LONGITUDINAL STUDY OF BIOSOCIAL FACTORS RELATED TO DELINQUENCY AND CRIME

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INTRODUCTION

This final report presents three monographs (Appendixes II-IV) and a book (Appendix V) on the most recent research stemming from a longitudinal study of numerous biological, psychological, and sociological correlates of delinquency and violent crime (the Biosocial Study). The study was initiated and conducted by the Center for Studies in Criminology and Criminal Law at the University of Pennsylvania.

An overview of the general theoretical perspective of the study, in addition to detailed descriptions of the study's major data bases, its sample, research design, and data and sample collection, cleaning, coding, and validation efforts, may be found in previous grant proposals, papers, and reports submitted to the National Institute of Justice. The major findings and results of the study may be found in the publications, presented papers, and monographs listed in Appendix I of this report. The discussion which follows in this Introduction is based on the assumption that all of these materials have been made available to the reader.

THE BIOSOCIAL STUDY

A considerable amount of research points to associations among certain biological features of human functioning and different types of criminal behavior. For example, both violent and nonviolent behavior have been linked to gender, neuropsychological deficit, low impulse control, and substance abuse. Such associations have been reported for samples varying in age, race, and nationality, and within studies employing different methodological techniques and measurements.

Evidence for the role of some biological factors in explaining certain types of criminality has thus been fairly well established (see Appendixes II-V). The nature and extent of the biology-crime interrelationship, however, is less clear-cut, particularly with regard to violence. Moreover, few opportunities have been made available to examine the interaction between biological and environmental factors and crime under the most preferred conditions: i.e., within the same sample, at different points in time, with multiple measures and indicators of key variables, and with adequate samples of nonviolent and violent offenders.

The purpose of initiating the study described in this report was to examine longitudinally a variety of possible biological and environmental correlates of violent and nonviolent offenses. The study uses extensive medical data collected on seven consecutive cohorts of over 9,000 Philadelphia youths, followed from birth to age 7, as part of the nationwide Collaborative Perinatal Project (CPP). School and police records collected on the youths by the Center for Studies in Criminology and Criminal Law provide in-depth educational achievement and arrest data from ages 10 through 17. Thus, longitudinal data are available at key developmental points ranging from birth to adolescence.

The CPP sample and data are unique in several ways. Contrary to most biosocial research data, the CPP data contain comprehensive information pertaining to a variety of disciplines, thereby allowing a true multidisciplinary perspective. In turn, the data describe cohorts selected independently of, and prior to, their involvement in the juvenile justice system. Thus, pre- and post-system involvement data can be compared. The

examination of youths across different developmental points in time provides in addition an opportunity to decipher possible changes in biological and environmental influences.

THE CPP SAMPLE

Mothers of the CPP youths selected for this study were participants in the Philadelphia CPP which was conducted at Pennsylvania Hospital and later at the University of Pennsylvania Hospital between 1959 and 1966. Pennsylvania Hospital was one of 12 medical centers included by the National Institute of Neurological Diseases and Stroke (NINDS) in a nationwide study of genetic, biological, and environmental influences upon development in a sample of nearly 60,000 youths. In Philadelphia, the sampling ratio was 100 percent; the sampling frame comprised all clinic patients except unregistered emergency deliveries and those planning to deliver elsewhere. Thus, the total sample reflects, in part, the characteristics of children born to a self-selected group of women who were interested in receiving inexpensive maternity care.

Sex and race distributions, by cohort, of the total sample of 9234 live births delivered between 1959 and 1966 are shown in Table 1. The distribution of sexes is nearly evenly split within each cohort. Ethnically, the combined cohorts are predominantly (88 percent) black. The average socioeconomic level of the sample was found to be slightly lower (by one decile) than that for the U.S. population.

TABLE 1

PHILADELPHIA CPP COHORTS BY SEX AND RACE

COHORT		WHITE	BLACK	ORIENTAL	PUERTO RICAN	TOTAL
One (1959)	Male	45 (5.51%)	342 (41.86%)	-	5 (.61%)	392 (47.98%)
	Female	55 (6.73%)	364 (44.55%)	-	6 (.74%)	425 (52.02%)
	Total	100 (12.24%)	706 (86.41%)		11 (1.35%)	817 (100%)
Two (1960)	Male	72 (5.96%)	525 (43.50%)	-	11 (.91%)	608 (50.37%)
	Female	63 (5.22%)	529 (43.83%)	-	7 (.58%)	599 (49.63%)
	Total	135 (11.18%)	1054 (87.33%)		18 (1.49%)	1207 (100%)
Three (1961)	Male	67 (5.54%)	514 (42.48%)	2 (.16%)	22 (1.82%)	605 (50.00%)
	Female	59 (4.88%)	523 (43.22%)	-	23 (1.90%)	605 (50.00%)
	Total	126 (10.42%)	1037 (85.70%)	2 (.16%)	45 (3.72%)	1210 (100%)
Four (1962)	Male	70 (5.29%)	596 (45.05%)	-	27 (2.04%)	693 (52.38%)
	Female	60 (4.54%)	552 (41.72%)	1 (.08%)	17 (1.28%)	630 (47.62%)
	Total	1330 (9.83%)	1148 (86.77%)	1 (.08%)	44 (3.32%)	1323 (100%)
Five (1963)	Male	69 (4.67%)	643 (43.57%)	-	27 (1.83%)	739 (50.07%)
	Female	72 (4.88%)	639 (43.29%)	-	26 (1.76%)	737 (49.93%)
	Total	141 (9.55%)	1282 (86.86%)		53 (3.59%)	1476 (100%)
Six (1964)	Male	52 (3.31%)	664 (42.32%)	-	27 (1.72%)	743 (47.35%)
	Female	52 (3.31%)	741 (47.23%)	-	33 (2.11%)	826 (52.65%)
	Total	104 (6.62%)	1405 (89.55%)		60 (3.83%)	1569 (100%)
Seven (1965-66)	Male	46 (2.82%)	738 (45.22%)	-	38 (2.33%)	822 (50.37%)
	Female	51 (3.12%)	719 (44.06%)	1 (.06%)	39 (2.39%)	810 (49.63%)
	Total	97 (5.94%)	1457 (89.28%)	1 (.06%)	77 (4.72%)	1632 (100%)
TOTAL	Male	421 (4.56%)	4022 (43.56%)	2 (.02%)	157 (1.70%)	4602 (49.84%)
	Female	412 (4.46%)	4067 (44.04%)	2 (.02%)	151 (1.64%)	4632 (50.16%)
	Total	833 (9.02%)	8089 (87.60%)	4 (.04%)	308 (3.34%)	9234 (100%)

The Philadelphia sample reflects both a socioeconomic and racial skewness. Although this skewness limits the generalizability of results to a certain extent, variables which have an important relationship to both delinquency and violence, such as race and SES, can be more easily controlled. Indeed, this study focuses upon those individuals who, in light of past research, are at a "high risk" in terms of having a police contact.

