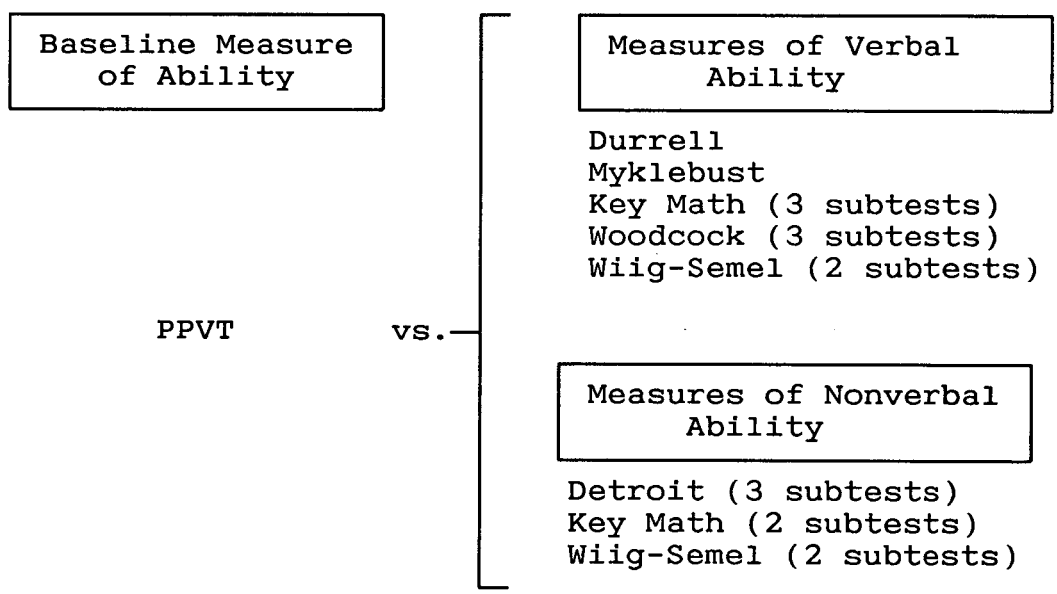
PSYCHOEDUCATIONAL TEST DATA

The psychoeducational tests were scored and interpreted by Ms. Owinda Thompson and by me with her help and close supervision. Standard method of scoring was used. The scores of the two groups were tabulated in matrix form. All tests were standardized in relationship to age and grade level. Subsequently all were converted to age level for the

purpose of the analysis, since that was the only measure that could be obtained for all of the tests.

The performance on tests was evaluated for discrepancies from the PPVT, which was used as measure of ability. Two clusters of comparisons were made for each student following the pattern of Table 7, and two composite scores were obtained.

TABLE 7. TEST GROUPING



Differences in ability are known to influence performance. Since a difference in ability was found (see Table 8) between the groups (favoring Kennedy), two measures were taken to minimize its effect:

TABLE 8. COMPARISON OF PPVT STANDARD SCORES: ALL SUBJECTS

TABLE 8.1

GOMPERS

SUBJECT	PPVT
#9	53
#7	63
#28	66
#6	70
#27	73
#26	76
#5	81
#15	82
#16	85
#25	85
#18	86
#14	90
#8	96
#30	97
#21	102
#1	107
#2	114

Mean: 84

TABLE 8.2

KENNEDY

SUBJECT	PPVT
#51	61
#48	73
#43	88
#55	88
#40	89
#50	94
#46	95
#63	95
#42	96
#58	97
#56	104
#60	117
#45	120
#54	122
#62	132
#57	134
#47	155

Mean: 103.5

1. A medium-ability group with comparable PPVT scores was singled out and examined.

2. Rather than comparing the performance of the two groups directly, each subject's performance was compared to his/her own ability only, to determine whether a significant discrepancy existed in each case.

The details of the procedures were as follows:

Performance of one standard deviation below the PPVT was considered a significant discrepancy which for subjects of this age group (mean = 16.7) was estimated to be three years.[3] An additional complication was introduced because in some of the tests the maximum score possible was already several years lower than the actual age of the subject. For example, on the Detroit Pictorial Absurdities test the maximum score is 10 years. For such tests a discrepancy was considered to exist if the earned score was either 2 years or 2½ years below the maximum score. The smaller discrepancy was used for tests with lower maximum scores. A discrepancy of 3 years was required for tests like the Woodcock where the maximum age score equals or exceeds the subject's actual age.

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[3] One standard deviation for the common educational tests given at the elementary school level is about 1½ years, and it is known to increase with age. One S.D. for the PPVT is 2 years at age 12 and is projected to be 3 years at age 17 [verbal communication, Dr. Karen Stark re unpublished research]. When comparing the PPVT to other tests the total age span of the test was considered. The estimated S.D. reflected the smaller S.D. at younger ages.

Estimated standard deviations for the various tests were:

Detroit Pictorial Absurdities	2 yrs
Durrell Reading Comprehension	2 yrs
Detroit Orientation Subtest	2½ yrs
Wiig-Semel Tests	2½ yrs
Detroit Oral Directions Subtest	3 yrs
Key Math Tests	3 yrs
Woodcock Test	3 yrs

A student was considered to have a significant discrepancy in a particular test if his score was at least one standard deviation lower than the PPVT score, provided that the particular test score was also at least one standard deviation lower than the maximum achievement of the test. Since the maximum possible score was much lower than the chronological age of the subjects on several tests (age 10 on Durrell Pictorial Absurdities, age 13-4 on Wiig-Semel) it was important to assure that the low score was not just a function of the test's ceiling. In other words, if either difference was smaller than one standard deviation, no discrepancy exists.

Using subject #1 as illustration, the PPVT score (converted into age score) was obtained from the Master Score Matrix and compared to his other scores (Table 9).

TABLE 9. EXAMPLE OF COMPOSITE DISCREPANCY SCORE DERIVATION

Subject #1. Biological age: 16 years 8 months. (16-8)

PPVT age-equivalent score: 18 years 1 month. (18-1)

Nonverbal CLUSTER	S.D.	SCORE	vs MAX/	vs PPVT	DISCREPANCY	
Detroit Pix Absurd	2 yrs	9-0	(10-0)	18-1	1-0 = NO	
Detroit Orientation	2½ yrs	13-0	(13-6)	18-1	0-6 = NO	
Detroit Oral Direct.	3 yrs	14-0	(19-0)	18-1	4-1 = YES	1
Wiig Temporal	2½ yrs	10-7	(13-4)	18-1	2-9 = YES	1
Wiig Spatial	2½ yrs	13-4	(13-4)	18-1	0-0 = NO	
Key Math Measurement	3 yrs	10-4	(14-10)	18-1	4-6 = YES	1
Key Math Time	3 yrs	10-5	(14-10)	18-1	4-5 = YES	1

COMPOSITE DISCREPANCY SCORE, Nonverbal: 4

VERBAL CLUSTER	S.D.	SCORE	vs MAX/	vs PPVT	DISCREPANCY	
Woodcock (Composite)	3 yrs	13-7	(18-2)	18-1	4-7 = YES	1
Durrell	2 yrs	9-2	(11-9)	18-1	2-7 = YES	1
Pix Story(Composite)	3 yrs	11-8	(19-0)	18-1	6-5 = YES	1
Wiig Comparative	2½ yrs	13-4	(13-4)	18-1	0-0 = NO	
Wiig Passive	2½ yrs	13-4	(13-4)	18-1	0-0 = NO	
Key Math Money	3 yrs	14-10	(14-10)	18-1	0-0 = NO	
Key Math Computation	3 yrs	13-10	(14-10)	18-1	1-0 = NO	
Key Math Missing El.	3 yrs	14-10	(14-10)	18-1	0-0 = NO	

COMPOSITE DISCREPANCY SCORE, VERBAL: 3

Thus #1 achieved an age level of 18 years 1 month on the PPVT. His score on Pictorial Absurdities is 9 years, 1 year below the possible maximum of that test. The estimated standard deviation of that test is 2 years. Therefore he is judged not to have a significant discrepancy on this test.

On the other hand, he achieved a level of 10 years 7 months on the Wiig Temporal test whereas the maximum possible is 13 years 4 months. The estimated standard deviation is 2½ years. He therefore has a sizeable discrepancy on that test.

Where the maximum level of a test is achieved, as in the case of Key Math Money for #1, a discrepancy is not judged to exist (difference = 0), although there is over 3 years' difference between the top possible score (14 years 10 months) and his PPVT score (18 years 1 month).

Statistical Analysis

The results of the composite discrepancy scores are tabulated and compared in Table 10. The comparison of ability of the two groups showed a bias, with Kennedy having some extremely high values and Gompers some very low values of PPVT standard scores. Statistical comparison yielded a ChiSq of 5.76, $p < 0.025$, a significant difference. Because of that, no statistical test of the differences in discrepancies in scores was performed, until a subgroup was extracted that could be matched for ability. A medium ability

TABLE 10.

DISCREPANCY SCORES: PPVT AGE EQUIVALENT FROM OTHER TESTS

TABLE 10.1

GOMPERS

	Discrepancy from: Nonverbal	Verbal
#1	4	3
#2	1	1
#5	2	1
#6	-1	-1
#7	0	-4
#8	1	2
#9	-2	-5
#14	0	0
#15	0	2
#16	3	2
#18	3	2
#21	4	5
#25	0	1
#26	1	2
#27	2	-3
#28	-1	-2
#30	5	2
Mean:	**1.23**	**0.4**
Median:	1	1

TABLE 10.2

KENNEDY

	Discrepancy from: Nonverbal	Verbal
#40	1	2
#42	1	2
#43	0	0
#45	1	0
#46	1	1
#47	1	0
#48	3	3
#50	1	2
#51	-6	-7
#54	3	1
#55	0	1
#56	3	2
#57	5	3
#58	1	1
#60	0	2
#62	1	2
#63	0	1
Mean:	**0.94**	**0.94**
Median:	1	1

group was extracted from both groups and equated on ability (Table 11). Subjects were selected for having scores between 85 and 115. The two groups turned out to have almost identical means (Gompers = 95.8; Kennedy = 94.0), and each group had nine students (Tables 11 and 12).

The differences between the discrepancies were examined using the sign test for independent groups (using the median), as well as the regular ChiSq test which relies on the mean.

The differences in discrepancies in the verbal area were found not to be significant using both the regular ChiSq and the sign test (Table 12A). However, in the nonverbal area a significant difference was found using the regular ChiSq (Table 12B). The sign test was not performed because too many values were lost in a sample where the numbers were already small; after the median of 1 was excluded Kennedy had 4 subjects left (Table 12B).

The examination of the group as a whole warrants one further comment. The comparison was distorted by ability differences which included some extreme lows in the Gompers group and some extreme highs in the Kennedy group. This produced an effect that led to reversed discrepancies: the low ability Gompers students performed much better on the achievement tests than their PPVT scores would predict.

(These reversed discrepancies are designated by negative

TABLE 11

COMPARISON OF MEDIUM ABILITY GROUP (PPVT STD SCORES 85-115)

TABLE 11.1

GOMPERS

SUBJECT	PPVT
#25	85
#16	85
#18	86
#14	90
#8	96
#30	97
#21	102
#1	107
#2	114
Mean:	**95.8**

TABLE 11.2

KENNEDY

SUBJECT	PPVT
#55	88
#43	88
#40	89
#50	94
#46	95
#63	95
#42	96
#58	97
#56	104
Mean:	**94.0**

TABLE 12

MEDIUM ABILITY GROUP (PPVT STD SCORES 85-115)

DISCREPANCY SCORES: AGE-EQUIVALENT PPVT FROM OTHER TESTS

TABLE 12.1

GOMPERS

	Discrepancy from: Verbal	Nonverbal
#1	3	4
#2	1	1
#8	2	1
#14	0	0
#16	2	3
#18	2	3
#21	5	4
#25	0	0
#30	2	5
Mean:	1.8	2.3
Median:	2.5	1.5

TABLE 12.2

KENNEDY

	Discrepancy from: Verbal	Nonverbal
#40	2	1
#42	2	1
#43	0	0
#46	0	1
#50	2	1
#55	1	0
#56	2	3
#58	1	1
#63	1	0
Mean:	1.3	0.8
Median:	2	1

TABLE 12A

COMPARISON OF DISCREPANCIES OF THE

VERBAL SCORES FOR MEDIUM ABILITY

Regular ChiSq Test (using the mean):

Mean = 2.5	Below	Above
Gompers	4	5
Kennedy	7	2

Not significant: ChiSq = 2.08

Sign Test (using the median):

Median = 2	Below	Above
Gompers	1	5
Kennedy	3	2

Not significant: ChiSq = 2.28

TABLE 12B

COMPARISON OF DISCREPANCIES OF THE NONVERBAL SCORES FOR MEDIUM ABILITY

Regular ChiSq Test (using the mean):

Mean = 1.5	Below	Above
Gompers	4	5
Kennedy	8	1

Significant: ChiSq = 4.0, $p < 0.05$

Sign Test (using the median): Not Performed

Median = 1	Below	Above
Gompers	2	5
Kennedy	3	1

values in Table 10.) On the other hand, some of the highest-ability Kennedy students had a sizeable number of positive discrepancies. This pattern of extreme values may not be significant; it may be due to a phenomenon referred to as "regression to the mean," where extreme scores are obtained partially because of chance and on retesting come out closer to the mean.

Summary and Interpretation of Results

On the basis of the results with the medium ability group, the two groups were found to be significantly different in the number of discrepancies from the PPVT (measure of ability) in the nonverbal area. This suggests a higher proportion of NCD in the study group in the nonverbal area as predicted in part of the first hypothesis. The prediction that there will be difference in both verbal and nonverbal areas cannot be substantiated.

SCHOOL RECORDS

After permission was granted to examine the school records, the information obtained was recorded on a data sheet form, as shown in Appendix J, summarizing the subject's school history and emphasizing possible problem areas. Subcategories were developed for the two major areas of concern--"Academics" and "Behavior"--and a coding system was devised to facilitate the recording of those specifics on the data sheet, as described in Methods and Procedures.

Statistical Analysis

Discussion of Results. The school records were first analyzed quantitatively. Six of the originally proposed seven categories yielded enough information to be coded. The seventh (achievement tests) had to be abandoned because of insufficient data.

The comparison of the two schools was done for the whole group as well as, when appropriate, for the medium group (ability matched). Statistical comparisons of the different categories are summarized in the School Records Data Summary (Table 13, p. 124). The following results were obtained:

Schools Attended. The number of schools attended for the whole group showed a significant difference, with the Gompers group having attended many more than the Kennedy group. The medium group showed a significant difference in the same direction. See Table 13, sec. 1, p. 124.

It was found that when the subject changed schools more often than the normal two transitions (elementary to junior high; junior high to high school) it reflected either numerous moves by the family, or more often an effort by the school department to provide a setting where the subject could be more successful.

The second category showed more private schools attended by the Kennedy group but the difference was not significant.

Grades Repeated. The number of students who had repeated at least one grade was very different for the whole group, with Gompers showing a much greater incidence. The same pattern emerged in the medium group, indicating that overall the Gompers students were having much greater difficulties in school even when ability was comparable. Section 3 of the School Records Data Summary (Table 13) provides the detailed comparison.

Special Testing. Five students from Gompers had received special testing and were placed in special education classes, compared to Kennedy's one student. Even though Gompers specifically excludes the identified learning disabled, these students were in fact placed at Gompers in spite of their history, as was predicted by the first hypothesis. The difference, however, in the numbers of identified learning disabled between the schools was not found to be statistically significant.

The medium group had two students from Gompers identified as learning disabled, to Kennedy's one student, which is obviously not a significant difference.[4]

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[4] Three of the students in this group (#9, #21, #26--all from Gompers) were clearly and consistently referred to as learning disabled in the school records and by the school staff. Two students (one from Gompers [#5] and one from Kennedy [#56]) showed evidence in the records of testing and of some time spent in special education. During testing, one student (Gompers #18) mentioned that he had been in a special class. His school records, however, had been lost in transit from San Francisco. Information given by his mother during the interview indicated that he was tested

In the category of testing for mental giftedness Gompers had one student and Kennedy six students for the whole group, which represents a significant difference. In the medium group (giftedness) Gompers had one and Kennedy had three students, which does not represent a significant difference (Table 13, section 4.2). When the whole group was considered the several very high scores in the Kennedy group produced the significant difference between the two groups. When ability was equated, the significant difference disappeared.

Section 4 of the School Records Data Summary (Table 13, p. 125) provides detailed comparisons for the above categories.

Academic achievement at the elementary school level was not seen as different between the two schools. Comparison of the whole group (total population) as well as comparison of the medium ability group showed no statistically significant difference.

Academic achievement in junior high school and high school was found to be significantly different between the two schools, with the Gompers group showing very poor progress. The comparison of the whole group in junior high

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early in elementary school and had attended a special class part time for many years. Another student from Gompers (#27) apparently had been referred to special education but since this could not be substantiated, she was not counted in this category.

school and comparison of the medium ability groups are given in detail in section 5.3 of the School Records Data Summary (Table 13, p. 127).

In high school the comparison was even more dramatic, with Gompers performance mostly at the failing level. The comparison of the high school performance of the two medium groups was also dramatically different with Gompers students mostly failing.

The statistical comparisons of the academic performance are summarized in section 5.3 of the School Records Data Summary (Table 13, p. 127).

Behavior. Comparing the two groups on the basis of the behavior category showed significant differences in all three subcategories (elementary, junior high, high school), with the Gompers students showing problems from elementary school on. This was true for the whole population as well as for the medium group, which was matched for ability, although behavior and mental ability could be considered independent of each other. The statistical comparisons of behavior are summarized in section 6.3 of the School Records Data Summary (Table 13, p. 129).

It is clear that the pattern of divergence is different in the areas of academics and behavior: the two groups started out in school looking quite similar academically, but in junior high the academic performance of the Gompers group

deteriorated seriously and was significantly different in both junior high and high school.

On the other hand, behavior was already different in the elementary grades, resulting in a different school experience which contributed to the differences that pushed one group towards referral to Gompers and the other towards a successful experience at Kennedy.

Examination of the behavior subcategories showed that disruptive, impulsive, inattentive behavior (Code #1), the traits that could denote ADHD, were present much more in the Gompers group than in the Kennedy group (Sections 6.1 and 6.2, School Records Data Summary, Table 13, p. 128).

This subcategory, however, is a mixed one since it does not discriminate between disruptive behavior in general and behavior specific to ADHD. Although the two groups often overlap, a more thorough analysis is needed to determine how many students actually match ADHD traits. This is undertaken in the qualitative analyses of the school records and of the interviews, and in the coordination of the analyses.

Within the scope of the above qualification the preliminary evidence showed that the Gompers group had more students with indication of ADHD traits. The records also showed that Gompers had more students identified as learning disabled, in spite of the criteria for admission that specifically excluded them. Both of the above points were stated in the hypotheses.

TABLE 13. SCHOOL RECORDS DATA SUMMARY

	Whole Group n = 34		Medium Group n = 18	
1. Schools Attended[1]	G	K	G	K
No record available	1	0	1	0
2 schools attended	0	1	0	1
3 schools attended	0	9	0	5
4 schools attended	3	2	2	2
5 schools attended	5	2	1	0
6 schools attended	3	2	1	1
7 schools attended	2	0	1	0
8 schools attended	1	0	1	0
9 schools attended	0	1	0	0
10 schools attended	1	0	1	0
12 schools attended	1	0	1	0
2. Private Schools Attended[2]	G	K	G	K
2.1 Yes	2	5	1	4
2.2 No	15	12	8	5

[1] The number of schools attended has been normalized by reporting Gompers figures as one less than actual number of schools attended, because a move to Gompers would not have a counterpart within the Kennedy group.