THE STUDY DATA

Altogether, the Biosocial Study uses four different data sets collected on the CPP sample: 1) extensive medical and environmental CPP data collected from birth to age 7; 2) school achievement and school record data gathered for ages 6 through 17; 3) juvenile arrest record data available for youths from ages 7 to 17; and 4) seriousness score data on juvenile arrests.

CPP Data

Data collection for the CPP was prospective. Upon registration, each mother was administered a battery of interviews and physcial examinations. Data recorded for each pregnancy included information on the mother's reproductive history, recent and past medical history, prenatal examination and laboratory test results, all drugs taken during pregnancy, and labor and delivery events. Data recorded for each child included information on neurological and medical examinations at birth, throughout the hospital stay, at 4 months, and at 1 and 7 years. Psychological test batteries and behavioral data were collected at 8 months, and at 4 and 7 years.

Additionally, children were administered speech, language, and hearing examinations at 3 and 8 years. Socioeconomic and family data were collected during the mother's registration and at the child's 7-year examination. As Figure 1 shows, the administration of examinations across all seven cohorts ranged from 1959 to 1974.

The CPP data set is particularly rich for research because it is longitudinal, and because it records data for numerous correlates of violent behavior. Approximately 3600 variables were coded for each pregnancy and outcome. All of these variables have been cleaned, validated, and documented.

School Record Data

Philadelphia public school records (for age 6 through 17) contain a variety of retrospective data which are complementary with the CPP data collected during the child's first 7 years. Records include information on subjects' California Achievement Test (CAT) scores, grades, and truancies, as well as participation in special programs for various physical, emotional, social, or learning disabilities. School record data also provide a method of pinpointing migrants, youths who have left the Philadelphia area, so that they may not be included with others in the sample.

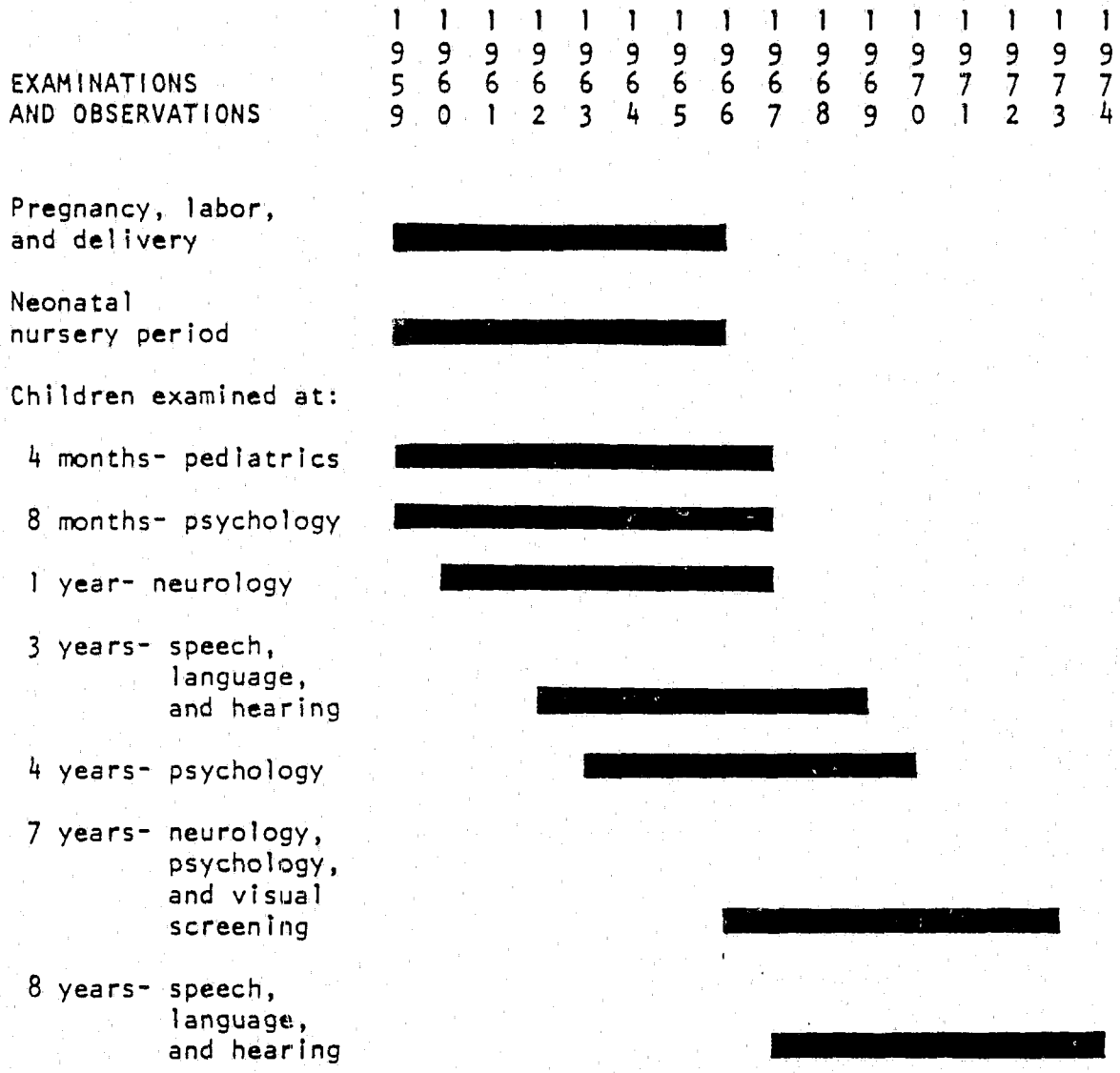

FIGURE 1.

Collaborative Perinatal Project Data Collection Time Span - 16 Years, 1959-1974. (Reproduced from J.B. Hardy, J.S. Drage, and E.C. Jackson (1979) The First Year of Life: The Collaborative Perinatal Project of the National Institute of Neurological and Communicative Disorders and Stroke. Baltimore: Johns Hopkins University Press.)

Juvenile Arrest Data

Juvenile arrest record information ranges in composition and detail according to the various forms available. The Juvenile Aid Division (JAD) Report, which appears in each case, contains demographic information on the offender and the charges filed. The Investigation Report provides specific data on the time, place, and district location of the offense. Included is a demographic outline of the complainant; any property which may have been stolen and its value; the number of individuals injured and the seriousness of the injuries; the type of any weapon present; and the extent of verbal and physical intimidation. The Arrest Report details arrest-relevant information such as the date, time, and place of arrest; the race, sex, and number of individuals involved; the offender's occupation; and the crime classification. A Seizure Analysis Report is included for cases involving the seizure of drugs and alcohol.