	Whole Group, n = 34 ChiSq	p	Medium Group, n = 18 ChiSq	p	
Regular test	3.91	< 0.05	8.6	< 0.005	(very significant)
Sign test	6.27	< 0.025	6.57	< 0.025	(significant)

[2]

	Whole Group, n = 34 ChiSq	p	Medium Group, n = 18 ChiSq	p	
Regular test	1.58	< 0.5	3.7	< 0.1	(not significant)

TABLE 13. (continued)

		Whole G	Whole K	Medium G	Medium K
3. Grades Repeated[3]		n = 34		n = 17	
3.1	Yes	7	0	2	0
3.2	No	10	17	6	9
4. Special Testing Results Avail.[4]		n = 34		n = 18	
4.1	Evaluating the Presence of Learning Disabilities[5]	5	1	2	1
4.2	Evaluating the Presence of Giftedness[6]	1	6	1	3
4.3	No Evidence of Above in Records	11	10	6	5

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[3] Whole Group, n = 34 Medium Group, n = 17

	ChiSq	p	ChiSq	p	
Regular test	8.82	<0.005	13	<0.001	(very significant)

[4] There were insufficient data in school records to make achievement test score comparisons.

[5] Whole Group, n = 34 Medium Group, n = 18

	ChiSq	p	ChiSq	p	
Regular test	3.27	<0.1	2.	<0.25	(not significant)

[6] Whole Group, n = 34 Medium Group, n = 18

	ChiSq	p	ChiSq	p
Regular test	4.42 (significant)	<0.05	1.28 (not significant)	<0.5

TABLE 13. (continued)

		Gompers			Kennedy		
5.1	Academics, Whole Group[7]	El	Jr	HS	El	Jr	HS
U	No Data	2	2	0	2	0	0
1	Failing	0	7	14	0	0	0
2	Below Average to Poor	5	5	3	3	0	1
3	Average or No Comment	3	3	0	3	12	5
4	Good	2	0	0	2	4	9
5	Excellent	5	0	0	7	1	2
X	Learning Problems Noted[8]	7			4		
-	No Learning Problems Noted	8			13		
-	Records Not Available	2			0		

		Gompers			Kennedy		
5.2	Academics, Medium Group	El	Jr	HS	El	Jr	HS
U	No Data	2	2	0	0	0	0
1	Failing	0	3	8	0	0	0
2	Below Average to Poor	1	1	1	1	0	0
3	Average or No Comment	1	3	0	2	6	2
4	Good	0	0	0	1	3	6
5	Excellent	5	0	0	5	0	1

[7] Academic achievement judged by grades and comments made by teachers.

[8] Learning problems noted in grade school: [n = 32, ChiSq = 2.7, $p < 0.1$ (not significant)].

TABLE 13. (continued)

5.3. Academics, Statistical Comparison:[9]

Elementary:	Whole Group, n = 31		Medium Group, n = 15	
	ChiSq	p	ChiSq	p
Regular Test	0.68	< 0.5	0.6	< 0.5
Sign Test	0.5	< 0.5	NA: Median=Highest Value (not significant)	

Junior High:	Whole Group, n = 32		Medium Group, n = 18	
	ChiSq	p	ChiSq	p
Regular Test	15.8	< 0.001	7.0	< 0.005
Sign Test	23.	<< 0.001	13.	< 0.001
			(highly significant)	

High School:	Whole Group, n = 34		Medium Group, n = 18	
	ChiSq	p	ChiSq	p
Regular Test	31.22	< 0.0001	18.	<< 0.001
Sign Test	29.	< 0.0001	18.	<< 0.001
			(highly significant)	

[9] Sample sizes for elementary and junior high school reflect records missing from school record folders.

TABLE 13. (continued)

		Gompers			Kennedy		
6.1	Behavior, Whole Group[10]	El	Jr	HS	El	Jr	HS
U	No Data	2	2	0	0	0	0
1	Disruptive, Impulsive, Inattentive	5	7	8	1	0	0
2	Truancy, Minor Rule Violation	1	6	9	0	0	0
3	Average or No Comment	7	2	0	1	5	3
4	Good	1	0	0	5	3	6
5	Excellent	1	0	0	10	9	8

		Gompers			Kennedy		
6.2	Behavior, Medium Group	El	Jr	HS	El	Jr	HS
U	No Data	2	2	0	0	0	0
1	Disruptive, Impulsive, Inattentive	3	4	6	1	0	0
2	Truancy, Minor Rule Violation	0	3	3	0	0	0
3	Average or No Comment	2	0	0	0	2	1
4	Good	1	0	0	2	2	4
5	Excellent	1	0	0	6	5	4

[10] The information was gathered from teachers' comments on report cards, progress reports, and referral slips.

TABLE 13. (continued)

6.3 Behavior, Statistical Comparison:

Elementary:	Whole Group		Medium Group	
	ChiSq	p	ChiSq	p
Regular Test	21.03	< 0.001	6.20	< 0.025
Sign Test	19.06	< 0.001	3.98	< 0.05
				(significant)

Junior High:	Whole Group		Medium Group	
	ChiSq	p	ChiSq	p
Regular Test	24.8	< 0.001	9.7	< 0.005
Sign Test	18.5	< 0.001	14.	< 0.001
			(highly significant)	

High School:	Whole Group		Medium Group	
	ChiSq	p	ChiSq	p
Regular Test	23.8	< 0.001	36.	<< 0.0001
Sign Test	16.	< 0.001	36.	<< 0.0001
			(highly significant)	

Summary and Interpretation of Results

The Gompers and the Kennedy groups showed significant differences in the number of schools attended and grades repeated. Although academic achievement looks similar at the beginning of school, it becomes significantly different in junior high school and further deteriorates in high school. Behavior is significantly different from the beginning of school. These factors, coupled with the greater

numbers of identified learning disabled and of students with indication of ADHD, clearly contributed to a student's being at Gompers rather than at Kennedy.

PIAGETIAN TASKS

At the time of the psychoeducational testing the subjects were also given four Tasks (Appendix H) evaluating the ability to understand conservation of area, conservation of substance, relationship of movement and speed, and the concept of classification.

To adapt the Tasks to the particular testing situation, I developed an additional scoring sheet with some simple directions (Appendix H).

In order to test the subject's ability to function on the level of Concrete Operations in the area of moral development, the subjects were given two vignettes and asked to evaluate comparative guilt of the characters in the stories (Appendix H). Failure to complete correctly any of the five Piagetian Tasks was considered a sign that the subject has not completely entered the Period of Concrete Operations.

Statistical Analysis

In the Gompers group nine subjects failed at least one Task. In the Kennedy group three subjects failed at least one Task. Statistical comparison of the two groups yields ChiSq = 4.6 which represents a significant difference ($p < 0.05$) (Table 14).

TABLE 14

PIAGETIAN TASKS

Total Failed: 12

Total Passed: 22

	Failed	Passed
Gompers	9	8
Kennedy	3	14

$$\text{ChiSq} = \frac{18}{11} + \frac{18}{6} = 4.6$$

$$p < 0.05 \quad \text{(significant)}$$

The detailed breakdown of the Piagetian scores is tabulated in the last section of the test Master Matrix (Appendix N), as well as in Table 15, below. No one in either group failed the Task that measured the conservation of substance. Three Gompers students and two Kennedy students failed the Task that measured understanding of conservation of area. Six Gompers students and no Kennedy students failed the Task that measured the understanding of classification. One Gompers student and three Kennedy students failed the Task that measured the understanding of relationship of

TABLE 15. TABULATION OF PIAGETIAN TASK SCORES

0 = FAIL 1 = PASS

Gompers						Kennedy					
ID #	CONS SUBS	CONS AREA	CLAS SIFY	SPD/ DIST	MORAL VALUE	ID #	CONS SUBS	CONS AREA	CLAS SIFY	SPD/ DIST	MORAL VALUE
01	1	1	0	1	1	40	1	1	1	1	1
02	1	1	1	1	1	42	1	1	1	1	1
05	1	1	1	1	1	43	1	1	1	1	1
06	1	0	0	1	0	45	1	1	1	1	1
07	1	1	1	1	1	46	1	1	1	1	1
08	1	1	1	1	1	47	1	1	1	1	1
09	1	1	0	0	1	48	1	0	1	0	1
14	1	1	1	1	1	50	1	1	1	1	1
15	1	1	1	1	1	51	1	1	1	1	1
16	1	1	0	1	1	54	1	1	1	1	1
18	1	0	1	1	0	55	1	1	1	1	1
21	1	1	0	1	1	56	1	1	1	0	1
25	1	1	1	1	1	57	1	0	1	0	1
26	1	1	1	1	0	58	1	1	1	1	1
27	1	1	0	1	1	60	1	1	1	1	1
28	1	0	1	1	0	62	1	1	1	1	1
30	1	1	1	1	1	63	1	1	1	1	1

speed and distance. Four Gompers students and no Kennedy students failed the Task which measured moral development. Four Gompers students and two Kennedy students failed more than one Task.

An interesting detail was that all four of the students who failed the Task that dealt with speed and distance were female.

Observations During the Testing Transaction

Extensive, potentially meaningful interaction took place around the administration of the Piagetian Tasks. Unfortunately, I did not foresee this and the sessions were not taped. The following observations are based on notes made immediately after the testing sessions. There was a clear and very impressive difference between the students who had a difficult time with the Piagetian Tasks and those who did not. Those who did not would answer my questions very quickly, without any hesitation, and several of them would comment that the Task was too easy for their age. Two students in the Kennedy group (a black female and a Hispanic male) watched me as I announced the classification Task, and told me before I got the materials on the table: "Those can be classified by size, shape, and color."

On the other hand those who had difficulty would immediately start hesitating with the answers. If they got one answer right, they would hesitate and fumble again with the next. Unfortunately, I found it very difficult to be

neutral. Many of them would see the disappointment on my face and several of them commented on it. I also tried to reword questions thinking that my accent might be interfering. Some responded to my efforts by correcting themselves on one Task, only to fail the next one. One Gompers student, a white male, commented after the session that he knew I was really disappointed that he couldn't do the classifying, but that he really tried and could not figure it out.

Two students, one black female from Gompers and one white female from Kennedy, failed the classification Task, but towards the end of the session said something to the effect "I know you are disappointed, let me try again" and both corrected themselves. In the Kennedy group this young woman as well as the three others who did fail one or more Tasks differed very much in their handling of the Piagetian Tasks from the rest of the Kennedy students. In the Gompers group, eight students who failed at least one Task, and the one who corrected herself, showed a very different pattern (confusion and hesitancy) from the other eight students who passed.

One student, a black male, was an exception in that he started the Tasks with great confidence commenting on how easy they were. He became stuck however on the classification Task. I tried to help by rewording, but after some time he said: "I am sorry, but I cannot do it."

Summary and Conclusions

The performance by the two groups on the Piagetian Tasks supported the second hypothesis in that the study group did have a significantly higher proportion who failed at least one Task, and therefore cannot be considered as functioning fully on the level of Concrete Operations.

It has also been found that those adolescents who have a firm grasp of Concrete Operations can be readily distinguished in their approach to the Task from those who are still struggling with its mastery.

The coordination of the different parts of the analysis to be presented on p.162 will explore the presumption that the students who failed the Piagetian Tasks tended to also have more discrepancies between ability and achievement on psychoeducational tests and demonstrated more traits characteristic of ADHD and of social impairment.

QUALITATIVE ANALYSIS

INTRODUCTION

Sources

One of the complicating factors of this part of the analysis was that my conclusions were based on different combinations of sources. I examined all the 34 school records and had extended personal contact with all the students in the process of arranging and conducting the testing. I talked to all the parents on the telephone, in some instances several times. In addition, 20 out of 34 parents and 18 out of 34 students were interviewed. Whenever citing evidence of behavior or giving my conclusions I will note the circumstances of the information sources used.

Overall Impression of Students and Parents

Gompers. During the testing of the Gompers students I was impressed by the seriousness of many of them and by their determination to correct their past mistakes and reach their goal in life. However, some of them came through as impulsive and unrealistic.

I had a chance to talk to all the parents, some of them at length, not only during the interviews but around obtaining parental permission and arranging appointments for testing and for the interviews. I was impressed by their commitment to the children, to the educational process, and to anything that might help the children to find themselves,

which the testing was seen as doing. The interviews took me into their homes and showed me a slice of their lives. Some were on the borderline of abject poverty. Many were maintaining an adequate home in the middle of a substandard area. I was deeply moved by their concern for their children's progress. They expressed pride and trust in the child's decision to put his/her life in order, and they were looking forward to their success.

There were five parents whose children continued to have serious problems. Three were interviewed; I communicated with the other two around the testing, getting the permissions, and trying to arrange interviews which never materialized.

These mothers still managed to have some optimism and pride in past accomplishments of the children. However, their main stance was high anxiety, desperate moves to improve the situation, and short periods of hope which I found out at later contacts had turned into disappointment.

Many of the families I had interviewed struggled with issues of economics and family relationships. The great majority, however, had a definite rhythm to their lives with definite roles and expectations. Their ways of coping included a great deal of reliance on an extended family. This was both a strength and an added source of stress. During interviews I would witness not only the many siblings drifting in and out of the house, but also a great many grand-

children, nieces, nephews, and cousins. They were all accepted and taken care of but the tone of the interactions was often brusque and intolerant.

This was actually one of the differences I noticed between the Gompers families and the Kennedy families (with one exception): not only were many more children present in the Gompers homes, they were treated with more yelling and threats and less individual respect than were the children in the Kennedy homes. It could be argued that the greater numbers of small children and the more difficult circumstances in general could explain the phenomenon. The sense of unity and family support was unmistakable in both groups, however.

The other striking feature of the Gompers group was the absence of serious delinquency: all of them had significantly damaged their school careers by acting out through truancy, sometimes fighting, and breaking other school rules. Some of them would stay away from home after a conflict. But the use of drugs was at a minimum, and stealing or promiscuity was not even an issue. Given that many of them had lived in the most serious crime and drug trafficking areas of Richmond, their record was impressive. Although many of them have had a somewhat wild period around age 14, by the time I met them (age 16 and 17) most of them had decided that the best thing to do was to have a small circle of friends (often they were also relatives) and to gather at

each other's homes for the most of their recreation. The parents were very protective and often strict.

One other factor needs to be noted. Out of the seventeen Gompers children, four had lost a parent through death. There were none in the Kennedy group.

Kennedy. Many of the Kennedy group lived in the same poor areas as the Gompers families. However, they seemed less overwhelmed by circumstances. The majority had fewer children and life seemed less hectic. I was surprised to find a group of young people, mostly black, who in spite of great odds against them were very successful academically, very responsible and goal oriented. With a few exceptions, parent after parent told me that raising this child had been easy and rewarding, although family circumstances were not always simple.

SCHOOL RECORDS

Introduction

The teachers' comments related to the students' behavior interpreted for the coding sheet used in the quantitative analysis were also used as qualitative data to complement information obtained during the interviews. In both instances the comments were examined for evidence of character traits such as impulsiveness, short attention span, distractibility, inability to finish tasks, disorganization, and spatial/temporal problems, which were in-

dicative of ADHD and possibly nonverbal problems. The quantitative analyses have already shown that behavior for the two groups was significantly different from elementary school on and that more Gompers students were in the subcategory of disruptive, impulsive, inattentive behavior, especially in junior and senior high. The qualitative examination of the comments further illustrates the differences between the groups in reference to the above traits.

Gompers School Records

At Gompers, out of a total of 17 students, six (#1, #8, #9, #15, #16, #21) had a mixture of some traits characteristic of ADHD and generally disruptive behavior. Example: (#1) "Disruptive, lack of concentration, inattentive, wastes time, doesn't finish work, many suspensions." One student (#26) had many traits characteristic of ADHD without aggressive or disruptive behavior.

Four students (#6, #14, #18, #30) were described as aggressive and generally disruptive without clear indication of traits characteristic of ADHD: e.g. (#6) "Fighting, defiant, disturbing class." Three students (#2, #7, #28) were described as merely "defiant." Two students (#5 and #25) had no mention of negative behavior except truancy in high school.

The qualitative analysis of the school records offered an opportunity to examine the behavior subcategories more closely and to distinguish which students fit the descrip-

tion of ADHD and which seemed to present a different picture. Comparing the interviews and the school records provided even greater clarity (see p. 158).

Kennedy School Records

By contrast at Kennedy, out of a total of 17 students, only one (#56) had several references to traits characteristic of ADHD and to being generally disruptive. Another four (#47, #48, #50, #51) had either one or two minor references to distractibility or insufficient self discipline. (#48, 5th grade: "Problems with self discipline." High School: "Tardiness--many times.")

Seven Kennedy students (#40, #43, #46, #54, #55, #57, #60) had either nothing recorded under "Behavior" or had one minor negative comment among other positive ones. (#40: "Delightful student; missed many PE periods.) Four students (#42, #45, #58, #63) had strong positive comments and no negative comments. (#63: "Well adjusted, works well with others, liked by peers.)

Summary of Impressions

The general flavor of the comments was quite different for the two schools. The overall strong impression was that one was dealing with two groups that were perceived very differently by school personnel.

The qualitative analysis of the school records does indicate that seven Gompers students and one Kennedy student could possibly be seen as having ADHD. This conclusion was supported during the testing, arranging of interviews, and by the content of the interviews. For two Gompers students the content of the interviews offered a different perspective on the students' behavior, as discussed on p. 157.

THE INTERVIEWS

The interviews took place in the students' homes with the exception of #2, #48, and the parent of #18, which were held in my office; all were audio taped. The tape recordings have been transcribed to allow detailed examination of the content. The first step in the analysis was to summarize each child's transcript. Two examples from each school are included in Appendix L. The transcript summaries were then examined for positive and negative characteristics. Positive here means traits and behavior that contributed to social and educational adjustment, whereas negatives were attributes that tended to prevent social and educational adjustment. Consolidated summaries (Appendix M)

were prepared of these positives and negatives for each student of each school.

The next step was to examine these summaries for specific trends that either supported or rejected the presence of ADHD and/or nonverbal learning problems in the two groups. The framework used was the character traits indicative of ADHD and possibly of nonverbal problems, such as impulsiveness, short attention span, distractibility, inability to finish tasks, disorganization, and spatial/temporal problems.

The following is a discussion of trends, such as school problems prior to high school, coping with the transition from elementary to junior high school, and the tendency to exhibit nonverbal problems in the interaction during testing and interviews. These provide evidence for the presence of the traits associated with ADHD and/or nonverbal learning problems. Unexpected trends that emerged were positive feelings about school, positive childhood memories, and a lack of serious delinquency.

The parents and students were interviewed separately. In most instances parents and students corroborated each other's information. In several cases one would give a lot more information about a circumstance than the other, which seemed mostly due to difference in temperament and ease in communication.

There were some instances of contradiction: the students who exhibited the most obvious symptoms of ADHD (#9, #16, #18, #21) described themselves as having no unusual problems, whereas their parents gave a vivid picture of a long-term struggle in most areas of life, such as learning, behavior, and family relationships. This could have been due to denial on the students' part, or an inability to evaluate one's own performance and impact on the environment, which is a characteristic of ADHD.

In two cases (#7 and #48) the parent seemed unaware of the child's struggles and glossed over any problems, whereas the student described them vividly. The parents of some of the most successful students (#2, #45, #50, and #60) gave a more positive report than the student did, which to me appeared to correspond more to the reality of the situation. The students in these cases seemed overly self-critical.

Gompers Group

I was able to interview seven students[5] and nine parents in the Gompers group. Two of the parents were interviewed without the student, who had left home before I was able to interview him/her (subjects #9 and #18).

From these interviews I learned that three of the students had had problems in school from the very beginning (#7

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[5]An eighth student was also interviewed but was later excluded from the study because she did not fulfill all of the criteria.

with learning only, #16 with behavior only, and #9 with both learning and behavior). Two others (#15 and #1) developed problems in the higher elementary grades (both behavior and learning). The remaining four (#2, #18, #28, and #30) did well until junior high school, but then "fell apart."