Seriousness Score Data

All offenses were coded for seriousness according to the scale used in the Criminology Center's National Crime Severity study. The seriousness scale allows a more precise representation of offense seriousness which is not reflected in the arrest code classification. Seriousness is determined by assigning weighted scores to the different amounts of injury, theft, and

damage which occur in index offenses, and by score value from the national study for nonindex offenses.

DESIGN THEORY

The general theoretical frame of the Biosocial Study rests on proposed interrelationships among correlates of juvenile delinquency, particularly violent behavior. These interrelationships are discussed in terms of early developmental, biological, and sociological factors whose cumulative and interactive influences vary over time. Given a sample at "high risk" for medical, psychological, neurological, and behavioral disorders, the study examines those factors which past research has found to be the strongest predictors of crime and violence.

The cumulative effects of these predictors and subsequent cognitive and delinquent behavior may be analogous theoretically to the combined effects of different variables used in risk research. "At risk" infants - those born prematurely, with low birth weight, etc. - appear to have somewhat more difficulty adjusting to poor environments than healthy, full-term infants.

Selected risk factors examined cumulatively are illustrated in Figure 2. As is shown, children with prenatal and perinatal complications are at a greater risk for later difficulties, particularly those associated with central nervous system (CNS) disorders: minimal brain dysfunction (MBD), impaired physical growth, or intellectual and academic difficulties. CNS-related difficulties for both sexes may be compounded by other factors such as large

family size, absence of the father, late birth order, or low socioeconomic status. These individuals are also at a greater risk for behavioral disorders or violent, repetitive, criminal behavior. Situational factors, such as victim-offender relationship, availability of weapons, etc. may also have an immediate impact on behavior irrespective of biological or early enviromental factors.

The nature and extent of relationships among such "at risk" factors and violent behavior are complex and, in many ways, difficult to detect. The opportunity to identify sequential or ordering effects is an advantage of longitudinal research because environmental interactions with violence are not always clear or consistent. A focus on the global chain of events which constitutes the developmental processes of violent behavior allows for more definitive results for policy implementation.

These interrelationships have been analyzed using a variety of statistical techniques. For example, longitudinal links among variables have been examined using structural equations models which are particularly appropriate for panel data with multiple indicators of key variables, such as intelligence. Interactions among categorical variables, such as presence or absence of the father in the household, have been analyzed using a generalized, weighted, least squares model with a logit response function. This type of model is excellent for analyzing two or multiple-way interactions among biological and environmental events. In turn, rare event phenomena, such as birth stress or neurological disorder, have been examined using survival analyses and logistic multiple regression equations.

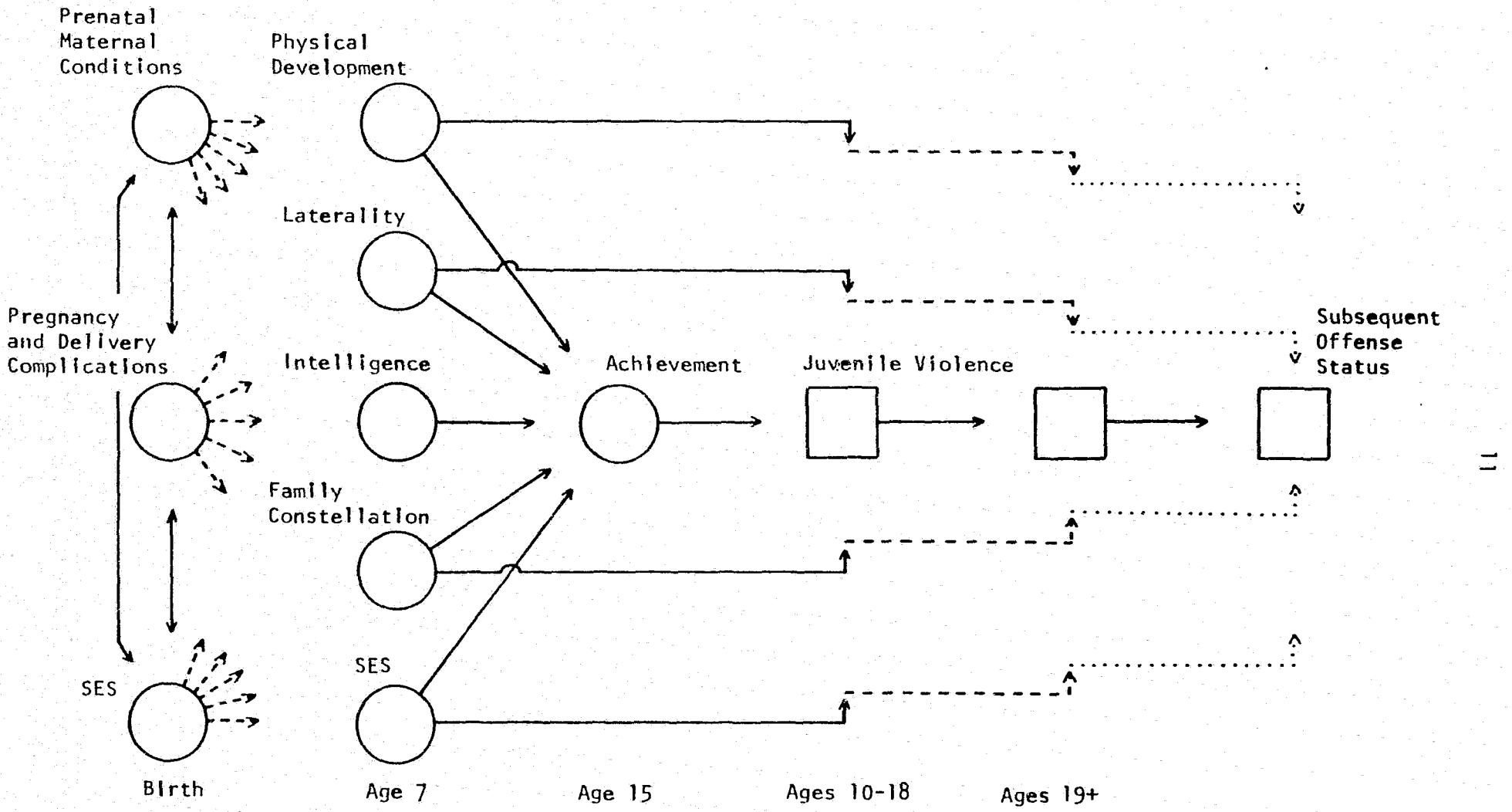

FIGURE 2.

Selected Biological and Environmental Correlates of Juvenile Violence

RESEARCH REVIEW

Considerable effort was made from the start of the Biosocial Study to guide research questions within an interdisciplinary theoretical framework. This effort is exemplified by the interdisciplinary index and bibliography noted in Appendix V (to be forwarded under a separate cover). The primary purpose of the index and bibliography was to link together the discoveries, concerns, and approaches of the many different areas of inquiry used in the Biosocial Study. Through these linkages, more informed and comprehensive research directions can be pursued.

The monographs presented in Appendixes II-IV of this report illustrate the full range of theoretical questions and avenues of research followed in the Biosocial Study. These monographs build upon findings and results in the previous publications, papers, and reports listed in Appendix I.

The monograph, "Sociological and Human Developmental Explanations of Crime: Conflict or Consonance?" (Appendix II) examines multidisciplinary correlates of delinquency in the CPP sample in an attempt to integrate social structure and learning theories of crime along with human developmental explanations. "Victim, Offender, and Situational Characteristics of Repeat Offense Status" (Appendix III) assesses possible differences between "one-time" and "repeat" offenders on select victim, offender, and situational characteristics associated with a first victim-related offense. One interesting outcome is the predictive importance of an offender's verbal ability in determining the

likelihood of recidivism, relative to situationally oriented factors. "Violence and School Failure" (Appendix IV) analyzes the link between poor academic performance, behavior disorder, and violent offense status which has been characteristic of the CPP offenders.

The policy implications of the research results of the Biosocial Study mostly center on the role of the public schools in detecting health-related learning and behavioral problems, and in providing educational programs early in life for youths at a high risk of academic underachievement and crime. For example, associations among delinquency, behavior disturbance, and low school achievement have been frequently linked to subtle health disorders such as minimal brain dysfunction and hyperactivity. Much like the sample of violent and nonviolent offenders in the CPP, hyperactive children are of normal intelligence, but they evidence antisocial and aggressive behavior in school which negatively impacts on their achievement levels. Longitudinal studies indicate that children who do not outgrow such behavioral disorders may retain antisocial conduct into adulthood (see Appendixes II-IV).

Most public schools do not have adequate facilities for treating children with learning or behavioral disorders; consequently these children's prospects for future "legitimate opportunites," such as employment, may be hindered. It appears also that expenditures in maintaining youth enrollment in school, as well as in promoting programs for the learning disabled, may provide more successful solutions to preventing delinquency or violent crime than other alternatives, such as employment programs (see Appendix II). Learning intervention programs are not suggested as substitutes for employment training or job services. However, provisions for training in

fundamental skills and basic education appear to be crucial for ensuring continual employment and other "legitimate" opportunities, particularly for high risk youths.

APPENDIX I

PUBLICATIONS AND PAPERS

BOOKS

Denno, D. and R. Schwarz. Biological, Psychological, and Environmental Factors in Delinquency and Mental Disorder: An Interdisciplinary Bibliography. Westport, CT: Greenwood Press, 1985.

Denno, D. Biology, Crime, and Violence: New Evidence, in progress.

DISSERTATION

Denno, D. Sex Differences in Cognition and Crime: Early Developmental, Biological, and Sociological Correlates. Ph.D. dissertation, University of Pennsylvania, 1982.

PUBLICATIONS

Denno, D., B. Meijs, I. Nachshon and S. Aurand. "Early Cognitive Functioning: Sex and Race Differences." International Journal of Neuroscience, vol. 16, 1982, pp. 159-172.

Nachshon, I., D. Denno and S. Aurand. "Lateral Preferences of Hand, Eye, and Foot: Relation to Cerebral Dominance." International Journal of Neuroscience, vol. 18, 1983, pp. 1-10.

Denno, D. "Sex Differences in Crime: Biological and Environmental Influences." In Charles E. Babbitt (ed.) Sociology Toward the Year 2000 and Beyond. Harrisburg, PA: Beacons Publishing Co., 1983.

Denno, D. "Neuropsychological and Early Environmental Correlates of Sex Differences in Crime." International Journal of Neuroscience, vol 23, pp. 199-214.

Nachshon, I. and D. Denno. "Violent Behavior and Hemisphere Function." In S.A. Mednick (ed.) Biology and Antisocial Behavior. New York: Cambridge University Press, 1985.

Denno, D. "Sociological and Human Developmental Explanations of Crime: Conflict or Consonance?" Criminology. Forthcoming.

Denno, D. "Violence and School Failure." Child Abuse and Neglect: The International Journal. Invited for submission.

Denno, D. "A Method for Organizing Interdisciplinary Literature on Crime and Mental Disorder." Submitted.

Nachshon, I. and D. Denno. "Birth Order and Lateral Preferences." Submitted.

Denno, D. "Victim, Offender, and Situational Characteristics of Repeat Offense Behavior." Submitted.

MONOGRAPH

Center for Studies in Criminology and Criminal Law. Collection and Coding of Offense Data for the Biosocial Project. Philadelphia: University of Pennsylvania, 1980.

INVITED PAPERS

Denno, D. "Preliminary Findings on Research Examining Some Etiological Components of Neuropsychological and Behavioral Disorders." Annual Meeting of the International Group in Criminology, Ft. Lauderdale, Florida, 15 November 1979.

Denno, D. "Race, Sex and Early Socioeconomic Correlates of Delinquency in Selected Philadelphia Collaborative Perinatal Project (CPP) Cohorts." Thirty-Second Annual Meeting of the American Society of Criminology, San Francisco, California, 8 November 1980.

Denno, D., B. Meijs, I. Nachshon and S. Aurand. "Early Cognitive Functioning: Sex and Race Differences." Eighty-Ninth Annual Meeting of the American Psychological Association, Los Angeles, California, 26 August 1981.

Denno, D. "Longitudinal Correlates of Verbal and Spatial Intelligence." 148th National Meeting of the American Association for the Advancement of Science, Washington, D.C., 6 January 1982.

Nachshon, I., D. Denno and S. Aurand. "Lateral Preferences of Hand, Eye, and Foot: Relation to Cerebral Dominance." Ninetieth Annual Meeting of the American Psychological Association, Washington, D.C., 24 August 1982.

Denno, D. "Structural Equation Models of Correlates of Violent Behavior." Thirty-Fourth Annual Meeting of the American Society of Criminology, Toronto, Canada, 9 November 1982.

Denno, D. and I. Nachshon. "Hemispheric Dysfunction and Deviant Behavior." Thirty-Fourth Annual Meeting of the American Society of Criminology, Toronto, Canada, 11 November 1982.

Denno, D. "Sex Differences in Cognition: A Review and Critique of the Longitudinal Evidence." 1983 Annual Meeting of the Eastern Sociological Society, Baltimore, Maryland, 5 March.

Nachshon, I. and D. Denno. "Violent Behavior and Hemisphere Function." Annual Meeting of the International Society for Research on Aggression, Victoria, B.C., Canada, 30 June 1983.

Denno, D. "Neuropsychological and Early Maturational Correlates of Intelligence." Ninety-First Annual Meeting of the American Psychological Association, Anaheim, California, 27 August 1983.

Denno, D. "New Evidence on Learning Disability and Delinquency." Thirty-Fifth Annual Meeting of the American Society of Criminology, Denver, Colorado, 10 November 1983.

Denno, D. "Sex Differences in Crime: Biological and Environmental Influences." Annual Meeting of the Pennsylvania Sociological Society, Villanova, Pennsylvania, 15 November 1983.