For all nine, junior high signaled a significant turn for the worse. They found it very difficult to transfer from a familiar, small elementary school, usually close to home, where the teacher often knew their parents, grandparents, and siblings, to a large junior high school which they found was impersonal, confusing, and much farther from home. Several of them commented that they encountered racial prejudice from classmates and teachers. The overriding complaint was that nobody knew who they were, and only a few people cared about what happened to them. Classes were longer, the classmates a lot harder to know, there was difficulty in understanding the subjects, and the students were embarrassed to ask for help. The high school experience was even worse.

Although the perceived social problems definitely added to the difficulties, it is more probable that these students had difficulty coping with change, with organization in a more complicated environment, and with attending to more difficult subjects for seven hours. All of them said that the regular school day of seven hours at their previous schools had been difficult for them. Gompers' schedule of

three hours per day made it possible for them not to miss school. This might denote short attention span, another sign of ADHD.

Certain problems in the nonverbal area suggest sources of the students' difficulty with organizing themselves to cope, without help, in a more complicated environment, such as having problems with the perception of time, with measurement, and with orientation.

Six of the nine students (#1, #7, #9, #15, #16, and #30) had problems estimating time and were habitually late or would miss commitments entirely, which was amply demonstrated during the testing and the interviews. Three (#1, #7, and #18) reported problems with measurement and orientation. Eight described themselves or were described by their parents as impulsive and occasionally bad tempered and also as having poor judgement (#1, #2, #7, #9, #15, #16, #18, and #28). I observed that two (#1 and #7) had a hard time with logic during the interviews. They would free associate, and go off on tangents. They also had a hard time understanding my questions. The indication was that these students had nonverbal problems as well as ADHD, especially those (#1 and #7) who showed several of the above symptoms.

Two sample excerpts from the interviews will illustrate the kind of information contained in the interviews that led to placing the data into specific categories.

Illustration of temporal and spatial problems. Subject #15 (Gompers). Interview of subject's mother by Olga:

M: He had some real problems with time...

O: ... does it interfere with his life?

M: I think that why he's cut school so much. He can get up on time but he diddles around and he make his-self late. And once he's late then he...doesn't want to show up in the classroom late...Then he won't go to school...he doesn't want to deal with that situation any more. So he cuts... He had a lot of difficulty learning the month in the year sequence... He was 15 before he knew the months of the year one after the other...Still...if you mix them up for him he will probably (still not able to do it). I guess (it is) an embarrassment for him because he told me he did not know the months of the year (during the test).

Illustration of impulsiveness, probable ADHD. Subject #1 (Gompers). Interview of mother, then subject, by Olga:

O: ...So what kind of kid was he like at 10 or 11?

M: He was quiet but he sometimes threw his tempers too. You know, like one time his school cafeteria, he run off one of the teachers and knocked off all of the chairs over and he, he had his days...

(With subject):

S: When I was in the fifth, sixth I used to bring home a report card, all they see is four A's, 2 B's and they was proud....I only had like, I always had a bad judge-ment in citizenship because...you know...like I'm the kind that going to speak my mind. I'm going to tell you how I feel. I used to get a F in citizenship.

O: So they thought you were rude, or what?

S: When I was in the fourth grade...and like you know, these teachers she made me mad...grabbed all on me...so

I cussed her out..I told her my mom was going to beat her up and stuff, start throwing chairs and stuff...
O: ...Do you remember what made the teacher angry when she grabbed you?
S: I think it's because I had a girl in the aisle.-..she made me mad and I hit her in the eye. Teacher started grabbing on me and I was mad...

All of the students mentioned that rules had been difficult to follow in early adolescence, but that by their present age they had realized that it was a necessary part of life, and were willing to accept rules. (This did not withstand the test of time for some of them.)

On the positive side, all but two had nice memories of childhood and did not present any problems until they started school. Six students reported a positive relationship with their parents which was strongly confirmed by the parents. One (#18) had an ambivalent relationship beginning in adolescence. Subjects #9 and #16 experienced problems with all members of the family from early childhood on.

The overriding positive trend in the Gompers group was their positive feelings about Gompers. Every one of them stated that they liked the program and the teachers. They felt appreciated as individuals and believed that the teachers really cared about what happened to them. They were able to learn because of the individualized program and the abundance of help. All of them were determined to make it when I first saw them, but by the time of the interviews, three

had left home after conflicts. Two of the parents agreed to be interviewed anyway, but the third one eventually decided against it, although she talked to me repeatedly on the telephone.

A possible conclusion was that Gompers presented an adaptation of the educational system that was much more appropriate for these students and allowed many of them to succeed. However, a small group presented special needs which could not be handled even by the resources at Gompers.

Kennedy Group

I was able to interview eleven students and eleven parents from the Kennedy group. On the whole the interviews were much easier to arrange than those for the Gompers group. Conducting the interviews was also easier since there were fewer sibling interruptions, and fewer relatives dropping by. Also, most of them had an easier time understanding the questions and "staying on track" within their answers. Two exceptions, #48 and #57, had difficulty in arranging their interviews and described themselves (or were described by their parents) as having problems with time in general. These two as well as #56 were also reported to have spatial visualization problems.

All of these students, and a fourth (#62) also had some problems in school. #48 and #62 started their interviews by saying that they always knew they had learning problems and illustrated this statement with examples of

great frustration from an early age on. They remembered not being able to do at all what others apparently found very easy, such as being able to cut out shapes and to count while in kindergarten, and not being able to grasp the requirements of a course in high school.

These four students (#48, #56, #57, and #62) were, however, the minority in the Kennedy group. The other seven experienced no problems with learning, or with estimating time and space. The preliminary conclusion is that seven Kennedy students were relatively free of the traits denoting nonverbal problems and/or ADHD, whereas the four show evidence of such problems.

Several of my questions addressed the transfer from elementary to junior high school, since this proved to be such a prominent issue for the Gompers students. Most of the Kennedy students experienced the same shift from a small, familiar, often all-black elementary school to a large, more distant, and racially mixed junior high school. Surprisingly, only two students (#56 and #43) expressed having some difficulty when beginning junior high school or in transferring from private to public school. The rest stated that they adjusted quickly to the new setting, and two even said they liked it better because it was more interesting. The question arises here of why these students with SES very similar to the Gompers students were not thrown off and discouraged by an environment that could be

considered alien and confusing, as was the case with the Gompers students. It could be proposed on the basis of my data that the greater incidence of NCD and ADHD in the Gompers group interacted with the families' lesser capacity to be supportive, which led to more behavior problems and made the Gompers students more vulnerable. This would make change more difficult and the new environment less understandable and harder to master. As a result the Gompers group probably presented a different kind of student to the school personnel than did the Kennedy group: one that was more difficult to relate to and to help.

All Kennedy students except #62 stated that school had been a positive experience. Nine students stated that they loved most of it. Several of them recounted good experiences with a favorite teacher who helped them out when the going got rough. Eight of the eleven stated that they missed going to school during vacations, and three of these said that they would rather have been in school than at home.

The question remains of how the four Kennedy students who had problems similar to the Gompers students managed to have a successful school experience. Numbers 56 and 57 (mentioned above as having problems early on) remembered many difficult times with schedules and with understanding directions. They too stated that they loved school, had had several favorite teachers, and were doing well now. A criti-

cal factor seemed to be the amount of help provided by the family or school or both. Subject #48, for example, was the weakest of the group and experienced a great deal of problems. Her family life was very chaotic and could not be supportive. She excelled, however, in singing and acting, and apparently had always received help from teachers who admired her special talents and hard work. She felt she was often the "teacher's pet," in spite of her problems and of barely passing grades. Subject #57, a volleyball champion, also received much help and encouragement from teachers and counselors. Her family was somewhat supportive. The mother of #56 was a teacher who helped her many hours each week all through school. Subject #62 was the one who never liked school. She felt that she succeeded only because of great amounts of help from her father (a Ph.D. scientist) and several tutors.

The Kennedy students' functioning in the areas of responsibility and dependability was striking. Nine of the parents stated that the student had been very easy to raise, had been law-abiding since childhood, and could be trusted with difficult tasks. Two of the parents described an ambivalent relationship with the child (in one instance both mother and daughter had been in therapy). However, even these parents stated that in spite of some difficulty between them and their children, they recognized that the student was overall very responsible and was doing well.

Summary and Discussion

The data shows a clear difference between the two school groups. There was ample evidence in the interviews of the nine Gompers students of traits characteristic of ADHD and/or nonverbal problems. Six of the nine had problems with time, and seven were described as impulsive. Three had problems with measurement and orientation. All of them found it difficult to sit in school for more than three hours, which could be indicative of a short attention span.

The difficulty and the disorientation experience by all the Gompers subjects in junior high school could be a reflection of the revealed difficulty with time, space, and organization. Suddenly they had to negotiate seven subjects, seven teachers, different classrooms, lockers, assignments. They found change difficult and disorienting.

For the majority, the disorganization in their lives and their difficulty with time and space were best demonstrated during my efforts to arrange a time and place for our meetings: a process that took as long as six weeks and up to three aborted efforts with some students. Several of the families themselves were disorganized and therefore interplayed with and probably augmented any problems the students had with time and organization.

The success of the majority at Gompers could be ascribed to the individual attention from the teachers which allowed a program geared to their unique learning style and

problems and gave them the help they probably had needed for a long time. It gave them a structure that they could manage that was not available in a regular high school.

The picture was very different in the Kennedy group. Nine of the eleven interviews were very easy to arrange. Some of the students actually called me. If a change in arrangements was necessary, they called again. With these nine students there was only one aborted contact, which was caused by the stepmother rather than by the student.

Two Kennedy students had spatial-temporal problems and, not surprisingly, also presented great problems in arranging interviews. Three tries were necessary for one of them. These two were among the four who had problems in school. However, these four students did not develop long-term behavior problems; only one (#56) had a problem transferring to junior high school, and one of them (#62) reported not liking school. At closer examination it seemed that the difference between the four Kennedy students who had problems and the Gompers group can be accounted for by the relationships the former developed with their teachers, and the special help they received from teachers or parents which helped them to compensate for their specific problems.

Unforseen Trends. For the majority in both groups the relationships between children and parents were better than I had anticipated. The Gompers group had a low incidence of serious delinquency, whereas in the Kennedy group even con-

flict between parents and children appeared minimal. For young people between the ages of 15½ and 18 who live in very trying circumstances this is an unexpected finding. The strong sense of community that I found in both groups was also an unexpected positive finding.

COORDINATION OF ANALYSES

QUANTITATIVE ANALYSES

Comparison of the Three Data Sources

The results of the comparison of the three sources of quantitative data--the demographic sheet, the psychoeducational tests, and the school records--show some significant differences between the two groups. Although many SES factors (ethnicity, income level, area of residence) were well matched, the Gompers families experienced more difficult living circumstances because of some difference in employment status, and significant differences in family status and number of siblings. The Gompers students showed a higher proportion of NCD in the nonverbal area on psychoeducational tests, and the school records showed more students with indication of ADHD traits, as well as more students identified as learning disabled. All of these were predicted in the first and third hypotheses. One of the predictions in the first hypothesis, that there will be significant difference in the verbal area, was not substantiated.

The Gompers students did seem to be at least relatively successful in elementary school, but by junior high school their academic progress was seriously compromised. Behavior, however, was different from the beginning of school.

It can be assumed that we are probably dealing with the interaction of several variables rather than a causal rela-

tionship: the interaction between NCD, ADHD traits, and more overwhelming family circumstances which led to less family support. The result was probably a more vulnerable child in an environment less equipped to deal with him/her. The behavior problems manifested from the beginning of school could have been partially caused by ADHD and/or by the above-mentioned interaction. Frequent changes of schools were probably the result as well as the agent of a difficult school experience.

All in all, conditions were created that provided the student with a different exposure that could have impeded normal development. NCD would be magnified rather than successfully compensated for. These risk factors added up and pushed the student in one direction (toward Gompers) rather than the other (Kennedy).

QUALITATIVE ANALYSES

Comparison of the Three Data Sources

The three sources of qualitative data were school records, interviews, and my own clinical observations. It was essential to consider them together in forming an accurate assessment of the student. In a few instances the school records or the interviews if taken by themselves would have provided a misleading picture. Comparison of the information on individual cases from several sources of data gives a much clearer understanding of the subjects and presents a

more accurate picture of the nature of their problems than can be derived from any one source.

For example, student #2 was described in the school records as defiant and fighting. There was no mention of traits characteristic of ADHD, nor was there during the interview with her and with her mother. It also became clear that the isolated incidents of aggressive behavior were not characteristic of the student, and that in perspective she had neither ADHD nor any serious learning or behavior problems. Conversely, student #18 was found to be a great deal more troubled and presented a more clear picture of ADHD from the information gathered during the interview and from my own observations than could have been concluded from the school records, which described him only as truant and defiant.

On the other hand, #56 presented herself during the interview as successful in school and not experiencing any problems. Questions based on my knowledge of the school records and the fact that she had not passed the Piagetian Tasks elicited the history of a difficult struggle through elementary school with learning and behavioral problems, and information about a great deal of help from her mother.

In summary, the school records and the interviews do support each other in the finding of a much greater incidence of traits and characteristics of ADHD and nonverbal problems in the Gompers group. Even though academically the

Gompers students were doing well in elementary school, their behavior was already a problem. Faced with the more complicated and unfamiliar environment of the junior high school they found it very difficult to function. One can assume that their problems with orientation, perception of time, and organization in general, as revealed in the interviews, through direct observation, and as also shown in the results of the quantitative analysis, contributed to their difficulty in dealing with the junior high school environment.

The tone and content of the teachers' comments in the Gompers school records make it clear that these students were seen as difficult to teach and help. This feeling might have been inadvertently communicated to them and would have contributed to their feeling of alienation and eventual deterioration of functioning.

By contrast, the majority of the Kennedy students had a very positive experience in elementary school, with only minor behavior problems, if any. Although the shift to junior high school presented them with the same issues of more complexity and ethnographic differences, they were able to respond to the challenge and establish good relationships with the teachers. The four Kennedy students who did have problems in school and were also found to have nonverbal or other learning problems still managed to have a successful school career. This was probably due to the special help

they received from the teachers or their parents, as discussed above (p. 154).

COORDINATION: QUANTITATIVE WITH QUALITATIVE ANALYSIS

The quantitative and qualitative analyses support each other in finding the study group (Gompers) to have more neurocognitive differences in the nonverbal area, more identified learning disabled students, and more students with ADHD, as the first and second hypotheses predicted. Further, when presence of such disorders was revealed among the comparison group (Kennedy) there seemed to be circumstances that mitigated the development of social maladaptation and further development of learning problems. The integration of these analyses yields patterns that reveal a very different path for the Gompers and Kennedy students.

The interviews showed us that both the Kennedy and the Gompers families in the majority of cases offered strength and support to the children, and that the students in both groups had happy memories of childhood. However, the objective data of the demographic sheet alluded to much more trauma and stress in the Gompers families through death, divorce, and larger families. The school records showed more moves and changes of schools.

Direct observation during the interviews revealed basically concerned and loving families for both groups. However, in the Gompers group most of the families had to deal

with more economic and psychological stress; they were also more disorganized, less sophisticated, and less skillful in dealing with children. The parents of those Gompers students who showed early signs of ADHD described the many struggles with the child's problems at home and at school.

In spite of all the above factors, the parents and students maintained that things went well in elementary school although behavior problems were present. Gompers students and parents viewed the breakdown in junior high school as caused by external circumstances.

Although junior high school was undoubtedly more stressful than elementary school, it was handled without any major problems by the Kennedy students, who had to deal with the same issues, sociologically and educationally. One possible explanation is that even a minor difference in the original endowment of the children in the form of nonverbal problems and/or ADHD traits interacted with an environment that could not help them compensate for and probably aggravated the problems. They still seemed to make satisfactory progress as long as they were in the protected environment of their neighborhood school. Faced with a more complicated environment and educational process in junior high, the learning and behavior problems surfaced and caused them to fail.

The majority of the Kennedy group demonstrated no traits that would denote nonverbal problems or ADHD or any

learning problems. Their family lives were less stressful and their parents seemed more capable of providing an environment conducive to optimum development. Looking at the four Kennedy students (#48, #56, #57, #62) who did have either nonverbal problems, signs of early ADHD, or other learning problems, we see that either the families were very capable and active in helping them (#56 and #62 compensate, and/or the students received an unusual amount of support from the school as a response to their special talents (#48 and #57).

Thus it appears that in the presence of NCD and ADHD, special support can help a child to compensate for weaknesses and develop strengths. This was provided to the four Kennedy students, but does not appear to have been available to the Gompers students. However, Gompers itself seems to have provided some of that help through an individualized program for each student which allowed most, but not all, to succeed. Perhaps those who did not might have if even more specialized and extensive help had been available.

COORDINATION: PIAGETIAN TASK DATA WITH ALL OTHER DATA

The analyses of the different parts of the study have shown that all three hypotheses were supported by the results, except for one part of the first hypothesis, which dealt with discrepancies in the verbal area. The latter was

predetermined by the use of the PPVT to make the groups comparable in verbal ability.

The next step is to relate results from the analysis of the Piagetian Tasks to the results of analyses from all other sources of data. In other words, what remains is the exploration of the presumption that the students who failed the Piagetian Tasks would be likely to have more discrepancies between ability and achievement on psychoeducational tests of nonverbal ability, that more of them would be identified as learning disabled, and that more of them have traits characteristic of ADHD.

Table 16, Correlation[6] of Piagetian Task Failures and Other Attributes under Study shows how subjects who failed the Piagetian Tasks correlate (YES or NO) to the presence of attributes under investigation: learning disabilities as identified from school records and interviews; ADHD traits as determined by school records, interviews, and observation; NCD in the nonverbal areas (determined by two or more significant discrepancies in the psychoeducational test scores analyses); and nonverbal problems as determined by interviews and observation.

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[6] The term "correlation" denotes a relationship (either positive or negative) between two sets of data. It is not used in a statistical context, and was chosen in preference to the terms "co-variance" or "relationship" for the sake of clarity.

TABLE 16. CORRELATION OF PIAGETIAN TASK FAILURES AND OTHER ATTRIBUTES UNDER STUDY

Gompers

ID #	ATTRIBUTES L.D.	ADHD	NCD	NON VERB	YES SCORE
01	NO	YES	YES	YES	3
06	NO	UNK	NO	UNK	0
09	YES	YES	NO	YES	3
16	NO	YES	YES	YES	3
18	YES	YES	YES	YES	4
21	YES	YES	YES	YES	4
26	YES	YES	NO	YES	3
27	UNK	UNK	YES	YES	2
28	NO	NO	NO	YES	1

Kennedy

ID #	ATTRIBUTES L.D.	ADHD	NCD	NON VERB	YES SCORE
48	NO	NO	YES	YES	2
56	YES	YES	YES	YES	4
57	NO	NO	YES	YES	2

YES = Positive correlation NO = No correlation

UNK = No data

Note: YES scores reflect positive correlation between failure of Piagetian Tasks and attributes under study.

Expected YES scores of those who failed: High (3 OR 4).

TABLE 17. CORRELATION OF PIAGETIAN TASK PASSES AND OTHER ATTRIBUTES UNDER STUDY

Gompers

ID #	ATTRIBUTES L.D.	ADHD	NCD	NON VERB	YES SCORE
02	NO	NO	NO	NO	0
05	YES	NO	YES	UNK	2
07	NO	NO	NO	YES	1
08	NO	YES	NO	NO	1
14	NO	NO	NO	UNK	0
15	NO	YES	NO	YES	2
25	NO	NO	NO	UNK	0
30	NO	NO	YES	YES	2

Kennedy

ID #	ATTRIBUTES L.D.	ADHD	NCD	NON VERB	YES SCORE
40	NO	NO	NO	NO	0
42	NO	NO	YES	NO	1
43	NO	NO	NO	NO	0
45	NO	NO	NO	NO	0
46	NO	NO	NO	NO	0
47	NO	NO	NO	UNK	0
50	NO	NO	YES	NO	1
51	NO	NO	NO	NO	0
54	NO	NO	YES	NO	1
55	NO	NO	NO	NO	0
58	NO	NO	NO	UNK	0
60	NO	NO	NO	NO	0
62	NO	NO	YES	NO	1
63	NO	NO	NO	UNK	0

UNK = No data

YES = Positive correlation

NO = No correlation

Note: YES scores reflect positive correlation between passage of Piagetian Tasks and attributes under study.