Denno, D. "Early Socioeconomic and Developmental Effects on IQ, Achievement, and Crime: New Evidence." 1983 Annual Meeting of the American Economic Association, San Francisco, California, 30 December.

Denno, D. "Longitudinal Study of the Crime-Work-Ability Interrelationship." Thirty-Sixth Annual Meeting of the American Society of Criminology, Cincinnati, Ohio, 11 November 1984.

Denno, D. "Early Maturation and Intellectual Development." Annual Meeting of the Eastern Psychological Association, Boston, Massachusetts, 24 March 1985.

Denno, D. "Family Income as a Predictor of Violent Crime: Still Strong After All These Years." Thirty-Seventh Annual Meeting of the American Society of Criminology, San Diego, California, November 1985.

Denno, D. "Sex and Violence: Influence of Academic Ability on Gender Differences in Violent Behavior." Thirty-Seventh Annual Meeting of the American Society of Criminology, San Diego, California, November 1985.

Denno, D. "Victim, Offender, and Situational Characteristics of Repeat Offense Behavior." Fifth International Symposium on Victimology, Zagreb, Yugoslavia, August 1985.

Nachshon, I. and D. Denno. "Birth Order and Lateral Preferences." Annual Meeting of the Pennsylvania Sociological Society. Submitted.

PANEL POSITIONS

Denno, D. Panel Chair, "The Biosocial Study of Crime and Delinquency." Thirty-Third Annual Meeting of the American Society of Criminology, Washington, D.C., 10 November 1981.

Denno, D. Panel Chair, "The Interaction of Biology and Environment in Violent Crime." Thirty-Seventh Annual Meeting of the American Society of Criminology, San Diego, California, November 1985.

RESEARCH REPORTS

Denno, D. A Review and Critique of the Recent Biological and Environmental Research on Crime. Washington, D.C.: National Institute of Justice, 1983.

Denno, D. Indicators of MBD and Learning Disability in the Biosocial Data Base: Initial Screening. Washington, D.C.: National Institute of Justice, 1984.

APPENDIX II

SOCIOLOGICAL AND HUMAN DEVELOPMENTAL EXPLANATIONS OF CRIME: CONFLICT OR CONSONANCE?

ABSTRACT

This paper examines multidisciplinary correlates of delinquency in an attempt to integrate social structure and learning theories of behavior along with human developmental explanations. Structural equation models are applied to assess biological, psychological, and environmental variables collected from birth through age 17 on a sample of 800 black children at high risk for learning and behavioral disorders. Results show that for both males and females aggression and disciplinary problems in school during adolescence are the strongest predictors of repeat offense behavior. Whereas school achievement and family income and stability are also strong predictors of delinquency for males, early physical development is the next strongest predictor for females. Results indicate that some effects on delinquency also vary during different ages. It is suggested that behavioral and learning disorders have both sociological and developmental correlates and that adequate educational resources are necessary to ensure channels of "legitimate opportunities" for high-risk youths.

The theoretical development of multidisciplinary explanations of crime seems to be one of the most praised concepts in criminology and, at the same time, one of the most ignored in actual research. For example, recent growth in the biological and neurological sciences has greatly increased knowledge about the complexities of human behavior. However, such influences are not reflected in most studies of crime which emphasize predominantly the role of environmental factors.

The seeming indifference in criminology to contributions in the biological sciences is not accidental; in part, it reflects a concern that the acceptance of biological theories of crime reduces the importance of environmental effects (Shah and Roth, 1974: 102). It also demonstrates the tendency for the different social and biological sciences to work in isolation; each using its own language and technique, each unintentionally discouraging interdisciplinary mergence and exchange (Denno and Schwarz, 1985). This disciplinary split pits one research bias against the other, with neither approach singly able to investigate thoroughly the more complex components of behavior. Previous attempts to develop criminological theories have often failed in particular to acknowledge variations in the physiological and psychological capabilities of individuals for internalizing socially approved behavior. In turn, many efforts to study biological factors in crime have ignored even the most obvious environmental and sociological influences.

The present study examines links among multidisciplinary correlates of delinquency in an attempt to integrate social structure and learning theories of crime along with human developmental explanations. It is suggested that social and developmental approaches can be complementary, not conflicting, and that both are necessary to explain behavior comprehensively.

THEORY INTEGRATION

Social structure theories suggest in general that delinquency is an adaptation to conditions and social influences in lower-class environments. These conditions include poverty, lack of opportunity, poor education and socialization, single household families, etc. According to ecological studies (e.g., Shaw and McKay, 1931), stable areas of delinquency are created and maintained in urban environments where delinquent behavior is transmitted across generations of youths. Some of these areas may be part of a "subculture of violence" which maintains norms of violence separate from the dominant culture and which may vary among different ethnic groups (Wolfgang and Ferracuti, 1982). The subcultural theories of Cohen (1955) and Cloward and Ohlin (1961) posit further that delinquency results when lower-class males in a gang culture lack opportunities for advancement, e.g., through education and employment, thereby achieving success through illegitimate means.

Whether or not a more generic link exists between low socioeconomic status and delinquency, exclusive of subculture, is still not fully resolved (see, for example, Elliott and Ageton, 1980; Hindelang et al., 1981; Wolfgang et al., 1972). As Kvaraceus and Miller (1975) note, however, not all lower-class youths become delinquent; other social or environmental pressures exist. These include urban density and race, with blacks showing disproportionately greater criminal involvement, particularly in crimes of violence (Hindelang, 1978).

Recognizing that behavior has both psychological and social bases, differential association and social learning theories propose that delinquency is imitated, facilitated, and internalized with social reinforcements and modelling (Sutherland and Cressey, 1978). Hirschi's (1969) social bond theory links delinquent behavior to the strength of an individual's ties with society through attachments, commitments, involvements, and beliefs.

The successful maintenance of these ties is perhaps most in jeopardy during adolescence. Although human development is continuous, some authors suggest that adolescence is a time of "moral turbulence," when a strong sense of self or behavioral control is not yet established (Zellermayer, 1976: 99). Adolescence is also the most significant period of value formation (Konopka, 1973) and when, presumably, behavior is most open to change (McMahon, 1970). School, family, and peer experiences are all

influential. Given opportunities, a youth will commit a delinquent act because he or she is not yet deterred by a strong attachment to conforming values in society. Consistent with some bonding theory, those adolescents who avoid deviant influences may have greater self-esteem and self-control (Jensen, 1973). By later adolescence and early adulthood, the increased understanding of social organization that develops with age allows the individual to realize the "social and legal relations that bind him to society and constrain his behavior" (Simpson, 1976: 101). Thus, individuals "outgrow" those ages most susceptible to environmental influence (Schur, 1973).