Expected YES scores of those who passed: Low (0 OR 1).

Portions of the correlation tables were hampered by missing data elements--not all of the students were interviewed, and some of the sources did not provide enough information in a particular category. Such elements are indicated by "UNK," and are not counted as a positive correlation. As such, the tables are useful as coordination indicators rather than as bases for statistical analysis.

Table 18 summarizes the results of tables 16 and 17. When students are grouped according to their success or failure on the Piagetian Tasks within each school and the findings on each student from all of the sources are compared it is clear that those who failed the Piagetian Tasks were also much more likely to have identified learning disabilities, NCD in the nonverbal area, ADHD traits, and nonverbal problems. This gives concurrent validity to the findings, i.e. the correlation of results derived from different techniques.

A further finding is that the pass-fail Piagetian Task pattern correlates across school lines (Tables 18.3, 18.4, and 18.5). Those from either school who passed the Piagetian Tasks had a much lower incidence of positive correlation to the other categories. Out of the twenty two students who passed the Piagetian Tasks, nineteen had either zero or one positive correlation, three had two positive correlations, and none had three or four. Conversely, out of the twelve who failed the Piagetian Tasks, only two had zero or one

TABLE 18. SUMMARIES OF PIAGETIAN TASK CORRELATION AND OTHER ATTRIBUTES UNDER STUDY

TABLE 18.1 GOMPERS PIAGET PASS-FAIL SUMMARY

	0 or 1 YES	2 YES	3 or 4 YES	Total
PASS	5	3	0	8
FAIL	2	1	6	9

TABLE 18.2 KENNEDY PIAGET PASS-FAIL SUMMARY

	0 or 1 YES	2 YES	3 or 4 YES	Total
PASS	14	0	0	14
FAIL	0	2	1	3

TABLE 18.3 PASS PIAGET GOMPERS-KENNEDY SUMMARY

	0 or 1 YES	2 YES	3 or 4 YES	Pass Total
GOMPERS	5	3	0	8
KENNEDY	14	0	0	14

TABLE 18.4 FAIL PIAGET GOMPERS-KENNEDY SUMMARY

	0 or 1 YES	2 YES	3 or 4 YES	Fail Total
GOMPERS	2	1	6	9
KENNEDY	0	2	1	3

TABLE 18.5 ALL STUDENTS PIAGET PASS-FAIL SUMMARY

	0 or 1 YES	2 YES	3 or 4 YES	Total
PASS	19	3	0	22
FAIL	2	3	7	12

"YES" indicates a positive correlation to study attributes.

positive correlation, three had two positive correlations, and seven had three or more. It can be concluded that the results of the study obtained by different techniques do support each other.

It also appears that failure or success on the Piagetian Tasks is a very good indicator of the child's functioning in at least three of the areas investigated in this study. Specifically, five of the six students identified as learning disabled failed the Piagetian Tasks; seven of the nine who had traits characteristic of ADHD failed the Piagetian Tasks, as did eleven of the fourteen who had indication of nonverbal problems. Within the framework of this study, failure on the Piagetian Tasks is a good indicator of problems in other areas.

The significantly higher rate of failure on the Piagetian Tasks of the Gompers students adds another important dimension to their difficulties. According to Piaget (1932) and Voyat (1982), inability to perform Concrete Operational Tasks would indicate the inability to go beyond the directly observable and to coordinate several observations. In the moral area it means that he/she does not understand rules separate from the situation, the intent of the rules, or differences of points of view.

Social cognition is defined as a subfunction of general cognition, although somewhat autonomous from it (Kohlberg 1964, Malerstein and Ahern 1982), and is also defined as the

manner in which social and emotional information is processed (Malerstein and Ahern 1982). If this is so the students who have not reached the stage of Concrete Operations would have problems not only with general cognition but also with social cognition: they would have difficulty generalizing a rule and knowledge from one situation to the next, coordinating one point of view with another, and seeing events and values as stable in the face of different situations and points of view. The academic and social expectation of the junior and senior high schools certainly require coordination of different situations and points of view, and generalization of knowledge and rules. Since the same group had a high incidence of ADHD and nonverbal problems affecting their perception and organization of time and space, it would appear that these students had to face almost impossible odds in the academic, social, and physical realm of a junior high school.

Special help and resources by parents and/or school would have been required to make it possible for the Gompers students to succeed in the very complex environment of an inner city junior and senior high school. This special support was available to the three Kennedy students who failed the Piagetian Tasks and yet had a satisfactory academic and social experience.

Quantitative and qualitative approaches proved complementary in exploring the assumption that NCD is an import-

ant factor in the makeup of socially maladapted adolescents. Quantitative measures provided information allowing for a comparison of the two groups on the basis of established norms. The qualitative analysis put the psychoeducational testing information into the context of the actual situation of each subject. Although the numerical data provided many clues why some subjects were having problems and others were not, it is the combination of this information with the linguistic data and clinical observations that allows for real understanding of the adolescent's functioning.

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CHAPTER V. DISCUSSION AND IMPLICATIONS

The main purpose of the study was to explore the hypothesis that NCD are one of the important factors in the makeup of maladapted adolescents. It focused on the differences between a group of adolescents defined as maladapted because they could not conform to the academic and behavior requirements of a regular high school and a group of students who were attending a regular high school. A greater incidence of NCD was found among the maladapted adolescents. The data also revealed a different pattern of experience among the two groups which highlighted the types of difficulties NCD children experience. It was also found that the social environment is an intervening variable that can either hinder or facilitate an adaptation to the NCD.

SUMMARY OF FINDINGS

The study addressed three main hypotheses:

1. The study group will have a significantly higher proportion of adolescents with neurocognitive differences as defined by psychoeducational tests. Some of these differences will fit the legal definition of learning disabilities, while others will represent a significant difference from the norm but will not fall into the official learning disability category. The preponderance of these differences is in the nonverbal category.

2. The study group will have a larger proportion of adolescents with attention-deficit hyperactivity disorder, as determined through interviews, from the examination of school records, and from clinical observation.

3. The study group will have a significantly higher proportion of adolescents who have not reached, in part or in full, the developmental stage of Concrete Operations as determined by their performance of Piagetian Tasks.

The findings confirmed the first hypothesis in that among the study group significantly more NCD in the nonverbal area was found, as well as a higher proportion of certified learning disabled. The expectation of more NCD in the verbal area was not confirmed.

The second hypothesis was confirmed in that a higher proportion of adolescents with ADHD was found among the study group.

The third hypothesis was confirmed in that the study group had a significantly higher number of adolescents who had not reached the developmental stage of Concrete Operations.

Results obtained by different techniques supported each other, in that those students who failed the Piagetian tasks were also much more likely to have identified learning disabilities, NCD in the nonverbal area, ADHD traits, and nonverbal problems.

Additional findings included significant differences between the groups in that the study group families were much less likely to be intact, had significantly more children, and were much more likely to have unstable employment histories. The two groups were shown to be similar in academic achievement in elementary school whereas behavior was significantly different. In junior and senior high schools both behavior and academic achievement were significantly different. During administration of the Piagetian tasks the adolescents with a firm grasp of Concrete Operations could be readily distinguished in their approach to the task from those who are still struggling with its mastery.

Unexpected findings for both groups included concerned and committed parents, a strong sense of community, and

positive feelings about their present school situation (both Kennedy and Gompers). In spite of the fact that many of the adolescents live in areas marked by poverty and other social problems, the study group had a low incidence of serious delinquency, and in the comparison group even conflict between parents and children seemed at a minimum.

INTERPRETATION OF FINDINGS

The finding of a greater number of neurocognitively different adolescents in the study group points to a significant association between social maladaptation and the presence of NCD. Maladaptation was found to be one of the possible results of a longstanding pattern of difficulties in coping with academic and social learning. This pattern manifested itself in behavior problems in elementary school and difficulty in transferring to junior high school, where academic performance and behavior were seen to deteriorate, and led to exclusion from the regular program. These problems did not occur in the control group even in the few cases with NCD. The four students from that group who did show NCD had received special help from parents and/or school which helped them to compensate for the difficulties.

Analysis of the data revealed a very different path for the Gompers and Kennedy students. Although both groups, on the whole, had concerned and loving families who offered

strength and support to the children, the Gompers families had more trauma and stress in the form of death, divorce, larger families, and numerous school transfers. Most of them had to deal with more economic and psychological stress, were more disorganized, less sophisticated, and less skillful in dealing with children.

Although the two groups were well matched for race, income, and residence, significant differences in employment status, number of children, and family status were found. All of these socioeconomic factors can impact neurocognitive functioning in the opinion of Amante et al. (1977), Deutsch (1964), and others--predominantly in the pre-1980 literature.

The greater incidence of ADHD, nonverbal problems, and identified learning disabled in the Gompers group denotes special vulnerability to behavior problems, as amply illustrated in the literature. The state of high arousal, impulsiveness, and lack of age-appropriate social responses (all traits typical of ADHD) impact the environment in a powerful way and create an excessive number of negative interactions (Goldstein 1985; Levine 1987, 1988). Inability to organize one's time and space and difficulty in social perception that reflects nonverbal problems interfere with the development of age-appropriate social skills and communication (Johnson 1987, Myklebust 1975, Wiig 1984a, b). These characteristics in the context of the families' lesser

capacity to be supportive seem to impede optimal development and prevent the successful compensation of NCD.

The behavior problems evidenced in the elementary school records of the Gompers group are probably the result of the aforementioned interaction as well as being intrinsic to the syndrome of ADHD (Goldstein and Goldstein 1986). Although only a few Gompers children were reported as having had problems before school, a significant number are so described in elementary school. Goldstein (1985) states that school in the middle years is a negative experience for the ADHD child. The child bothers the teachers and the other students because he/she is immature and socially incompetent. The school district tried numerous school transfers in an apparent effort to find a better environment for many of the Gompers children. By late elementary school many of them were not only seen as very difficult but had clearly had a different exposure than the Kennedy children.

When the Gompers students transferred to junior high school they were faced with an unfamiliar and much more complicated environment which required some level of competence with organization of time, space, and schedules, presenting a major hurdle for those with ADHD and with nonverbal problems (Levine 1987, 1988; Thompson 1985c). They would be also expected to have reached the level of Concrete Operations as pointed out by Wiig (1984a), which many of the Gompers students had not, since they had failed the Piaget-

ian tasks. Therefore they would be perception bound, unable to generalize rules and knowledge from one situation to the next, and unable to coordinate one point of view with another (Piaget 1932, Voyat 1982, Malerstein and Ahern 1982). All of these competencies are expected in the academic and social realms of the junior and senior high schools (Wiig 1984a).

We see a snowballing effect of risk factors adding up and interacting with the environment and finally leading to the exclusion of the child from a regular school program. This longstanding pattern of difficulties did not occur in the case of the adolescents in the control group which, with a few exceptions, was free of NCD, ADHD, and nonverbal problems. Most of them did not have behavior problems in elementary school and in junior and senior high school, and are described as delightful young people who were a pleasure to teach and help. Those Kennedy students who did show NCD, nonverbal problems, and/or did not pass the Piagetian tasks still managed to have a successful academic career. Although all four are reported as struggling in some areas in elementary school, by senior high school they are described by the school and their parents as successful young people, even when some academic problems remained. Closer examination of the data shows that special help from parents and/or school made it possible for them to compensate for weaknesses and to develop strength.

The study suggests that in the presence of NCD the social/educational environment can act as an intervening variable, either reducing or augmenting the severity of both learning and social impairments. Furthermore, when the familial environment is lacking, enhancement and adaptation of the educational environment can help the NCD child to develop social and learning skills which lead to a more successful overall adaptation.

Underlying the study of the relationship between NCD and maladaptation is the reconceptualization of learning difficulties in the broader more inclusive category of neurocognitive differences, which is potentially more valuable for research and for practical application. People in the field have expressed the need to look at variations of cognitive functioning along a continuum (Levine 1987) rather than making a dichotomy between normal and disabled (Gelzheizer 1987). Using the broader category of NCD the study demonstrated that it is possible to pick up considerable variations in cognitive functioning that do not qualify as diagnosable learning disabilities and yet contribute to unsuccessful academic and social adjustment. Thus a need for help can be discovered that would be missed by standard assessment procedures. Richardson (1985), Levine (1987), and Myklebust (1975) advocate an approach that focuses on a subject's difficulties in functioning in the mainstream and on guidelines to necessary intervention. Using the broader

conceptual category, the study discovered many adolescents with ADHD, nonverbal problems, and difficulty in functioning on the Concrete Operational level, signalling the type of difficulties these students would have to overcome to negotiate the regular junior and senior high school. Since some of the control group also showed NCD but were able to adapt to the regular environment, a few indications of the kind of help needed to compensate for the NCD have evolved from the study.

QUESTIONS AND ISSUES

The conclusions of the study--that the adolescents who were found to have NCD and were also living in a more disorganized environment developed maladaptation because their environment could not offer them help in compensating for the NCD--might be challenged by the assertion that the disorganized environment actually created the NCD as well as the ensuing maladaptation. This would be in concordance with the findings of Amante et al.(1977), Deutsch (1964), as well as echo one of the hypotheses tested but found wanting in the Link study (Dunivant 1982, Crawford 1982a).[1] The present study could be seen as offering some evidence that

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[1] Hypothesis #5 of the Link study stated that both learning disabilities and juvenile delinquency were caused by sociodemographic factors rather than the cognitive and personality characteristics of the young person. This hypothesis was disproved by the findings (Dunivant 1982).

the environment alone may not produce maladaptation. At least two students in the control group lived with chaos and with very poor functioning of their immediate family. Yet their own functioning was not only adequate but superior in most areas.

On the other hand one must point out a group of four students in the study group who continued to have severe problems in spite of a great deal of help from their families and from Gompers. Three of the families were very stable. At my last contact with the school or with their parents all four had dropped out of Gompers and left home under hostile circumstances. Their neurocognitive differences were severe. Three were diagnosed learning disabled and one had severe ADHD. All had failed at least one of the Piagetian tasks. A possible conclusion is that in the case of severe NCD the resources of a normally supportive family and a specialized program like Gompers are not sufficient to compensate for the difficulties. Polombo (1984) addressed this issue by pointing out that in the case of severely neurocognitively impaired adolescents the organic factors may act to set limits on the extent to which they are capable of eliciting and profiting from available nurturance.

The two groups described here illustrate the wide range of responses people may have to conditions in the environment. For those students who could take full advantage of what the environment had to offer, the regular high school

proved to be a wonderful resource. The failure of the study group to adapt to the regular high school's norms was not due so much to a lack of a good program or (especially) of dedication on the part of the teachers, as to a lack of full realization by the public school system that a considerable adaptation of the regular high school program might be necessary for a sizeable number of students who have problems functioning in the mainstream and yet who do not fit into a special education category and cannot (and should not) be labeled or considered disabled.

LIMITATIONS OF THE STUDY

The sample obtained was limited by the selection process, which depended on the school staff and on the ability of the students to follow through. As a result this sample was probably more problem free than the population of the school in general. This seemed to have been true for both schools.

It is likely that the greater availability of females biased the results in the direction of fewer LD and ADHD traits because males are known to be more likely to have these characteristics. Finally, if the learning disabled had not been consciously excluded from admission to Gompers, many more of them may have been found within the study group.

These three limitations bias the study in the direction of finding fewer NCD subjects than would be found in a truly representative sample. That significant numbers of them were found in spite of these biases lends more validity to the findings.

The other limitations were (1) the relatively small size of the sample which limited the significance of the ChiSq results, and (2) the unavailability of a full measure of ability , e.g. WISC.

CLINICAL IMPLICATIONS

If attention is directed to the possible presence of NCD when behavior in school is observed to be maladaptive, clinical intervention can be geared to help in compensating for the special difficulties. Family strength and dynamics would obviously remain critical factors, but the direction of the work would have a new emphasis. The work with the child would need to focus on the development of coping mechanisms and techniques, and the emphasis with the family would involve the need to supply special help to a vulnerable offspring.

Here it should be pointed out that the Piagetian tasks would be a simple, efficient diagnostic tool. Chabot (1977) and Delaney and Fitzpatrick (1976) state that performance on Piagetian tasks is an essential adjunct to IQ measures and

to psychiatric diagnoses, allowing the planning of intervention to be more precise and realistic. The present study demonstrated that failure to perform the Piagetian tasks related closely to the presence of other special problems such as nonverbal learning problems and ADHD. In clinical practice failure on the Piagetian tasks might point to the need for a detailed diagnostic workup, as well as perhaps clarify the interventions needed.

SUGGESTIONS FOR FURTHER STUDY

White (1985) found no difference in performance of conservation tasks between learning disabled and normal adolescents. On the other hand Chabot (1977), Delaney and Fitzpatrick (1976) and Lerner and Lehrer (1972) found that learning disabled as well as socially deviant and seriously emotionally disturbed subjects experienced great difficulty in performing conservation tasks. Chabot states that performance on Piagetian tasks related to the child's ability to learn much more directly than IQ measures. My study found that performance on Piagetian tasks related closely to nonverbal learning problems and to ADHD, as well as to diagnosed learning disabilities. The above studies were performed on diverse populations. Chabot studied preadolescent boys; White, Delaney and Fitzpatrick, and Lerner and Lehrer

studied adolescents of both genders, and my study looked at a predominantly female population of late adolescents.

Since the majority of the findings point towards a close positive relationship between performance on Piagetian tasks and other problems of learning and behavior, there seems to be a compelling reason to explore this phenomenon further. If a large, well-matched and well-controlled study could confirm these findings, performance on the Piagetian tasks could be used as a simple, cost-effective diagnostic tool that does not require sophisticated training to administer. The use of such a screening tool would seem especially important at the beginning of junior high school (approx. age 12) when mastery of Concrete Operations is assumed and the absence of it spells potential troubles. This could be a screening tool either for the whole school population or for those who already show some signs of problems.

CONCLUDING REMARKS

The introduction to this study addressed the growing understanding that profound inborn differences exist among people, and that people function along a continuum of normal variations. Considerable variations from the norm (in either direction) seem to be part of the normal human condition. If this premise is accepted the need to adapt regular

institutions and programs to accommodate a wider range of variations will be approved, and compensation for differences will be built into the regular planning and operation of the human services delivery systems.

* * * * *

APPENDICES

APPENDIX A

LEARNING DISABILITIES: DEFINITIONS AND SOURCES

Adapted from Vaughan, R., and L. Hodges. "A Statistical Survey into a Definition of Learning Disabilities: A Search for Acceptance." Journal of Learning Disabilities 6 (Dec. 1973): 658-64 (68-74). From Table 15-1, "Definitions and Sources."