Although considerable research supports the premise that social bonding and environment influence adolescent behavior, it is difficult to determine which constraints have the most impact. Moreover, bonding theories fail to explain adequately the persistence of criminal behavior among those who have reached maturity--or the start of criminal behavior among adolescents who have a favorable environment. The extent to which children and adolescents are relatively more susceptible to peer and social influences has also not been clearly gauged.

The strength of social bonding and the likelihood of a delinquent status may be dependent, in part, on early developmental, biological, and environmental factors whose cumulative and interactive influences vary over time. Considerable evidence indicates that many biological and developmental disorders associated with delinquency (e.g.,

learning and reading disabilities) may be attributable, in part, to minor central nervous system (CNS) dysfunction which is linked, most predominantly, to complications occurring before and after birth (for a review, see Denno, 1982).

The cumulative effects of indicators of CNS trauma and subsequent bonding and behavior may be analogous theoretically to the combined effects of different variables used in risk research (see, for example, Garmezy, 1977; Slone et al., 1976). "At risk" infants--those born prematurely, with low birth weight, etc.--appear to have somewhat more difficulty adjusting to poor environments than healthy, full-term infants.

> Because the central nervous system of these infants is either immature or compromised as the result of mechanical and/or chemical injury, these infants are under more stress than full-term healthy newborns. A depriving environment is an additional force that prevents the kind of integration of central nervous system (CNS) mechanisms necessary for the recovery and plasticity in maturation of an already vulnerable CNS [Eagle and Brazleton, 1977: 37].

Thus, infants "at risk" are not only more vulnerable to their immediate environment, they are also more prone to later CNS-related disorders associated with delinquency. These disorders include reduced intelligence or achievement, minimal brain dysfunction (MBD), problems associated with cerebral dominance, and learning and reading disabilities (Denno, 1982). Unfavorable environmental circumstances during childhood may compound these disorders (Denhoff et al., 1972: 164-165). Likewise, CNS-related deficits along with subcultural or familial deprivation may inhibit social bonds.

The nature and extent of relationships among "at risk" factors and delinquent behavior are complex and, in many ways, difficult to detect. The opportunity to identify sequential or ordering effects is an advantage of longitudinal research because biological and environmental interactions with delinquency are not always clear or consistent. Overall, specification of interrelationships among various kinds and occurrences of developmental variables may pinpoint those factors which initiate and perpetuate offense behavior.

The purpose of the present study is to examine associations among select indicators of social structure and social learning theories relative to human developmental explanations in the prediction of repeat offense behavior. Analyses are conducted on a sample at high risk for difficulties linked to social structure and bonding as well as development. It is expected that factors associated with the economic and social stability of the family will be the dominant predictors of repeat offense status for both males and females since these factors are also related to higher incidences of CNS and learning disorders (Nichols and Chen, 1981; Niswander and Gordon, 1972). However, select developmental factors should be contributing predictors as well if a susceptibility to criminal behavior exists among some individuals exclusive of the environment.

Analyses of sex differences provide an additional method for deciphering sociological and developmental effects. Consistent with

previous research, it is expected that developmental factors will be relatively more strongly associated with delinquency among females for two reasons: Males are physically more vulnerable to environmental influences than females; and female delinquents deviate more widely from biological norms in light of the greater sociological and cultural constraints on female behavior (Climent et al., 1973; Cowie et al., 1968).

METHOD

SUBJECTS

Subjects were selected from a sample of 2,958 black children whose mothers participated in the Philadelphia Collaborative Perinatal Project (CPP) at Pennsylvania Hospital between 1959 and 1962. Pennsylvania Hospital was one of twelve medical centers included by the National Institute of Neurological Diseases and Stroke (NINDS) in a nationwide study of genetic, biological, and environmental influences upon child development (Niswander and Gordon, 1972). Thus, the total sample reflects, in part, the characteristics of children born to a self-selected group of women who were interested in receiving inexpensive maternity care.

Data collection for the CPP was prospective. Upon registration, each mother was administered a battery of interviews and physical examinations, and extensive data were recorded for each pregnancy.

Data recorded for each child from birth through age 7 included neurological, medical, psychological, and behavioral test results. Socioeconomic and family data were collected during the mother's registration and at the child's seven-year examination. The forms used for collecting data and assessing coder reliability have been described in detail (U.S. Department of Health, Education, and Welfare, 1966, 1970). School and police records collected on the Philadelphia CPP youths by the Center for Studies in Criminology and Criminal Law provide educational achievement and arrest data during ages 10 through 17.

The sample of 800 subjects (410 males, 390 females) used for analyses fit the following criteria: (1) located in a Philadelphia public school, (2) stayed in Philadelphia from ages 10 through 17, (3) received selected intelligence tests at ages 4 and 7 ($\pm$ six months) and achievement tests at ages 14 and 15, (4) were not among sibling members excluded from the sample to prevent possible biases in multiple family membership. Comparisons between the final sample of 800 subjects and the excluded sample of 2,158 subjects show no significant differences in total and per capita family income, the number of prenatal examinations the mother attended, and mother's age. In general, the final sample appeared to be representative of the sample from which it was drawn (Denno, 1982).

MEASURES

Measures in this study, presented in Table 1, were selected according to social structure, social learning, and human developmental theories of delinquent behavior.

SOCIAL STRUCTURE

The selection and characteristics of the Philadelphia CPP sample control for a number of potentially social structure variations. All subjects were born and raised (until young adulthood) in the same urban area and received very similar medical treatment early in life. There is evidence to suggest that a sizable number of subjects lived in the same neighborhoods (Rosalyn Ting, personal communication). All subjects selected in the present study attended Philadelphia public schools and most shared a predominantly lower to lower-middle socioeconomic status. Only black subjects were included in this study's sample. Thus, the sample represents a fairly homogenous group with social structure characteristics found in some past research to associate strongly with delinquency.

Aside from such homogeneity, however, previous research has also demonstrated the importance of a wide range of other social structure factors in predicting crime. For example, various maternal and family variables have been linked to delinquency,

TABLE 1

INDEPENDENT AND DEPENDENT VARIABLES: THEORETICAL MODEL

INDEPENDENT VARIABLES (ξ)

ξ_1 Prenatal Maternal Conditions

—Number of Prenatal Examinations
—Number of Prenatal Conditions (a count of 8 items including presence of heavy smoking, sedative use, infectious diseases, etc.)
—Poor Obstetrical History (number of prior stillbirths, abortions, premature siblings, or neonatal death of siblings)
—Mother's Age
—Number of Prior Pregnancies

ξ_2 Pregnancy and Delivery Complications

—Number of Birth Complications (a count of 17 items including presence of placenta previa, bleeding during pregnancy, Caesarean or breech delivery, etc.)
—Duration of Labor
—Apgar at One and Five Minutes (a widely used, scaled scoring system to evaluate an infant's physical condition one and five minutes after birth)
—Birth Weight, Gestational Age (indicators of infant health and premature birth)

ξ_3 Socioeconomic Status - Registration

—Family Income
—Mother's Education
—Husband or Father Present in the Household

ξ_4 Intelligence - Age 4

—Stanford-Binet Intelligence Scale

ξ_5 Nursery School Attendance - Age 4

—Enrollment in a Publicly Funded Nursery School Program

ξ_6 Physical Development - Age 7

—Height, Weight
—Blood Pressure (systolic and diastolic)

ξ_7 Cerebral Dominance (Laterality) - Age 7

—Hand, Eye, Foot Preference

TABLE 1 (cont.)