A. A child with a learning disability is any child who demonstrates a significant discrepancy in acquiring the academic and social skills in accordance with his assessed capacity to obtain these skills. In general, these discrepancies are associated with specific disabilities such as: gross motor, visual memory, visual discrimination, and other language related disabilities. (Baer, as cited by McDonald 1968)

B. An identifiable perceptual or communicative handicap is an impediment in one or more of the basic learning processes involved in the understanding or reception, organization or expression of written or spoken language. This includes a condition referred to as a specific learning disorder, rather than a learning problem which is primarily due to speech, visual, hearing, or motor handicaps, limited intellectual functioning; emotional disturbance; or to environmental disadvantages. [State Advisory Comm. on Spec. Ed. 1972]

C. The term is used as a generic one which covers any difficulties in acquiring knowledge possessed by children (or adults) with average (or above) intelligence. (IQs approx. over 75.) (Bannatyne, as cited by McDonald 1968)

D. It is synonymous with marked underachievement. It is not seen as a population of children or another discrete category of handicapped children. Rather it is a new way of looking at children who have difficulties in school. It is part of a school based classification system which includes "behavior disorders." It thus cuts across traditional categories of handicapped children and represents a departure from the medical model to a more appropriate school based model. (Trippe, as cited by McDonald 1968)

E. Learning disability refers to one or more significant deficits in essential learning processes requiring special education techniques for remediation. Children with learning disability generally demonstrate a discrepancy between

expected and actual achievement in one or more areas, such as spoken, read, or written language, mathematics, and spatial orientation. (Kass and Myklebust, 1969)

F. The term "children with specific learning disabilities" means those children who have a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell or do mathematical calculations. Such disorders include such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Such terms do not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, of mental retardation, of emotional disturbance, or of environmental disadvantage. (HEW, 1970)

G. Learning disabilities are the presumptive product of disturbances in the normal time-table of development. Uneven levels of functioning, with performance in some areas within or above age level expectancy and in others below, are characteristic of such disruption. (Gateway School [McDonald 1968])

H. Children whose behavior is characterized by disorganization and difficulty in the development of generalization to a degree which interferes with their education progress. Because of their failure to generalize, special educational presentations and special learning situations are required. (Kephart, as cited by McDonald 1968)

I. A learning disability refers to an educationally significant discrepancy between estimated intellectual potential and actual level of performance in one or more of the processes of speech, language, perception, behavior, reading, spelling, or arithmetic. (Chalfant, as cited by McDonald 1968)

J. A learning disability is an impediment to the learning process and exists, to a varying degree, when conditions in the educational process and/or specific functioning of the child are such that a child's normal progress toward stated objectives of the school district's general educational program cannot be maintained without intervention by specialized personnel, materials, educational strategies, and/or modifications of the educational process. [Colorado Vail Conference, 1972]

APPENDIX B

NEUROPHYSIOLOGICAL SUBSTRATA

THE BRAIN: STRUCTURE AND FUNCTION

Some familiarity with the structures of the brain and their functions is necessary for even a superficial understanding of the neurophysiological substrata of neurocognitive differences.

The oldest part of our brain is the brain stem, which is directly above the spinal cord and deals with basic survival, like breathing and heart rate. It also contains the reticular formation, which controls the level of wakefulness and alerts the organism to incoming information through connections with all the other areas of the brain.

As the human species developed, this primitive brain was not replaced but rather added on to.

Attached to the brain stem is the cerebellum, which originally controlled balance, body position, and movement in space. Later, storage of simple memories was added to its function. Immediately above the brain stem is the limbic system. It contains the olfactory bulb, stores memories, and regulates body temperature, blood pressure, heart rate, and emotional reactions that have to do with survival: sexual desire, and self protection through fighting and fleeing.

The part of the limbic system that is the main "control station" is the hypothalamus. It connects to several other structures, including the pituitary.

On both sides of the limbic system in each hemisphere are the basal ganglia, consisting of several different structures. In the middle of the limbic system is the thalamus, which is the gateway to the cortex. Sensory input synapses (except olfaction) take place in the thalamus before being relayed to the cortex.

As mammals developed further, the cortex was added to respond to new demands of the environment. In humans it is 1/8 inch thick and is folded over many times to fit into the human skull, which has to be small enough to fit through the birth canal. It is the outside surface part of the two cerebral hemispheres.

The cortex is the executive branch of the brain responsible for making decisions and judgments and initiating programs for action, coding and storing information.

The areas of the brain that are important for processing language are in the two cerebral hemispheres, each of which has four major lobes: frontal, parietal, temporal, and occipital. The surface part of the lobes is the cerebral cortex. There are many connections between the two hemispheres. The main one is the corpus callosum.

Each of the lobes has a primary projection area that contains cells that receive sensory input or send motor output. The occipital lobe receives visual input, the temporal lobe receives auditory input, and the parietal lobe receives tactile and kinesthetic input. The frontal lobe deals with the organization of motor activity and is in charge of such higher functions as decision making and planning.

These primary areas project only to their secondary association areas, and all these secondary association areas project to the region of the interior parietal lobule (angular and supramarginal gyrus).

The two hemispheres are <u>not</u> symmetrical.

In right handers and the majority of left handers the left hemisphere mediates language. The right hemisphere mediates visual-spatial, emotional, and other nonverbal processes. The left hemisphere is viewed as the linear, analytic, and logical hemisphere, and the right hemisphere as the holistic, nonlinear, gestalt hemisphere.

The brain has been divided into about 200 areas by neurologist Brodman based on differences of function and cell structure. The motor part of speech is controlled by area 44, or Broca's area, whereas speech comprehension is controlled by Wernicke's area, part of Brodman's area 22. Problems of language usually involve both of these areas, as well as the rest of the perisylvanian region, which is adjacent to the Sylvanian fissure, which divides the temporal lobe from the frontal and parietal lobes.

Marian Diamond (1985) reviewed the structure and the synapse of neurons. Nerve tissue consists of neurons and glial cells. Neurons are designed to receive and transmit information and store it. Glial cells, which develop earlier, seem to be designed to serve as nursemaids, being in effect a support system for the neurons. The neuron con-

sists of a cell body with branches. Branches serve as communication paths between neurons. One of the branches is an axon, which is the main conduction path for impulses between neurons. Other branches are called dendrites, which can increase in size and multiply, thus greatly increasing the communication potential between neurons.

Axons are covered by a cellular sheath, with or without myelin, an insulating material which can greatly improve the efficiency of conduction between neurons.

The process of neuronal communication is the synapse, during which a chemical carrier called a neurotransmitter crosses the gap between two neurons. Neurotransmitters carry messages to all parts of the body. Irregularities of structure and function of neurons can produce disturbances of behavior.

* * * * *

APPENDIX C

CRITERIA FOR ADMISSION TO GOMPERS HIGH SCHOOL

GOMPERS HIGH SCHOOL
August 24, 1984

To: Secondary Deans
From: Charles Dorton, Principal
Subject: Enrollment Procedures

1. The referring dean will call Gompers' principal, or dean, to receiver an orientation date, and inform the student to report prior to the assigned date for review.

2. Upon receipt of a green referral sheet, completely filled out--Orbit Test scores, grades, credits earned, immunization status, Chapter 1 status, etc., the orientation date will be noted and the form placed in the intake folder.

3. When the student and parent arrive, he will be interviewed by the principal, sign his contract and be referred to his counselor.

4. Registration will be on a first arrival basis. When arriving students outnumber vacancies last students in may be given a subsequent enrollment date.

   -- Students arriving without green sheets and transfers will be referred back to their RUSD schools for same. Out-of-District students will be processed on individual basis.

5. Students are enrolled every other week, and deans will have such dates. (Schedule attached)

6. Priority guidelines:

   6.1 Working students
   6.2 Severe discipline-prone students
   6.3 Non-achieving discipline-prone students
   6.4 Students having received 15 or more days of suspension
   6.5 Parental request

7. Grade failing, or truant students are to be programmed within constraints at their regular school.

8. If parent request is used, give reason, i.e., Parent Request -- student working.

9. Special cases will be reviewed by the sending school principal and myself.

10. All special education students must be de-certified prior to enrollment at Gompers. Please attach part 2 of the I.E.P. to the referral sheet. Special day class students who are being de-certified with possible Gompers placement must have a Gompers' representative at the meeting.

Distribution: Principal and Deans (3)
De Anza
El Cerrito
Kennedy
Pinole Valley
Richmond High

* * * * *

APPENDIX D

THE INITIAL INTRODUCTION OF THE SUBJECT TO THE TESTING

(Guide for Investigator)

Hello. I appreciate very much your willingness to participate in my study. What I am trying to do is to find out how people learn: Do they have to read something to remember it or can they remember just by listening? Do they need to write things down in order to learn them? I want to see if students from different schools respond differently to the questions. I also wonder if the way you think directly affects your performance. Maybe the way you learn made it difficult for you to succeed in a regular high school. After we have the results I will let you know the answers to these questions.

After you are through with the testing I will ask you if you are willing to come back for an interview to talk about what has happened in your life. I would also like to talk to your parents if I can. (I will pay both you and your parents.)

* * * * *

APPENDIX E

HUMAN SUBJECT INFORMED CONSENT FORM

CALIFORNIA INSTITUTE FOR CLINICAL SOCIAL WORK

Informed Consent Form

I, _____, hereby willingly consent to
(Human Subject)

participate in the NEUROCOGNITIVE DIFFERENCE research pro-
(Name of Study)

ject of Olga I. Shkurkin, LCSW and Mary Ahern, PhD of CICSW.
(Principal Investigator's Name)

I understand the procedures to be as follows:

Psychoeducational Testing and Interviews

I am aware of the following potential risks involved in the study:

(Not Applicable)

I understand that I may withdraw from the study at any time without penalty. I understand that this study may be published and my anonymity will be protected unless I give my written consent to such disclosure.

Date: _____ Signature: _____

Witness: _____
Olga I. Shkurkin, LCSW

APPENDIX F

DATA SHEET FOR DEMOGRAPHIC INFORMATION

Subject I.D.: #_____ Date_____

Male____ Female____ Address:

Birthdate: Birthplace:

School: Grade: 1st Lang: English Spanish Other

Race: W B Other:

Family Constellation:

	Father	Mother	Stepmother	Stepfather	Other
Living with subject>½-time					
Away from subject>½-time					
Seen rarely or never					

Siblings:

	Sister	Brother	Halfsis	Halfbro	Stepsis	Stepbro
Living with subject						
Living away						
Seen rarely or never						

	Father	Mother	Stepfather	Stepmother
Occupation:				
Education:				
Appr. Income:				

CODING GUIDE FOR DEMOGRAPHIC INFORMATION

Living Situation	Code No.
Lives with both natural parents	1
Lives with one parent and one stepparent	2
Lives with single parent	3
Lives with single parent + grandparent	4
Lives with grandparent or other relative	5
Orphaned (used in conjunction with other codes)	6
Siblings	
No siblings	1
One or two siblings	2
Three or more siblings	3
Employment Status of Parents/Guardians	
Welfare or disability income only	1
Disability income + gainful employment	2
Gainful employment for one parent/guardian	3
Gainful employment for both parents/guardians	4
Occupation of Parents/Guardians	
No outside employment at present	1
Unskilled occupation	2
Skilled laborer	3
Semi-professional, professional, or own business	4
Income Level[1]	
Poverty level	1
Barely adequate	2
Adequate	3
Comfortable	4
Residence	
Very poor area and housing; near-slum conditions	1
Poor area but housing adequate	2
Area and housing average	3
Better area and above-average housing	4

[1] Determined from a variety of sources: Interviews, reports of parents and of subjects, school records, and subjective interpretation.

APPENDIX G

RELIABILITY AND VALIDITY DATA FOR PSYCHOEDUCATIONAL TESTS

WIIG-SEMEL TEST OF LINGUISTIC CONCEPTS

Comparative relationships	Yes	No
1. Are watermelons bigger than apples?	x	
2. Are jets slower than turtles?		x
3. Are trees smaller than flowers?		x
4. Are trains faster than airplanes?		x
5. Are parents older than children?	x	
6. Are lemons sweeter than candy?		x
7. Is ice cream colder than coffee?	x	
8. Is night darker than day?	x	
9. Are feathers heavier than books?		x
10. Is water wetter than snow?	x	

Passive relationships		
1. John was hit by Eric. Was John hit?	x	
2. Bill was caught by Tom. Was Tom caught?		x
3. Jerry was pushed by Bob. Was Bob pushed?		x
4. Judy was pulled by Sue. Was Judy pulled?	x	
5. Betty was brought by Ruth. Was Betty brought?	x	
6. Mary was driven by Alice. Was Alice driven?		x
7. Pearl was phoned by Fran. Was Fran phoned?		x
8. Don was upset by Jane. Was Jane upset?		x
9. Paul was chosen by Steve. Was Paul chosen?	x	
10. Ann was left by Kate. Was Ann left?	x	

Temporal relationships		
1. Does lunch come before breakfast?		x
2. Does evening come before afternoon?		x
3. Does dinner come before lunch?		x
4. Does noon come after morning?	x	
5. Does Saturday come before Sunday?	x	
6. Does Thursday come after Tuesday?	x	
7. Does summer come after spring?	x	
8. Does Thanksgiving come before Halloween?		x
9. Does May come after June?		x
10. Does December come before November?		x

Wiig-Semel (continued)

Spatial relationships	Yes	No
1. Pat came after James. Was James first?	x	
2. The elephant sat on the mouse. Was the mouse on top?		x
3. Sally ran in front of Brian. Was Sally first?	x	
4. The chair fell on the toy. Was the chair on the bottom?		x
5. Philip rode behind Charles. Was Philip last?	x	
6. Leslie swam between Burt and Angel. Was Angel in the middle?		x
7. Sharon finished before Henry. Was Henry last?	x	
8. The ball rolled to the left of the fence. Was the ball on the left side?	x	
9. Hal stood in back of Beth. Was Beth in front?	x	
10. Mike walked to the right of Joe. Was Joe on the right side?		x

Familial Relationships

1. Give another name for your mother's father.
2. Give another name for your father's father.
3. Give another name for your father's mother.
4. Give another name for your mother's brother.
5. Give another name for your mother's sister.
6. Give another name for your father's brother.
7. Give another name for your aunt's daughter.
8. Give another name for your uncle's son.
9. Give another name for your aunt's son.
10. Give another name for your uncle's daughter.

Construct Validity

Construct validity was determined by evaluating age differentiation. As language comprehension skills are reported to be developmental, test scores were expected to show an increase with age. Two hundred and ten grade school children were randomly selected, thirty each from the first through eighth grades. Analysis of variance indicated significant differences between grades. Norms for all grades are presented in Table A1.

TABLE A1.
CORRECT RESPONSES TO LOGICAL GRAMMATICAL SENTENCES BY 210 GRADE SCHOOL STUDENTS BY GRADE (nS = 30)
(Wiig and Semel, 1974)

Relationship Tested	Grade						
	1	2	3	4	5	6	7-8
Total test							
Mean	26.30	34.90	37.13	41.06	45.10	46.97	46.27
S.D.	4.99	4.76	6.14	3.99	3.86	2.06	2.00
Comparative							
Mean	7.70	8.10	8.50	8.67	9.47	9.60	9.40
S.D.	1.55	1.33	1.28	1.38	0.72	0.61	0.55
Passive							
Mean	6.60	7.80	7.83	8.37	8.67	9.17	9.00
S.D.	1.43	1.64	2.03	1.28	1.17	0.90	1.03
Temporal							
Mean	6.50	6.53	6.77	7.60	8.73	9.07	8.73
S.D.	1.50	1.83	1.75	1.33	1.41	0.82	0.99
Spatial							
Mean	4.73	7.23	8.13	8.60	9.17	9.43	9.27
S.D.	2.06	1.52	1.43	0.99	1.10	0.92	0.73
Familial							
Mean	1.43	5.23	5.97	7.83	9.07	9.70	9.87
SD.	1.50	2.92	2.98	2.68	2.21	0.74	0.43

WOODCOCK READING MASTERY TESTS--REVISED (WRMT-R)

Reliability

Internal consistency reliability coefficients, which indicate the degree of item homogeneity, were calculated by form for all WRMT-R tests and clusters across their range of use. The calculation of reliability statistics for each reported grade or age level included all subjects in the norming sample at that level. Reliabilities were calculated using the split-half procedure and were corrected for length with the Spearman-Brown formula. Raw scores on the odd and even items were used in the split-half coefficient calculations.

Table A2 reports selected test and cluster reliability coefficients and standard errors of measurement (SEM). Values for SEMs are reported in W scale units. Increased precision (a smaller SEM and a greater reliability coefficient) is obtained using test record form G+H to combine scores from both forms of the WRMT-R. Form G+H is recommended whenever the "standard precision" provided by Form G+H alone is judged inadequate for a specific application. Form G+H provides greater precision in use of the WRMT-R.

TABLE A2
SELECTED SPLIT-HALF RELIABILITY COEFFICIENTS (r) AND STANDARD ERROR OF MEASUREMENT (SEM) FOR WRMT-R TEST AND CLUSTER SCORES FROM SELECTED GROUPS

		Grade 11	
		G or H	G + H
Word Identification			
Sample size	N	242	
Reliability	r	0.86	0.93
Std. Err. of Meas.	SEM	5.9	4.3
Passage Comprehension			
Sample size	N	242	
Reliability	r	0.68	0.81
Std. Err. of Meas.	SEM	6.7	5.1

Content Validity

Content validity is the degree to which the content of the test represents the domain of content it is designed to measure. Logical evidence of content validity is one of the most relevant forms of validity information for tests of academic achievement. Important information regarding the content validity of the WRMT-R can be obtained by an examination of the scope and sequence of items in the WRMT-R tests and in the supplementary G-F-W Sound-Symbol Tests (GFW) and Woodcock-Johnson Psycho-Educational Battery (WJ) tests included in the diagnostic profiles.

WRMT-R items were developed with contributions from outside experts, including experienced teachers and curriculum specialists. The items contained in each test were designed to be comprehensive in both content and difficulty. All items are open-ended, or free-response, in nature. An open-ended design most closely parallels the requirements of reading in real-life situations. This item design also virtually eliminates guessing as a confounding factor in scores (often a major problem with multiple-choice tests). Classical item selection techniques were used in the early stages of item development, and the Rasch model was used during later stages; both contributed to the stringent statistical criteria employed during the process of item selection in the WRMT-R.

The WRMT-R, GFW, and WJ tests covered by the Diagnostic Readiness Profile were selected to provide a sampling of the complex set of skills related to learning to read. The skills measured range from repetition of orally presented sounds to letter recognition and identification.

The WRMT-R, GFW, and WJ tests included in the Diagnostic Basic Skills Profile were selected to sample major facets of word decoding and related skills. Auditory and visual-auditory association skills, decoding and encoding are measured. Items at many levels of difficulty are provided so that a wide range of skills is covered.

The WRMT-R and WJ tests included in the Diagnostic Comprehension Profile were selected to measure and compare critical oral and reading comprehension skills. The supplementary WJ subtests in the profile allow direct comparison of a subject's reading comprehension skills, as measured by the WRMT-R, with corresponding oral comprehension skills, as measured by the WJ.

Concurrent Validity

Concurrent validity indicates the relative effectiveness of a test, when compared with an independent criterion measure, in assessing a subject's behavior. Table A3 reports the concurrent validity correlations among the WRMT-R and the WJ reading tests at grade 8. Table A4 reports the correlations between Total Reading scores from the 1973 WRMT and scores from several other measures of reading, administered to a random sample of students in grade 12. Although these results are based on the 1973 WMRT, they are reported in this revision because the psychometric characteristics of the original WMRT (1973) and the WRMT-R are so similar that many generalizations from one to the other can be validly made.

TABLE A3
CORRELATION OF THE WRMT-R WITH WOODCOCK-JOHNSON READING TESTS, FOR SELECTED GROUPS

WJ Test	WRMT-R Test	
Grade 8: N = 84	Word ID	Passage Comprehension
Letter-Word ID	0.72	0.46
Word Attack	0.63	0.25
Passage Comprehension	0.56	0.55
Total Reading	0.82	0.52

TABLE A4
CORRELATION OF WRMT (1973) TOTAL READING SCORE WITH SELECTED READING MEASURES

Reading Measure	Grade 12
Iowa Tests of Educational Development (Total Reading)	0.79 (N = 40)
WJ Reading Achievement	0.88 (N = 40)
WRAT Reading	0.92 (N = 40)

WRMT-R Summary

The procedures followed in developing and standardizing the WRMT-R have produced an instrument that may be used with confidence in a variety of educational and noneducational settings. The standardization plan produced a norming sample carefully matched with the distribution of population variables in the U.S., including socioeconomic characteristics of communities. The reliability and validity characteristics of the WRMT-R meet basic technical requirments for use of the battery as a basis for individual placement and instructional decisions.

KeyMath DIAGNOSTIC ARITHMETIC TEST

Reliability

Reliability measures are indicators of the confidence that can be placed in the same individual scoring similarly under similar circumstances. Obviously, many factors mitigate against the circumstances being similar. In developing KeyMath, particular attention was directed to the ease of administration and scoring to enhance the consistency of these factors. In item construction, an open-ended format was adopted to reduce the influence of guessing and enhance reliability.

Table A5 presents the reliability coefficients for grades K through 7 obtained from a split-half analysis of the calibration population's performance on KeyMath.

TABLE A5.
INTERNAL CONSISTENCY RELIABILITY COEFFICIENTS
(SELECTED SUBTESTS)

Grade	K	1	2	3	4	5	6	7	Median
n=	82	169	140	107	140	127	93	76	Reliability
Addition (15 items)	.64	.77	.44	.70	.64	.70	.79	.59	.67
Subtraction (14 items)	.59	.70	.33	.74	.69	.74	.84	.46	.68
Multiplication (11 items)	.61	.70	.78	.81	.66	.84	.59	.52	.68
Division (10 items)	.59	.66	.23	.65	.81	.83	.76	.69	.68
Missing Elements (7 items)	.80	.89	.89	.90	.72	.77	.67	.68	.78
Money (15 items)	.72	.75	.68	.63	.73	.63	.73	.69	.70
Measurement (27 items)	.85	.78	.88	.86	.85	.82	.84	.66	.84
Time (19 items)	.85	.84	.82	.73	.68	.73	.70	.51	.73

KeyMath Concurrent Validity

The data collected on concurrent validity have involved predecessors to the final form of KeyMath. The test description booklet (early 1970s) indicated that research efforts were needed on concurrent validity data on the final form of KeyMath.

DETROIT TESTS OF LEARNING APTITUDE (1967)

Standardization and Statistical Evaluation

Age norms have been developed for the nineteen subtests and a general mental age is derived for the median ages of whatever series of subtests have been administered. The standardization was made on pupils from the Detroit Public Schools whose school population was typical of large metropolitan cities as measured on surveys by the use of standardized tests of educational achievement and group intelligence examinations.

For the initial standardization fifty pupils at every age level were selected as being in their normal grade for their age and ranging in IQ from 90 to 110 only as measured on standardized group intelligence examinations. On subsequent testing the number at every age level was increased to one hundred fifty pupils. The standards on a few subtests were raised three months each since in the initial standardization the authors wished to be on the liberal side.

Over a period of many years more than 75,000 individual pupils have been examined with the Detroit Tests of Learning Aptitude. The majority of them were believed to be candidates for mentally retarded classes. A sampling of the IQ distribution of over 4,000 cases was compared with a similar number who had been examined a few years earlier with another well-known individual examination. There was agreement within one point in IQ at the first quartile, the median, and the third quartile of the two distributions, which indicated that the Detroit Tests of Learning Aptitude were a suitable instrument for the examination of the mentally retarded as well as for the average pupils.

Test reliability for mentally retarded, delinquent, and emotionally unstable children was sampled. First, 48 cases produced a correlation of .959 $\pm$ .01 after an interval of five months between first and second testings. A second correlation of .675 $\pm$ .01 was found for a group of 792 pupils ranging in chronological age from seven to twelve years with an inter-vening difference of two or three years between testing. The median IQ of the first examination was .70 and the reexamination IQ was .71. The standard deviations of the IQs remained the same for both examinations at eight IQ points.

Sixteen subtests were correlated with each other on one hundred children. Most correlations fell from .2 to .4 indicating a fairly low yet positive correlation.

PEABODY PICTURE VOCABULARY TEST (PPVT)

The PPVT Manual (1965) contains an extensive presentation on reliability and on several aspects of validity. A summary is given below.

Reliability

Alternate form reliability coefficients for the PPVT (the degree to which a subject scores consistently on the test) were obtained by calculating Pearson product-moment correlation on the raw scores; standard errors of measurement for standard scores (IQs) were then calculated from the parallel forms reliability coefficient.

TABLE A6.
PPVT RELIABILITY COEFFICIENTS FOR SELECT AGE LEVELS

Age Levels	Reliability Coeff.	Std. Errors IQ
18-0	0.84	6.00
17-0	0.84	6.00
16-0	0.80	6.70
15-0	0.83	6.18

Studies providing reliability information on the PPVT involving deaf, emotionally disturbed, and community trainable retardates reported reliability coefficients comparable to those found for the standardized population. Furthermore, coefficients of equivalence and temporal stability appear to be satisfactory for both average children and those who have one of a number of disabilities.

Validity

Validity data for the PPVT (the extent to which it measures what it purports to measure) were obtained both for the individual items and for the total test. There are two main types of validity evidence--rational and statistical. Two common types of rational validity, content and construct, are available. Common types of statistical validity include item validity, congruent validity, concurrent validity, and predictive validity.

Content Validity

Content validity was built into the test when a complete search was made of Webster's New Collegiate Dictionary (G & C Merriam, 1953) for all words whose meanings could be

depicted by a picture. Care was taken to keep the final selection of response and decoy items unbiased.

Construct Validity

When an inference is made that the test measures verbal intelligence or scholastic aptitude, rational validity must be based on construct validity. Evidence to support the concept that the vocabulary test is the most valuable single test for intelligence may be found in the literature. It does not, however, purport to provide a comprehensive measure of intellectual functioning, but rather attempts to provide a useful prediction of school success.

Item Validity

Item validity was established by selecting individual words where the percentage of subjects passing increased from one age group to the next. Only items demonstrating linear, steep growth curves were retained. The item selection resulted in linearizing the plots of mean raw scores versus age; total vocabulary of children versus age does not in fact produce such plots.

Congruent Validity

Congruent validity is defined as the extent to which PPVT scores compare with scores on other vocabulary and intelligence tests. PPVT mental age scores have correlated with 1937 Binet mental age scores over the range 0.60 to 0.87 with a median of 0.71. On the 1960 Binet the mental age correlations have ranged from 0.82 to 0.86 with a median of 0.83. Here, as in all of the statistical validity data, lowest correlations were found when IQ scores of a restricted group of subjects on the intellectual continuum were used. What is needed are data on correlations of PPVT and Binet IQ scores by age levels for subjects falling across the full intelligence range. The above correlations are typical of congruent validity data comparing PPVT scores with a number of other vocabulary and intelligence tests. Highest correlations tend to be with instruments such as the Ammons and Van Alstyne Picture Vocabulary Tests, and lowest with performance or quantitative-type intelligence tests such as the SCAT(Q).

Concurrent Validity

Concurrent validity is defined as the extent to which PPVT scores correlate positively with measures of scholastic achievement. Unfortunately not as much evidence of this type, as contrasted with congruent validity, has accumu-

lated. Because the PPVT does not measure nonacademic factors that influence academic success, the validity coefficients from various studies present a wide range--from a low of 0.04 to a high of 0.91.

Predictive Validity

Concurrent validity and predictive validity are similar except for the difference in time when the measures are taken. (This definition of predictive validity differs slightly from that of Myklebust in describing the Picture Story Language Test.) Studies indicate that the PPVT is a better predictor from grade 3 on.

PICTURE STORY LANGUAGE TEST (Myklebust)

Validity

In appraising validity the primary consideration is whether the test adequately serves the purpose for which it has been developed and for which it is intended. All tests of ability encompass aspects of behavior other than the one for which they were designed. With the Picture Story Language Test this means, does it in fact measure written language or mainly some other behavioral characteristic, such as intelligence or motor ability?

Though the validity of the Picture Story Language Test must be explored more fully, present indications are that it is a valid measure of proficiency in use of the written word.

Reliability

The reliability of the Picture Story Language Test has been assessed in certain respects and these estimates have been highly positive, but because some of the traditional methods could not be applied other appraisals had to be made. Odd-Even studies for Syntax and for Words per Sentence reflect that these measures attain a satisfactory level of reliability. In addition, repeated administrations of the test to children enrolled in a remedial training program indicate that the three scales, Productivity, Syntax, and Abstract-Concrete, can be used with confidence.

Interscorer reliability was studied extensively and found to be excellent. However, previous training in scoring Syntax emerged as a critical factor. Significant differences between trained and untrained scores did not occur for the Productivity and Abstract-Concrete scales.

Because the scoring of Syntax is time consuming, an analysis was made to determine the number of sentences required to estimate the Syntax Quotient within certain levels of accuracy. It was found that for many purposes only the first three sentences are necessary. In the study of handicapped children and of those with language disorders, often it is advisable to score the whole story.

Though additional evaluation of the reliability of the Picture Story Language Test is anticipated, the Odd-Even coefficients, interscorer reliability and the agreement between the Syntax Coefficients for the first three sentences and the total story signify that this test can be used with confidence so far as reliability is concerned.

DURRELL ANALYSIS OF READING DIFFICULTY

Validity

Validity in educational analysis is determined by the clarity, precision, pertinence, and completeness of the observation instrument for the purpose at hand. If an analysis of reading difficulty yields a clear, accurate, and complete description of abilities pertinent to planning the essential details of effective remedial service, it may be said to be valid for this purpose.

The Durrell Analysis of Reading Difficulty has been developed through clinical use since 1932 and modified by critical review since its first publication in 1937. The third edition of the Analysis was shaped from reports from nearly 200 college teachers of reading. The relative stability of the content of the Analysis from revision to revision attests to current professional confidence in its general validity.

The paragraphs for the Oral Reading, Silent Reading, and Listening Comprehension tests were designed to be representative of reading content for the indicated level; vocabularies for these tests were screened both by standard word lists and by careful field testing. The Listening Vocabulary test was developed by drawing selected words from all eight of Roget's Thesaurus word classes, screening these words by standard word lists, and by item analysis during field testing.

Reliability

The Durrell Analysis of Reading Difficulty consists of a series of short tests assessing different aspects of reading. Since the length of a test contributes to its reliability, short tests are not expected to be as reliable as longer measures. Nevertheless, the tests included in the Analysis should meet practical standards of reliability. Since the tests of the Analysis differ in type and in range of grade level, different treatments are used to estimate reliability.

Relationships Among Tests

Relationships among selected tests, based on 216 test records with 36 children from each grade are shown in Table A7 for the Listening Comprehension subtest.

TABLE A7.
CORRELATIONS AMONG INTERMEDIATE TESTS
AND WITH METROPOLITAN READING TEST
GRADE EQUIVALENT SCORES

	Oral Reading	Silent Reading	Word Recognition	Word Analysis	Spell
Listening Comprehension (Metro)	.68	.66	.56	.59	.56

APPENDIX H

PIAGETIAN TASKS

Tasks to determine the person's ability to perform Piaget's Concrete Operations

1. Conservation of Area: Task 15 G15 (Voyat 1982, 45).

Given: Two identical pieces of green cardboard (A and B), each about 20 x 30 cm. Two small toy cows and 30 little "houses" (toys or blocks or pieces of paper, each about 1 x 2 cm).

The child is shown the two cardboards placed side by side; they are described as fields with grass for cows to eat. There is one cow in each field. The child is first asked whether both cows have the same amount of grass to eat. A farmhouse is then placed on each field and the question is repeated. Other houses are then added, at least 4 or 5 times, one more at a time (always the same number on A and B) until 30 houses have been placed. On A, the houses are arranged in one or more tight rows, touching; on B they are widely scattered at random. Each time, after houses have been added to both fields, the child is asked whether both cows still have the same amount to eat.

Stages

1 [AR 4-6]: When confronted with different configurations, the child negates equality. Judgment is based entirely on perception. [Absence of conservation; sometimes, failure to understand the question]

2 [AR 5-8]: Up to a certain number of houses, the child recognizes that the remaining grass areas on A and B are equal; beyond that number, the perceptual configurations are too different; the number varies from one child to another. Thus conservation is conceived as a possibility but not as a necessity. [Perceptual intuition and intermediate responses; no operational composition]

3 [AR 7-9]: The child recognizes that the areas are always equal no matter how A and B are perceived. [Conservation is a necessity]

ANSWER SHEET 1. CONSERVATION OF AREA (15 G15)

Subject I.D. #_____ Date_____

1. Do both cows have the same amount to eat? YES NO

   If NO, explain:

2. If a farmhouse is placed on each field, do both cows still have equal amounts to eat? YES NO

   If NO, explain:

3. If three farmhouses are placed on each field, do both cows still have equal amounts of grass to eat? YES NO

   If NO, explain:

4. With seven farmhouses on each field, do both cows still have equal amounts of grass to eat? YES NO

   If NO, explain:

5. With fifteen farmhouses on each field, do both cows still have equal amounts of grass to eat? YES NO

   If NO, explain:

2. Conservation of Substance: Task 45 N1 (Voyat 1982, 81).

Given: Two identical balls of clay.

The child is asked to observe the equality of the quantities of both balls of clay. If the child disagrees with the idea of the balls being of equal quantity, he is asked to add or take away some clay so that his perception of them is that they consist of the same amount ("to eat"), whether or not that is objectively true. Once equality in the child's mind is established:

The experimenter transforms one of the balls of clay into a sausage shape and asks, "Do we still have the same amount to eat?" The experimenter then returns the clay to its original shape and repeats the question. This may be repeated, employing different shapes, or dividing the ball into several little pieces, and then returning it to the original form.

Stages

1 [AR 4-7]: When the shape of the ball is altered so that it is no longer identical with the second, the child maintains the amounts are no longer equal. Judgment is tied to one dimension; different shapes are different amounts. [Absence of conservation]

2 [AR 6-8]: The child vacillates in his answers and usually fails to conserve. He focuses on one dimension at a time and continues to find one object having more or less than the other. He might affirm conservation for one transformation, but this is not generalized and justified for all transformations. [Conservation is a possibility]

3 [AR 7-9]: The child affirms conservation. To justify his responses, he uses one of several available arguments: reversibility (object returned to original shape is again equal in amount); compensation (what object has lost in height has been gained in width); or identity (substance is the same as it was before, since nothing was added or taken away). [Conservation is a logical necessity]

ANSWER SHEET 2. CONSERVATION OF SUBSTANCE (45 N1)

Subject I.D. #_____ Date_____

1. One ball of clay changed into a sausage.
   Do we still have the same amount to eat? YES NO
   If NO, explain:

2. Back to the original shape.
   Do we still have the same amount to eat? YES NO
   If NO, explain:

3. When in several little pieces,
   do we still have the same amount to eat? YES NO
   If NO, explain:

4. If back to the original form,
   do we still have the same amount to eat? YES NO
   If NO, explain:

3. Speed (Starting and stopping points coinciding or in alignment but paths of unequal length): Task 84 M8 (Voyat 1982, 123).

1a. Given: Angle CAB, the arms forming paths AB and AC. The child is first asked if one path is longer than other. Then he is told that two cars are going to travel along them at same speed and asked whether one will finish before the other. The experiment is performed and he is asked why the car traveling along AC arrives at C after other has reached B. The experimenter moves cars by hand as the cars can be fixed on two rigid wire rods that can be pulled back and forth.

1b. Given: Two cars (a and b) travelling at same speed between points A and B. The questions given above are repeated.

2a. Given: Two cars travelling along AC and AB. They start and finish at same time. He is asked if one car must go faster than other. After experiment is performed, he is asked whether speeds are equal.

2b. Given one straight line and one wavy line AB. Same conditions and questions as above.

Stages

1 [AR 4-7]: The child is unable to structure speed or duration and frequently not even path to be travelled before perceiving movements. [No understanding of differences in speed]

2 [AR 5-8]: The child solves 1a and 1b without difficulty. He judges that time is proportional to distance travelled regardless of order of stopping points, but fails in problems of speed (2a and 2b) even after experiment is performed. The child gradually discovers correct solutions to 2a and 2b, but only after the experiment is performed. [Intermediate reactions]

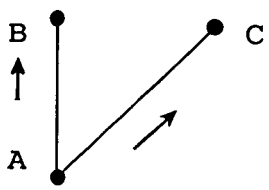
3 [AR 6-8]: The child immediately solves all four questions appropriately grouping and distinguishing the relevant factors of speed and space. [Operational solutions]

ANSWER SHEET 3. SPEED AND DISTANCE (Short Title)
Task 84 M8 (Voyat 1982, 123).

Subject I.D. #_____ Date_____

This task needed additional clarification to assure easy administration. Also, a large drawing of the different paths was designed. This is how the instruction and questions were laid out:

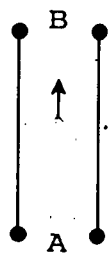
1a. Is one path longer than the other?
YES NO



The cars will travel at the same speed. Will one finish before the other? YES NO

(Push cars at same speed, arrive at B first). Why did car arrive at C <u>after</u> car arrived at B?
Ans:

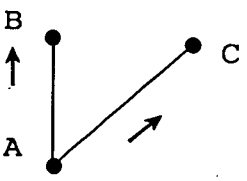
1b. Is one path longer than the other?
YES NO



The cars will travel at the same speed. Will one finish before the other? YES NO

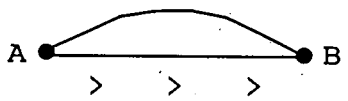
(Push cars at same speed, arrive at B together). Why did cars arrive at B at the same time?
Ans:

2a. Cars will start and arrive at the same time. Will one go faster than the other? YES NO



(Make cars arrive at the same time). Were the cars going at the same speed?
YES NO

2b. Cars will start and arrive at the same time. Will one go faster than the other? YES NO



(Make cars arrive at the same time) Were the cars going at the same speed?
YES NO

4. Classification and the Relative Size of Classes: Task 120 E7 (Voyat 1982, 157)

Given:
1. Initially:
4 large blue squares (5 x 5 cm)
4 small blue squares (2½ x 2½ cm)
4 large blue circles (5 cm dia.)
4 small blue circles (2½ cm dia.)
1 large red circle (5 cm dia.)
1 small red circle (2½ cm dia.)
1 small red square (2½ x 2½ cm)

2. Later on:
1 large red square (5 x 5 cm)
1 small red circle (2½ cm dia.)
1 small red square (2½ x 2½ cm)

1. The child is first asked to classify these objects into two classes according to any criteria he likes. He is then asked to redivide them into two classes using different criteria, and then reclassify them a third time, using yet other criteria.

2. Three more objects are added to the set, and the child is again asked to classify them.

Stages

1 [AR 5-7]: The child tends to avoid the properties of the unique element (red circle), and to treat it as though it is just like the others. When the other red elements are added, and when it is suggested to him, the child begins to accept a classification based on color. [Failure to dissociate numerical extension and concept of set]

2 [AR 6-9]: The child spontaneously adopts classification by color when the additional red elements are brought in, but not before. He initially neglects to make the classification by color because he tends to classify objects by constructing collections, and a single red circle cannot form a collection. [Difficulty in coordinating numerical extension from correct quantification]

3 [AR 6-9]: Complementarity (red vs. blue) overrides numerical extension. At times, the child refers to "the red ones," considering that the fact of only one red object is immaterial to the validity of redness as an intensive property. [Correct classification]

ANSWER SHEET 4. CLASSIFICATION (120 E7)

Subject I.D. #_____ Date_____

The subject should be told that the whole pile of shapes have several things that are alike or different.

The task will be to sort the objects into 2 piles, several times, each time using some other thing to make the choice on how to divide the piles.

	Objects in pile	Objects in pile
1. First sort:		
2. Second sort:		
3. Third sort:		
4. Comments:		

	Objects in pile	Objects in pile
5. "Later Objects" introduced:		
6. Comments on #5:		

ANSWER SHEET 5. MORAL JUDGEMENT--ASSIGNMENT OF GUILT

Subject I.D. #_____ Date_____

1. Gloria was driving her brother's car which he let her borrow. She was turning the corner when a car cut in front of her and made her lose control of the car; she ran into a pole and demolished the whole front end of the car.