ξ_8 Socioeconomic Status - Age 7

—Family Income
—Education, Occupation of Household Head (Census Bureau Index)
—Husband or Father Present in the Household

ξ_9 Disciplinary Code in School - Age 15

—Enrollment in a Program for Youths with Disciplinary Problems at Any Time during High School

ξ_{10} Retardation Code in School - Age 15

—Enrollment in a Program for Youths with Tested Evidence of Retardation at Any Time during High School

DEPENDENT VARIABLES (η)

η_1 Verbal Intelligence - Age 7

—Verbal Subscales of the WISC[a]
—Spelling, Reading, Subscales of the WRAT[b]

η_2 Spatial Intelligence - Age 7

—Spatial Subscales of the WISC
—Arithmetic WRAT
—Bender Gestalt Test, Goodenough-Harris Drawing Test

η_3 Achievement - Age 15

—All Subscales of the CAT[c]

η_4 Number of Offenses - Ages 10-17

—Total Number of Officially Recorded Offenses (both police contacts and arrests) during ages 10 through 17

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[a]Wechsler Intelligence Scale for Children

[b]Wide Range Achievement Test

[c]California Achievement Test

such as broken homes (Andrew 1981; Gabrielli, 1981) and absence of the father (Virkkunen, 1967), with differential effects according to the sex and race of the delinquent (Austin, 1978; Datesman and Scarpitti, 1980). In the present study, family indicators of social structure emphasized in the criminological literature included measures of socioeconomic status (income, occupation, and education) and presence of the husband or the father in the household.

An additional indicator of social structure in this study is whether or not a subject attended a publicly funded nursery school at age 4 (similar to Head Start), which was made available to some participants in the CPP. Head Start and related programs were instituted originally during the 1960s to provide disadvantaged preschool children with "legitimate opportunities" for academic success. There is evidence that some preschool programs have had a positive effect on the later school competence of children from low socioeconomic families, contradicting several past findings of no effect (Darlington et al., 1980).

BONDING AND LEARNING THEORIES

The extent to which youths are committed to normative values in society can be assessed through their degree of socially conforming ambitions and aspirations (Hirschi, 1969) as well as through their actual behavior. Academic achievement in school is often considered as an indicator of commitment to conformity in terms

of both current peer acceptance and the recognition of future prospects (Paternoster et al., 1983). Undisciplined or deviant school behavior is more of a direct indicator of lack of normative commitment and involvement in unconventional activity.

In the present study, school achievement was measured by subjects' California Achievement Test (CAT) scores for ages 14 and 15 (grades 7 and 8). Seriously problematic or undisciplined school behavior was measured in terms of whether or not a subject participated in a program for the remedial disciplined at any time during high school ("Disciplinary Code at Age 15"). These children were diagnosed as having normal intellectual ability but a long record of asocial behavior in school, such as physical aggression toward teachers, firestarting, inability to adjust to school, and conduct disturbance. According to the Philadelphia School Board, recommendation of a child to this program was based solely on in-school performance and was made independently of any knowledge of a child's official (delinquent) status.

HUMAN DEVELOPMENT

Human developmental theories of delinquency emphasize the physiological and psychological capacities of individuals to adjust to their social and physical environments and to internalize normative conduct. Individuals who experience disorders of the central nervous system, who have delayed maturation, or who have

low scores on intelligence tests may be particularly more vulnerable to negative or stressful environments, or exhibit less control over their behavior. In the present study, indicators of human development are generally of three types: (1) early CNS dysfunction or development, (2) intelligence and cerebral dominance, and (3) physical health and growth.

(1) Early CNS dysfunction or development is measured by a variety of prenatal and pregnancy complications found to relate to later disorders, including the mother's obstetrical history, her age, and her health conditions during pregnancy and delivery. Measures of the child's health include birth weight, evidence of premature birth (indicated by age at gestation), and Apgar score, an accepted and validated scale of health and development immediately after birth. (For a review of the literature, see Denno, 1982.)

(2) Evidence of anatomical and functional differences between the two (left and right) hemispheres of the brain provides one possible explanation for both intellectual and behavioral variations in the general population and, perhaps, between the sexes. In most (right-handed) individuals, the left cerebral hemisphere specializes in processing verbal stimuli, whereas the right cerebral hemisphere specializes in processing spatial stimuli (Bogen, 1969; Dimond and Beaumont, 1974). WISC verbal and spatial tests are widely used indicators of left and right hemispheric abilities and of "cerebral dominance"; i.e., when one of the hemispheres plays a

relatively more active role in certain kinds of cognition than the other (Reitan and Davison, 1974). (Further discussion of these differences and the controversies surrounding this area of research may be found in Gevins et al., 1981, and McGlone, 1980.) In the present study, measures of intellectual and behavioral development included the Stanford-Binet at age 4 and the WISC (as well as other psychological tests) at age 7.

Additional factors have been found to be associated with cerebral dominance or functional assymetry, most notably hand preference and, to a lesser extent, eye and foot preference (Nachshon et al., 1983). Findings that some left-handers tend to rely on the "less analytical, more emotional, more impulsive response modes" associated with the right cerebral hemisphere have been used to explain their greater involvement in delinquency and violence (Gabrielli and Mednick, 1980; for a review, see Denno, 1984). In the present study, hand, eye, and foot preferences at age 7 are analyzed as indicators of cerebral dominance.

Evidence of mental retardation in high school ("Retardation Code at Age 15") was determined by the results of a full battery of psychological tests in addition to personal assessments by school psychologists.

(3) Physical growth, even at an early age, is one of several predictors of subsequent health and development (Prahl-Andersen et al., 1979) and, in some studies, of physical maturation (Frisch and Revelle, 1971). Measures of height and weight, selected for

the present study, have been found to be excellent indicators of physical growth (Davie et al., 1972). Although blood pressure is a less stable measure of growth, it is highly related to height and weight in childhood and, as in adulthood, is an accepted correlate of general health (Katz et al., 1980).

GENDER

Males and females are examined separately in the present study in light of gender differences in human development and in response to variations in social structure and environments. For example, males appear to be relatively more vulnerable to environmental stress and developmental difficulty. In general, they experience a higher incidence of prenatal and perinatal mortality and complications, reading and learning disorders, mental retardation (Reinisch et al., 1979), as well as left-handedness and left hemisphere deficits (Cater-Saltzman, 1979). The higher incidence of (particularly violent) delinquent and criminal behavior among males is well-documented (Wolfgang and Ferracuti, 1982).