John took his mother's car without permission because his girlfriend needed a ride from the bus. He was in a hurry so he tried to pass several cars illegally. He side-swiped a car going in the opposite direction. Fortunately the damage to the two cars was only minor.

Both Gloria and John caused accidents and damage to somebody else's car. Who was more guilty? (Circle one)

Gloria John

Why?

2. Mary was the last to leave the house in the morning and forgot to lock the front door. When her parents came home that afternoon they discovered that the house was broken into. They lost $1000 in cash and several other belongings.

Bob came home from school and saw his mother's purse opened and lying on her bed. He took $20 from the purse, closed the purse, and put it up into the closet where it was usually kept.

Both Mary and Bob caused their parents to lose money. Who was more guilty? (Circle one)

Mary Bob

Why?

APPENDIX J

DATA SHEET FOR SCHOOL RECORDS SUMMARY

Subject I.D. #_____ Date_____

Schools attended:

Grades repeated:

Special education:

Testing available:

Problems: Academic Behavior

Elementary:

Junior high:

High School:

Gompers:

When and why at Gompers:

Remarks:

CODING GUIDE FOR SCHOOL RECORDS SUMMARY

		Code No.
School Attended		
N represents actual number of schools		N
Grades Repeated		
N represents actual number of grades repeated		N
Test Results Available		
Special Testing:	Special Education	1
	Gifted	2

ACADEMICS AND BEHAVIOR RECORDED FOR ELEMENTARY, JUNIOR HIGH, AND HIGH SCHOOL (THREE SETS OF DATA):

Academics	
Failing	1
Below average to poor	2
Average or no comment	3
Good	4
Excellent	5
Learning problems noted	X
Behavior	
Disruptive, impulsive, inattentive	1
Truancy and minor breaking of rules	2
Average or no comment	3
Good	4
Excellent	5
Emotional problems noted	X

APPENDIX K

THE INTERVIEW GUIDES

SUBJECT INTERVIEW GUIDE

Subject ID #_____ Date:_____

INTRODUCTORY STATEMENT: "I am interested in your early memories. What do you remember about being a little kid; what was it like both at school and at home? Where did you live? What is your earliest memory?"

Part I: Questions Relating to Educational History

As the subject talks about his/her memories I will listen for the following topics, and ask exploratory questions about them. I will bring them up myself at an appropriate time if necessary. The topics are:

1. **What are your earliest memories? How was preschool? Was it:**
   a. Scary b. Fun c. Difficult d. O.K. e. Easy

2. **How was kindergarten? What are your memories? Was it:**
   a. Scary b. Fun c. Difficult d. O.K. e. Easy
   Were the other kids f. Friendly g. Hostile

3. **How was elementary school?**
   a. Difficult b. Fun c. Easy

   Any special problems with:
   d. Learning e. Teachers f. Other kids
   g. Moves h. Repeats i. Behavior in school

4. **In junior and**
5. **senior high school, were there any problems**
   a. With learning (specific subjects)?
   b. With behavior? c. With teachers?
   d. With other students? e. What did you like?
   In both junior and senior high school, was it difficult
   f. To concentrate? g. To organize your work?
   h. To remember the necessary items?
   i. To go to school regularly? j. To follow rules?
   k. Did you find it necessary to fight?
   l. Did you daydream a lot?
   m. Was it hard to finish what you started?
   Anything else about school that we have not covered?
   n.

Part II: Self-Concept

Here are the topics relating to the subject's self-concept which the investigator will listen for, and bring up if necessary:

6. Would the subject describe him/herself as:

a. Patient?
b. Loses temper easily?
c. Shy, or
d. Outgoing?
e. Liking people?
f. Makes friends easily?
g. Well coordinated?
h. Impulsive (acts before thinking)?
i. Is it hard to wait for rewards?
j. Gets lost easily?
k. Forgets things a lot?
l. What is he/she particularly good at?

7. Special Behavior Problems

a. Drugs
b. Alcohol
c. Running away from home
d. Early pregnancy
e. Other

Part III: Relationship with Parents

Again, I will listen for themes related to the subject-parent relationship and ask questions about it when appropriate. If some topics are not covered I will bring them up. The topics are as follows:

8. How do you see your parents?

a. Are they caring?
b. Fair?
c. Understanding?
d. Have they been helpful?
e. Have they, overall, acted in your best interests?
f. Are they primarily concerned with appearances?
g. Are you and your parents close?
h. How have they responded to problems?
   h_1 Restriction?
   h_2 Other punishment?
   h_3 Offered incentives for good behavior?
i. Anything else about your parents we have not covered?

9. Relationship with Siblings

a. Nature of this relationship.

PARENT INTERVIEW GUIDE

The investigator will start by making certain that the parent is clear about the purpose of the study. Also, the factual information about the family and about the subject's health history given by the subject during the testing sessions will be double-checked and complemented.

Introductory statement to the actual interview: "I am interested in your memories of (name)'s childhood: How was it to raise him/her? What kind of a baby was he/she? Was he/she difficult? Was he/she fun?"

Again, as the parent talks about his/her memories the investigator will listen for the following topics and ask exploratory questions about them. She will bring them up if necessary. The topics are:

10. **As a baby, was the subject:**
    a. Sickly
    b. Irritable/generally difficult
    c. Friendly/outgoing, and easy
    d. Independent

11. **During preschool and kindergarten, was the child:**
    a. Sickly
    b. Irritable/cranky
    c. Afraid of people
    d. Poor sleeper and eater
    e. Different from other children
    f. Teased by other children
    g. Aggressive, or
    h. Had low energy?
    i. Friendly/affectionate/likeable
    j. Well coordinated
    k. Active
    l. Adaptable to change
    m. Got along well with other children
    n. Loner

12. **In Elementary School:**
    a. Did he/she learn easily? (Enumerate subjects)
    b. Did he/she do well with the teachers?
    c. Did well with other kids?
    d. Perceptual problems?
    e. Coordination problems?

    Did he/she have behavior problems such as:
    f. Truancy
    g. Fighting

h. Difficulty with rules
i. Daydreaming /hard time concentrating
j. Problems with organization in general (being messy and forgetful)
k. Hyperactivity

Many of the same questions about learning and behavior will be asked about the junior and senior high school years:

13. **In junior high and**
14. **senior high did he/she have problems such as:**
a. Did he/she learn easily? (Enumerate subjects)
b. How did she do with the teachers?
c. With other kids?
d. Perceptual problems?
e. Coordination problems?

13/14. **Did he/she have behavior problems such as:**
f. Truancy
g. Fighting
h. Difficulty with rules
i. Daydreaming /hard time concentrating
j. Problems with organization in general (being messy and forgetful)

15. **In addition to these, the parents will be asked about specific personality traits such as:**
a. Impulsiveness
b. Immaturity
c. Inability to postpone rewards
d. Explosive temper/aggressiveness
e. Ability to evaluate own behavior
f. Ability to learn from experience
g. Problems with time
h. Problems with orientation
i. Ability to follow instructions
j. Ability to make and keep friends
k. Self-confidence
l. Very outspoken
m. Very outgoing

16. **Parent's perception of relationship with child.**
The parent will be asked if he/she is close with the adolescent and about how it felt raising this child.

Relationship:
a. Close
b. O.K.
c. Difficult
d. Other

17. **What remedies have been tried if problems were encountered?**
    a. Restriction
    b. Incentives for good behavior
    c. Other punishment

18. **Relationship with siblings:**
    a. Good
    b. O.K.
    c. Bad

19. **Other significant information volunteered about the family:**
    a. Parent LD
    b. Sibling LD
    c. Sibling delinquent
    d. Parent in trouble with the law
    e. Other

* * * * *

APPENDIX L

EXAMPLES OF SUMMARIES OF TRANSCRIPTS

SUBJECT #50 (KENNEDY)

TESTING: This is a 17 year old slim, serious-looking young black woman who expressed surprise that I paid so much money to the kids. She was ill but still tried very hard. She protested when I checked that she lived with a stepfather. She said, "Please don't call him that--he is my little sister's father." She did well except for a few items.

INTERVIEW: Pretty, refined girl. Own house in good shape. Area rather poor. Mother, she, and little half-sister all dressed up to go to Ice Capades. Very patient with sister.

Self: Nice memories of mother in early childhood. Played mainly with cousins, shy with others. Moved a lot--no problems with changes. Got along with teachers and kids just fine. Happy experience (except teased in 4th grade after change). Helped teacher clean, then helped with kindergarten children. When moved to Del Mar picked on by older kids. In junior high didn't like history, had one referral from Spanish teacher. No problem with organization, remembering, neatness. Likes school. Favorite thing: babysitting, work at day care, wants to be child psychologist. Used to be close with mother--now "doesn't communicate." Dislikes mother's boyfriend intensely. Close to sister. Never restricted or punished--except "lives" in school for talking. I explained to her about auditory attention span.

Mother: Youthful, pretty lady. Daughter very independent as baby--friendly but preferred her own to strangers. Well coordinated; teacher's helper. Everything went smoothly--she was easy. During junior high--still easy--less interested being at home unless studying. Very well organized, orderly, follows rules--except late sometimes. (Mother showing a little anxiety, maybe resents daughter's independence.) Mature, responsible girl, was easy to raise. Now very active.

SUBJECT #48 (KENNEDY)

TESTING: This is an 18-year-old petite, pretty young black woman who was hard to reach and get to the interview. She lives in two households and holds an almost-full-time job. She is one of 9 children. She lives with her aunt and visits her parents. Her father is a minister.

During the testing, she did very poorly (including the Piagetian tasks) and resembled the Gompers kids a lot more than the Kennedy kids. After the testing, when I talked to her about arranging the interview, she was touched that I should be "so interested in her," and her eyes lit up. She agreed, saying that she would see me again.

INTERVIEW. The subject and her mother came to my office since their home is too crowded. It took me many tries and cancellations to arrange this interview. When I tested #48 she was living with a relative not far from my office. At this point she lives with her parents in a poor section of town in a dilapidated house (she has 8 brothers and sisters). Subject remembers very little about her early years. She was teased by kids in elementary school because she wore skirts (religious reasons).

Subject came in saying that she always believed that she has LD, but no one said anything about that and she didn't either but she thinks she needed the help. She had problems with reading and math. It got even harder as time went on. Had to work very hard and got barely C grades. Got in trouble for not being where she was supposed to be. In the 5th and 6th grades some teachers took extra time to help her. In Adams Jr. High she excelled in sports and singing--teachers seemed to protect her. She was a hard worker--still is, works long hours in addition to school. She used to wonder why she wasn't catching on when everyone else was. Has not had real behavior problems. Seems to be confused about the graduation requirements which sometimes gets her in trouble. Went to CDC Vocational Program. Plans to go to Healds College--already took test. Very persevering and patient, determined. Loses temper sometimes. She feels she is understanding and good at helping people. Plays the organ at church. The relationship with mother has been difficult. She feels mother wanted her home to take care of the kids and for her welfare money. She has been sick a lot from overwork (anemic).

Mother: Daughter was very small when born, barely made it, cried a lot, but later did fine. Never had any problems with her at school. Talented in music--problems with math. Teachers praised her and gave her extra help. She did very well in musical program at Adams Jr. High. Worked hard at the unemployment office during the summer, was spoken of well, but was not allowed to go back--took it hard. Mother says she does have a problem with time. She didn't like her moving out. Feels her brothers agitate her. One brother had serious problems in school. Daughter was always good at story writing. (Mother seems well meaning but probably was

exploitative of daughter the last few years, expecting her to carry a lot more than her fair share of the load.)

SUBJECT #2 (GOMPERS)

TESTING: This is a 17 year old caucasian young woman who is obviously very alert and verbal. She was very eager to be tested, hoping and probably expecting to do well. She was eager to tell Wendy (Ms. Owinda Thompson, who was helping me with the testing) and me about her life and the hardships at home (her parents have custody of four grandchildren--one of them the son of a 15-year old sister). Her mother has a computer business at home and the subject has to babysit a lot, so that mother can work as many hours as possible. Father is a policeman. Interestingly enough, he was graduated from Gompers also, and then went to Contra Costa College. Financially, they are doing well.

INTERVIEW. Self: Had a good time as a little kid--didn't have to deal with anything. Liked school, was real easy. Until she got to junior high, where she was "stuck" in all of the high classes (as gifted) and didn't understand a lot of the stuff. She and sister fought from early childhood on. She was student of the week most of the time in kindergarten and first grade. Problem with organization; "always" used a full purse so as to remember--then used it to hit. Usually doesn't wait--goes after it--but very patient with people. Is friendly, maybe a little blunt. Good relationship with parents but stays out too long on weekends. She does some drugs, likes the fact that parents care and "get after her." Father once told her he lost his respect further and that hurt. Both sisters more delinquent. Now parents getting the respect back--she can drive father's car. Knows she forgets what she hears, but was glad it was confirmed--knows she "spaces off" in class. Close but very busy family--however, she is very accepting of the difficult circumstance, and feels real support from the parents (has to help a lot).

Mother: Always very self confident. Not demanding, very precocious. Very good communicator--however, doesn't "repress" anything. Very empathic, in tune. Took chances, scared of nothing. School was wonderful until junior high. "Went to hell in a hand basket"--there was no one to look after her--couldn't handle it. Was no good in decision making. Is a very likeable, favored child, much easier than her sisters. (Had mysterious fevers as a baby that would pass.) Adjusted well to change. Mother has some dyslexia--reverses. Mother didn't notice problem with coordination, but subject did. She trusts people too much, gets hurt

easily. Is very giving and intuitive. They spend much time together--are very close. Family very emotional but marriage very strong. Very attached to grandchildren. She is impulsive--her judgement not too good--can be loud and temperamental, but comes back and apologizes. Things that have worked with her have not worked with her sisters.

SUBJECT #16 (GOMPERS)

TESTING: This is a 17 year old black young woman who is very competent and appropriate. She worked well and was cooperative. She spoke of her little boy as an additional hardship. Surprisingly, she did not pass the Piagetian classification task. Her disposition and attitude are a real asset. (These impressions written after the testing did not hold up at all during the interview).

INTERVIEW: Subject lives in her own apartment with her little boy. She moved out from grandmother after a conflict. We picked up the subject and her boy and went to grandmother's house. The subject loves the boy and likes being a mother, but is quite impatient.

Self: Childhood was good until her mother met her fiance--after that she had no time for her and her three brothers. Parents were not married--she doesn't know him and doesn't care. Some nice memories about early childhood--then went to Illinois. At 4 or 5 she lived in Richmond at her grandmother's with her mother, before brothers were born (13, 9, and 8 at time of interview). Went to pre-school and elementary school at King. Remembers being chased after school in early elementary school. (Doesn't remember much; says it must have been fine.) She moved a lot during elementary school. First to Portland to live with grandmother because she was having problems with mother's fiance, then to Illinois when mother married another man (she didn't like him either, he was childish and mean--her mother left him). Then they moved back to Richmond (5th grade). Some problems at King then. Real problems started at Portola junior high. Transferred to Crespi, repeated 8th grade. Had fights, talked back to teachers. Did better at Crespi. Mother died that year. (Didn't want to talk about it, didn't go to the funeral.) Apparently she and mother had serious problems. She moved in with uncle at Hilltop. Then went to L.A. (turns out she stayed with father for a while). Father remarried, has baby. Didn't work out--she hated him (he treated her like a "stepchild in the 3rd grade"). In 1983 to grandmother, and to Kennedy high school. Things were very bad by then. She spent most of her time across the street from Kennedy in a park. Says subjects were easy; she

actually liked math and biology--but cut and got into fights. Got pregnant in 1985 and went to Gompers since. Kennedy wanted her to repeat grade. She was quite ill after baby was born. Likes Gompers because of the short hours and because teachers are "warmer." Dr. Burris apparently talks to her a lot ("He is living in the 80s"). She is impatient and impulsive, she says, but now she has to change since she is responsible for herself and baby.

Subject close to her mother as a small child--went to work with her, etc., until mother met the man (2nd grade). Relationship with grandmother not great either although she thinks she cares since she took her in all of those times (when put out by mother and other relatives). She is determined to succeed (she made an excellent impression on me during the testing and has a good reputation at Gompers). She is only close to "her kid."

Grandmother: As a small child subject "just normal"--jealous of attention to anyone else. Didn't get along with any one later. O.K. as baby, then withdrew, didn't fit in, at age 3 already (at time her brother was born). Grandmother describes major problem in getting along with subject. Can't keep promises; insults people, breaks the rules, is insensitive; still expects people to be nice to her (my observation: socially unaware). Went to three therapists and liked it a lot. Grandmother told me of final conflict (with grandmother): subject had forgotten that she had taken money out of the coffee pot, and accused an aunt of stealing, called grandmother a bitch and hit grandmother. Grandmother put subject out and wouldn't allow her back, even when subject realized where the money was. Grandmother told of subject mistreating the baby. Subject is very inconsiderate, selfish, from childhood on. O.K. one to one but otherwise impossible. At age 8 grandmother took her but had a very difficult time. Nothing holds subject's interest for long. Mother had put her out at age 12. School subjects were not difficult. She is good at art--her work was exhibited at the Richmond Art Center, got 2nd place. Tried to push the baby onto grandmother but won't give him up. Determined to make it at Gompers.

* * * * *

APPENDIX M

CONSOLIDATED SUMMARIES OF POSITIVE AND NEGATIVE CHARACTERISTICS FROM THE INTERVIEWS

GOMPERS POSITIVES

#1 Protected by grandmother as a child. Quiet and shy
Good grades and rewards in elementary schools
Special trips by an organization
Sings in choir, connected to Young Life, and now to Brothers and Sisters Taking Action (BSTA)
Now will make it

#2 Good memories of childhood
School real easy
Rewarded, Student of the Week
Friendly, outgoing with people
Good relationship with parents, even through problem times
Very self confident, not demanding
Very empathic
Very likeable, favored by parents
Family close, emotions expressed
Gompers very positive experience

#7 Nice memories of childhood; some injustices
Loves being a mother
Gompers very positive, individualized experience, teachers care, treat as person
Feels mother helpful

#9 Liked Gompers--was even on honor roll when pregnant
Talented in art and dancing

#15 Liked preschool--no problem when small child
Liked the intermediate school although was expelled
Definite goal now for 1 yr: good relations with girl-friend
Liked therapy
He is compassionate

#16 Some good memories of early childhood
Likes Gompers very much
Close to "her kid"
Subjects were easy
O.K. one to one
Determined to finish high school
Liked therapy

#18 Friendly, loving as a baby
Active as child, but not too much though

#28 Gompers very positive experience. Teachers care; questions can be asked.
Determined to straighten out her life.
Very close to grandmother--very trusting and respectful
Has plan of action--might not be quite realistic
Grandmother very proud
Neat with her things--"intelligent," can orient herself

#30 Attractive house in Parchester Village
No problems at all in elementary school
Good in Catholic school, until transfer to Kennedy
Talented, earns money braiding hair

GOMPERS NEGATIVES

#1 Cried a lot as a baby; had bronchitis
Picked on a lot as small child
In 6th grade had a physical fight with the teacher, threw a chair
Not comfortable at junior high--got slapped
High school--severe problems--cutting, fighting
Has problems with time and measurement
Sister LD and delinquent

#2 Had mysterious fevers. Fell apart in Jr. High--stopped going
Didn't understand problem with organization
Involved in some physical fights
Does drugs. Forgets what she hears; spaces out in class
Impulsive--poor judgement

#7 Panicked when in strange area (Vallejo)--orientation?
No friends until 7th grade
Gets mad, loses temper. Doesn't trust adults
Impatient, but has to work
(Logic poor in several places)
Lives in very poor area, poverty obvious
Mother not aware of A's schooling very much
House disorganized, both mother and daughter have great problems with time
Brother rude and mean towards subject in front of me
Great problem arranging time--messages, notes disappeared

#9 Always temperamental, difficult to control
Cried a lot as a child
Age 2: difficult to calm down, wanted her way
Unpredictable; sometimes liked people, sometimes not
Lost interest in dancing, track, although talented
Problems with learning in elementary school--repeated third grade
In junior high teachers couldn't talk to her; she "lit" into a person, couldn't be controlled until she herself decided she is O.K.
In junior high suspended a lot for behavior
Breaking rules, defiant
So far not responsible, makes poor decisions, doesn't seem to learn
Hard time with time--always late to school
Unrealistic about future--wants to be a pediatrician

#15 Fought in elementary school to earn respect
In 4th grade problems started
In junior high in Vallejo decided he didn't have to respect rules after someone slighted him--was expelled
High school--couldn't settle down, got into "pencil and paper"
Logic poor--"skewed"
6th grade was having lots of problems--was tested
Not considerate of other people's feelings
Has real problems with time and sequence of months and days and seasons
"Hated" family life and with many moves and siblings and going to foster home

#16 Impatient, didn't get along with mother (serious)
Real problems started in junior high, although some problems with being teased before
Repeated 8th grade, had fights
Rude
Changed relatives' homes several times--put out every time
High school--stopped going
Fights, although subjects easy
Impulsive
Withdrew, didn't fit in from age 3 on
Breaks rules, insensitive
Swearing, hitting, then sorry
Mistreated her own baby although very attached
Inconsiderate, selfish
Nothing holds her interest for long

#18 Missed a lot of school, lost job
When became a teenager, became restless and started having problems in school--both academic and behavior--in special class
In high school just stopped going
Always problems with space
Short attention span
Older brother has all of the traits only worse

#28 Fell apart in Jr. High--stopped going
Had asthma
Huge classes--didn't understand, couldn't re-read what was said
Moody--gets very mad (I noticed during testing)
Has a hard time staying in school more than 3 hrs
Problems with rules, and impulsive--but now changing
Used to have a temper

#30 Bad experience at Helms junior high

KENNEDY POSITIVES

#42 Good memories of preschool
Positive about religious training
Very good in drafting
Really liked junior high
Admires stepfather and is close
Tries to adapt to differences and succeeds
Likes to think things through and do them well (apparently succeeds). Likes to get along with variety of people
No real problems with learning or teachers
Developed techniques to adapt to change

#43 Sweet, trusting, pretty, eager to talk and please
Good relationship with father when small; "perfect up to age 10"
Had therapy
Now things better
Accepted to college to study electrical engineering
Actually liked the changing of classes in junior high
Subjects were always easy
Never any problems with teachers and kids
Seemed to adjust both to Catholic and public school except in 9th grade (didn't want to move to Richmond)

#45 Loves school--played teacher from early on--read many books with grandmother (who is a teacher).
Liked going to mother's work and talk to co-workers when little
Still visits second grade teacher
Handled difficult situations well with many moves and racial prejudice
Certified gifted
Overcame prejudice by kids (snubbed and teased) and teacher in one school by working hard and getting into GATE
If bored--studies more
Runs track and excels
Learned to question unfair rules and accomplish some changes
Likes to organize things
Always easy to raise, works hard, always has little projects going, learned very easy, knows how to get the best out of people
Relations very good with father--can be talked to and reasoned with

#48 Very hard worker--special talents in music and sports--celled, singled out and helped, protected
Teachers always praised her for trying so hard and gave her extra help
Won a lot of recognition for her performance at Adams junior high

#50 Nice memories of mother in childhood
No problems with changes
Happy experiences with teachers and kids in elementary school
Helped teacher clean, then helped with kindergarten children
No problems with organization, memory, neatness
Really likes school, still
Never restricted or punished
Well coordinated, teacher's helper
Everything smooth and easy, even in junior high
Very well organized, orderly, mature, responsible, law-abiding girl

#54 (Great house)
Always very easy time in school--was skipped
Communicates well
Feels close to grandmother and cousins--spent a lot of time with them

#55 Always liked people and had lots of friends
Did extremely well in school--still stops to see elementary school teacher--certified gifted
Likes Kennedy--teachers and kids
Good in sports
Responsible and helpful
Never got into trouble at home (once in school) would not change anything in her life
Good relations with mother
Mother says daughter keeps her in line, with time and organization

#56 Good grades. Kept on honor roll in spite of difficulty--apparently very hard worker (overachiever)
Writes things down in order not to forget
Good in math and sports

#57 Liked Catholic school, did well
Passed test to Holy Names but didn't go
Got a volleyball scholarship to go to Catholic college
Likes school--tries hard because wants to go to college
Always loved school--would even go when ill
Works hard, often stays home, just to do homework
Good with children, trustworthy
Independent

#60 Extremely gifted, always excelled in his native Central American country as well as in the bilingual program
Skipped several grades
Certified gifted
Gets along very well with adults
Excellent in communication--spoke at board meeting to visiting politicians
Loves school

#62 Parents helped her a tremendous amount, also hired tutors (still has a tutor)
Transferred to private school--good experience until high school
Has lots of friends, very active in church
Relationship good with father; he has taken great interest in her schooling
Very affectionate, sociable
Very verbal

KENNEDY NEGATIVES

#42 Mean teacher in 5th grade--learning a little more difficult
Adapting to change takes time
Relationship with mother ambivalent

#43 Parents divorce difficult
When transferred from Catholic school to 9th grade--difficult
Started having problems with mother when she remarried and had a new child
Moody, sometimes depressed
In junior high, would do nothing she was told to do

#45 Difficult to arrange time--maybe because could not be negotiated with stepmother, who was the one I usually reached
Encountered prejudice and snobbery in junior high
Not close to mother
Many disruptions
Somewhat impulsive, and a little moody

#48 Many tries at interview--cancellations, etc.
House chaotic according to subject--also looks very dilapidated
Teased in elementary school because had to wear skirts
Believed always was learning disabled--but didn't tell anyone
Always needed a lot of help and got it. Still ended up with Cs only
Always had to work very hard
Got into trouble in high school for not being where she was supposed to be
Wondered why she was not catching on when everyone else did
Still confused about requirements
Loses temper sometimes
Feels mother exploits her
Sickly as baby and little child -- recently anemic
Worked at unemployment office during summer, spoken of well, but not allowed back
Does have problem with time
Brothers have more serious problems

#50 In Del Mar elementary picked on by older kids
In junior high didn't like history--one referral
Intensely dislikes mother's boyfriend
Used to be close to mother--now "don't communicate"

#54 Kids always "talked about her"
Math a little difficult
Rebelled some at Catholic high school, got away with it

#55 Enjoyed school until junior high--in history in highest stanine; didn't understand
Because certified gifted, into science and algebra in 7th grade--got turned off
Daydreams in class
Transferred out of difficult classes

#56 Remembers being referred to as "bully"
As subjects became more difficult in elementary school she had some problems with learning and behavior
Had a hard time concentrating and forgot things
Transition to junior high hard--a big step
Transferred to harder subjects because of good grades--now has a hard time
Doesn't like going to school every day
(Confused categories--to question "are you outgoing?" answered "Yes, I go out a lot")
Says she is impatient and impulsive
(Took a long time to arrange appointment)

#57 Problem with scheduling appointments
2nd grade--things difficult with kids--fighting
In high school confused about classes
Had to do some fighting
Used to be impulsive and now tries to stop it
Some problems with orientation and with oral directions (spatial!). Needs to go slow with oral directions

#60 Gets very angry--cries, kicks, and eats
Few friends--except through forensic club

#62 She said she felt the she had learning problems
Already in nursery school felt that she had a harder time than other children--couldn't handle construction paper
Talk of retaining her in kindergarten because she couldn't learn to count
Couldn't color right in 1st grade
6th grade--very frustrated--stopped going
In private school high school difficult
Hard time at Kennedy
Daydreams a lot, problems concentrating
Had a hard time as a baby--then better
Somewhat difficult as a young child
Never liked school

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APPENDIX N

MASTER MATRIX, PART 1

SUBJECT			DETROIT			WOODCOCK			WIIG-SEMEL					
COMPERS: ID#	AGE	GRADE	PIX ABS	ORIEN-TATION	ORAL DIR	LTR ID	WORD ID	PSGE CMPH	WIIG TOTAL	WIIG COMP	WIIG PASSV	WIIG TEMPL	WIIG SPATL	WIIG FAML
M01	16-8	11	9-0	9-9	13-0	6.2 .50	9.9 .14	8.7 .37	8.0	8.0	8.0	5.5	8.0	8.0
F02	17-0	11	9-9	13-0	14-0	12.9 .78	12.9 .80	12.9 .75	8.0	8.0	8.0	8.0	8.0	8.0
F05	16-7	11	9-0	11-9	10-3	6.2 .50	8.3 .28	7.2 .25	8.0	4.5	5.5	8.0	4.5	8.0
F06	16-4	10	7-9	10-9	9-9	6.2 .50	6.9 .22	7.6 .30	5.4	4.5	1.5	8.0	8.0	8.0
F07	17-10	12	9-6	10-0	8-9	6.2 .50	7.4 .16	5.0 .07	5.5	8.0	8.0	5.5	2.5	8.0
M08	16-4	11	9-0	12-6	13-3	6.2 .50	11.0 .47	12.9 .57	8.0	8.0	8.0	8.0	8.0	8.0
F09	16-1	10	9-0	10-0	11-0	12.9 .80	6.7 .20	6.0 .17	4.5	8.0	1.5	5.5	8.0	4.5
F14	16-8	11	9-0	12-6	14-9	12.9 .78	9.9 .40	12.9 .89	8.0	8.0	8.0	8.0	8.0	8.0
M15	16-0	10	8-3	11-6	14-0	6.2 .50	12.9 .86	7.8 .38	8.0	8.0	8.0	8.0	8.0	4.5
F16	17-0	11	7-9	9-6	13-0	4.3 .23	9.1 .34	11.0 .48	8.0	8.0	8.0	8.0	8.0	8.0
M18	16-3	10	10-0	10-0	11-6	12.9 .80	12.9 .72	8.4 .36	5.5	8.0	5.5	5.5	2.5	8.0
M21	16-8	11.4	8-9	12-0	12-9	6.2 .50	9.6 .38	6.5 .19	5.5	4.5	5.5	5.5	4.5	8.0
F25	16-6	10	10-0	13-0	13-0	12.9 .78	12.9 .80	9.2 .40	8.0	8.0	8.0	8.0	8.0	8.0
M26	17-10	12	9-6	13-6	13-0	12.9 ??	10.3 .45	7.8 .27	8.0	8.0	5.5	8.0	2.5	8.0
F27	16-3	11	4-6	11-0	10-3	12.9 .78	6.2 .12	7.4 .25	4.5	8.0	4.5	5.5	2.5	8.0
F28	17-6	12	9-6	9-3	12-3	12.9 .78	4.4 .04	4.1 .07	8.0	8.0	8.0	8.0	4.5	8.0
F30	16-4	11	9-0	11-0	15-0	12.9 .78	11.0 .47	6.5 .15	5.5	8.0	5.5	5.5	2.5	8.0
KENNEDY: ID#	AGE	GRADE	PIX ABS	ORIEN-TATION	ORAL DIR	LTR ID	WORD ID	PSGE CMPH	WIIG TOTAL	WIIG COMP	WIIG PASSV	WIIG TEMPL	WIIG SPATL	WIIG FAML
F40	17-6	12	10-0	13-0	15-9	12.9 .78	11.0 .42	12.9 .63	8.0	8.0	4.5	8.0	4.5	8.0
M42	16-0	11	9-9	10-6	14-6	12.9 .78	11.0 .47	12.9 .78	8.0	8.0	8.0	8.0	8.0	8.0
F43	17-2	12	9-0	12-0	14-6	12.9 .78	12.9 .60	12.2 .50	8.0	8.0	8.0	8.0	8.0	8.0
F45	16-2	11	9-9	13-6	15-6	12.9 .78	12.9 .86	12.9 .74	8.0	8.0	8.0	8.0	8.0	8.0
M46	17-3	12	9-0	13-0	12-0	12.9 .78	12.9 .72	12.2 .50	8.0	8.0	8.0	8.0	8.0	8.0
F47	16-2	11	9-9	12-6	15-0	12.9 .78	12.9 .93	12.9 .74	8.0	8.0	8.0	8.0	8.0	4.5
F48	18-0	12	7-9	10-0	8-9	6.2 .50	8.8 .26	6.2 .50	4.5	4.5	3.5	5.5	1.5	4.5
F50	17-0	11	9-9	12-6	16-3	12.9 .78	11.5 .52	12.2 .53	8.0	8.0	8.0	8.0	8.0	8.0
M51	16-3	11.4	9-3	12-6	14-0	6.2 .50	12.9 .80	9.5 .50	8.0	8.0	8.0	8.0	8.0	8.0
F54	15-11	11.4	9-3	12-0	14-3	12.9 .78	12.9 .62	12.9 .81	5.5	8.0	8.0	4.5	2.5	8.0
F55	18-0	12.4	9-6	11-0	14-9	12.9 .78	10.6 .40	12.9 .66	8.0	8.0	8.0	5.5	8.0	8.0
F56	16-4	11.4	8-0	12-0	14-9	6.2 .50	9.6 .38	7.8 .27	4.5	8.0	5.5	1.5	2.5	8.0
F57	16-4	11.4	9-0	13-6	11-6	6.2 .50	12.9 .70	8.4 .30	4.5	8.0	3.5	4.5	4.5	8.0
F58	17-11	12.4	9-0	12-0	15-9	12.9 .78	12.3 .72	9.2 .57	8.0	8.0	8.0	8.0	8.0	8.0
M60	15-1	9.4	10-0	12-6	16-0	4.3 .12	12.9 .94	12.9 .96	8.0	8.0	8.0	8.0	8.0	8.0
F62	17-3	12.4	9-0	11-0	13-0	12.9 .78	12.9 .88	12.2 .75	8.0	8.0	8.0	8.0	8.0	8.0
F63	16-6	11.4	9-9	12-6	13-6	4.3 .23	12.9 .66	11.6 .50	8.0	8.0	8.0	8.0	8.0	8.0

MASTER MATRIX, PART 2

PIX STORY				KeyMath								PBV	DUR	PIAGET				
GOM. ID#	W/S	SYN	ABS CNCPT	+	-	X	:	MSSNG ELMNT	$	MEAS	TIME	PBODY VOC	LISTN CMPRH	CONS SUBS	CONS AREA	CLA -SS	SPD/ DIST	MOR VAL
M01	11-0	17-0	7-6	9.5	6.7	8.8	9.5	9.5	9.5	5.2	5.3	107 .68	4	1	1	0	1	1
F02	12-0	14-0	17-0	9.5	9.5	7.2	9.5	9.5	9.5	8.0	9.5	114 .82	5	1	1	1	1	1
F05	13-0	8-6	17-0	9.5	9.5	7.2	9.5	9.5	9.5	8.0	8.5	81 .11	4	1	1	1	1	1
F06	17-0	8-6	7-0	9.5	9.5	8.8	9.5	4.3	9.5	3.9	5.3	70 .03	3	1	0	0	1	0
F07	11-6	8-6	7-6	8.4	8.0	8.0	7.8	5.3	7.8	4.3	6.1	63 .01	3	1	1	1	1	1
M08	12-0	10-0	7-0	6.6	8.0	7.2	6.7	9.5	9.5	6.6	6.9	96 .40	3	1	1	1	1	1
F09	15-0	7-6	17-0	5.6	8.0	9.5	9.5	5.3	7.8	3.6	4.2	53 <.01	2	1	1	0	0	1
F14	8-6	17-0	17-0	9.5	8.0	8.8	7.8	9.5	9.5	8.0	9.5	90 .25	5	1	1	1	1	1
M15	8-3	10-0	10-0	8.4	8.0	8.8	9.5	9.5	9.4	6.6	6.9	82 .12	4	1	1	1	1	1
F16	14-4	7-0	13-0	8.4	6.7	6.2	7.8	9.5	9.4	8.0	6.9	85 .16	3	1	1	0	1	1
M18	11-6	13-0	7-6	8.4	8.0	8.8	9.5	4.3	9.5	6.1	6.1	86 .18	3	1	0	1	1	0
M21	7-6	17-0	7-6	6.6	8.0	5.4	7.8	9.5	9.5	6.6	6.9	102 .55	3	1	1	0	1	1
F25	17-0	10-0	12-0	8.4	9.5	8.8	9.5	9.5	9.5	6.1	5.3	85 .16	3	1	1	1	1	1
M26	9-0	17-0	7-0	8.4	9.5	8.8	9.5	9.5	9.4	7.5	9.5	76 .06	3	1	1	1	1	0
F27	16-0	8-0	12-0	5.6	5.7	7.2	9.5	9.5	9.4	6.6	6.9	73 .04	3	1	1	0	1	1
F28	10-0	9-0	17-0	5.6	6.7	4.6	5.1	9.5	7.8	4.1	4.2	66 .01	3	1	0	1	1	0
F30	12-0	8-6	8-6	9.5	9.5	8.8	9.5	9.5	9.5	5.6	5.3	97 .42	3	1	1	1	1	1
KEN. ID#	W/S	SYN	ABS CNCPT	+	-	X	:	MSSNG ELMNT	$	MEAS	TIME	PBODY VOC	LISTN CMPRH	CONS SUBS	CONS AREA	CLA -SS	SPD/ DIST	MOR VAL
F40	17-0	17-0	17-0	6.6	9.5	8.8	9.5	9.5	9.5	8.0	9.5	89 .24	3	1	1	1	1	1
M42	7-6	10-6	17-0	8.4	9.5	9.5	9.5	9.5	9.4	8.0	9.5	96 .40	3	1	1	1	1	1
F43	7-6	14-0	17-0	9.5	9.5	8.8	9.5	9.5	9.5	8.0	9.5	88 .22	6	1	1	1	1	1
F45	14-0	17-0	17-0	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	120 .91	5	1	1	1	1	1
M46	11-6	10-6	17-0	8.4	8.0	9.5	9.5	9.5	9.5	8.0	9.5	95 .37	6	1	1	1	1	1
F47	17-0	17-0	17-0	8.4	9.5	9.5	9.5	9.5	9.5	8.0	9.5	155 .99	6.5	1	1	1	1	1
F48	17-0	8-6	11-0	3.8	6.7	7.2	6.7	5.3	6.6	6.1	9.5	73 .04	2	1	0	1	0	1
F50	13-0	8-0	16-0	8.4	9.5	9.5	9.5	9.5	9.4	5.6	9.5	94 .34	3	1	1	1	1	1
M51	12-0	9-0	7-6	9.5	8.0	6.2	9.5	9.5	9.5	7.25	9.5	61 .01	5	1	1	1	1	1
F54	14-0	10-0	12-0	8.4	9.5	8.8	9.5	9.5	9.5	8.0	9.5	122 .93	6	1	1	1	1	1
F55	13-0	17-0	11-0	9.5	9.5	8.8	9.5	9.5	9.5	6.6	6.9	88 .22	3	1	1	1	1	1
F56	13-0	17-0	9-0	9.5	8.0	8.8	9.5	9.5	9.5	8.0	6.9	104 .60	5	1	1	1	0	1
F57	17-0	8-6	8-8	8.4	8.0	9.5	9.5	9.5	9.5	6.6	6.9	134 .99	5	1	0	1	0	1
F58	9-0	17-0	17-0	9.5	6.7	9.5	9.5	9.5	9.5	6.1	6.9	97 .42	6	1	1	1	1	1
M60	8-0	17-0	17-0	9.5	9.5	9.5	9.5	9.5	9.4	9.5	9.5	117 .87	6.5	1	1	1	1	1
F62	17-0	17-0	17-0	9.5	5.7	7.2	9.5	5.3	9.4	8.0	9.5	132 .98	2	1	1	1	1	1
F63	17-0	17-0	12-0	8.4	8.0	9.5	9.5	9.5	9.5	9.4	9.5	95 .37	3	1	1	1	1	1

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