DELINQUENCY

In the present study, delinquency was measured in terms of the number of official police contacts (offenses) a subject experienced between the ages of 10 and 18. Previous analyses of this data set

have found "number of offenses" to be associated with total offense seriousness and to be the single best indicator of offense behavior (Denno, 1982). A detailed description of arrest data coding and reliability can be found in Center for Studies in Criminology and Criminal Law (1981).

THEORETICAL MODEL

Longitudinal relationships among selected variables were examined using structural equation models which combine features of both factor analysis and regression analysis. The models are especially appropriate for analyzing longitudinal panel data because each equation represents a "causal link," in contrast to other techniques such as ordinary least squares (OLS) regression, where each equation represents an empirical association (Goldberger, 1973: 2). OLS regression is also based on the assumption that measurement error in explanatory variables does not exist. However, in the social sciences, valid and reliable single indicators for theoretical concepts such as "achievement" are frequently unavailable. Consequently, the errors in the equations representing the omitted variables may be biased.

Jöreskog (1973) has developed a general linear model for the analysis of covariance structures which allows for both error in the equations and error in the variables. The general model is a system of equations relating both unobservable and observable

independent and dependent variables with an underlying causal structure (Jöreskog and Sörbom, 1978: 4).

Variables selected for the initial structural equation model, which was used as a theoretical framework for the present study, are shown in Table 1. The model consisted of ten latent independent variables (identified by ξ) with twenty-eight indicators and four latent dependent variables (identified by η) with twenty indicators. Direct and indirect relationships among social structure, social learning, and human developmental variables and delinquency were specified for males and females across four different time points.

The cumulative effects of indicators of early CNS trauma may be viewed longitudinally as risk factors. Children with prenatal and perinatal complications are at a greater risk for CNS-related difficulties such as impaired physical growth, intellectual and academic problems, minimal brain dysfunction, and pathological or mixed cerebral dominance associated with left hand, foot, or eye preference. These CNS disorders are also interrelated. For example, children with pathological or mixed cerebral dominance are significantly more apt to experience MBD and to have learning and reading disorders. Likewise, positive correlations between physical development, intelligence, and achievement have been demonstrated.

Regardless of the presence of birth-related CNS injury, however, CNS difficulties developed during childhood increase the likelihood of intellectual and behavioral problems. These difficulties may be

compounded, or dominated, by negative social structure factors such as absence of the father and low socioeconomic status. Notably, such individuals are at a greater risk for behavioral disorders and delinquency as well as persistent and violent behavior. The considerably greater incidence of males in delinquency and violence may be attributable, in part, to their more frequent incidences of CNS-related disorders as well as cultural pressures to be aggressive. (Evidence for the links among these variables may be found in Denno, 1982.)

The extent to which the interrelationships among these variables predicts delinquency has not been thoroughly investigated, particularly among black, lower SES subjects. Longitudinally, it is expected that the strength of associations would become more pronounced during adolescence, when physiological and, to some extent, environmental influences are strongest.

MODEL TESTING

Testing of the theoretical model involved examining each of the fourteen factors of variables separately by confirmatory factor analysis. The procedure for determining the appropriate fit of each model is described in Jöreskog and Sörbom (1978). In general, independent factors for the final structural equation model were considerably different from those outlined initially. The final model comprised twelve independent and four dependent factors, as shown with means and standard deviations in Table 2.

TABLE 2

MEANS AND STANDARD DEVIATIONS OF INDEPENDENT AND DEPENDENT VARIABLES BY SEX: FINAL MODEL

Variable		Males		Females		t
		Mean	(S.D.)	Mean	(S.D.)	(df = 798)
ξ_1	Mother's Age	24.42	(6.66)	24.79	(6.34)	-.81
ξ_2	Birth Weight (lbs.)[c]	7.10	(1.16)	6.66	(1.08)	5.54
ξ_3	Income at Registration (1970 dollars)	4070.83	(1897.31)	4016.59	(1919.66)	.40
ξ_4	Husband in Household, Registration (0 = present, 1 = absent)	.32	(.47)	.26	(.44)	1.65
ξ_5	Stanford-Binet - Age 4[a]	89.83	(12.23)	92.06	(13.46)	-2.45
ξ_6	Nursery School Attendance - Age 4 (0 = attendance, 1 = no attendance)	.90	(.30)	.89	(.31)	.35
ξ_7	Physical Development - Age 7					
	—Blood Pressure, Systolic	101.87	(9.85)	100.63	(9.81)	1.78
	—Blood Pressure, Diastolic[a]	62.01	(7.65)	60.89	(8.06)	2.01
	—Weight (lbs.)[c]	55.06	(10.31)	51.94	(9.07)	4.56
	—Height (cms.)[c]	124.40	(5.68)	122.37	(5.61)	5.10
ξ_8	Cerebral Dominance - Age 7					
	—Hand Preference	.12	(.32)	.09	(.29)	1.14
	—Foot Preference (0 = right, 1 = left or variable) (0 = right, 1 = left or variable)	.16	(.37)	.21	(.41)	-1.79
ξ_9	Income at 7 Years	6575.84	(3492.98)	6663.80	(3257.17)	-.37
ξ_{10}	Husband in Household, 7 Years (0 = present, 1 = absent)	.38	(.49)	.41	(.49)	-.86

TABLE 2 (cont.)

Variable		Males		Females		t
		Mean	(S.D.)	Mean	(S.D.)	(df = 798)
ξ_{11}	Disciplinary Code in School - Age 15[a] (0 = present, 1 = absent)	.05	(.21)	.01	(.11)	2.12
ξ_{12}	Retardation Code in School - Age 15[b] (0 = present, 1 = absent)	.05	(.22)	.02	(.15)	2.83
η_1	Verbal Intelligence - Age 7					
	—WISC Information	9.24	(2.37)	9.24	(2.43)	-.07
	—WISC Comprehension[b]	8.65	(2.49)	8.20	(2.27)	2.67
	—WISC Vocabulary[b]	8.27	(2.39)	7.77	(2.35)	2.98
	—WISC Digit Span	9.16	(2.87)	9.56	(3.06)	-1.94
	—WRAT Spelling[a]	22.80	(4.73)	23.65	(4.71)	-2.53
	—WRAT Reading[a]	31.16	(7.64)	32.91	(8.32)	-3.11
	—WRAT Arithmetic	20.03	(3.48)	20.49	(3.19)	-1.91
η_2	Spatial Intelligence - Age 7					
	—WISC Block Design[a]	9.10	(2.27)	8.77	(2.14)	2.08
	—WISC Coding[c]	9.71	(2.86)	10.63	(2.76)	-4.66
	—WISC Picture Arrangement[b]	8.88	(2.69)	8.33	(2.59)	2.96
	—Bender-Gestalt[c]	7.78	(3.33)	8.68	(3.62)	3.66
	—Goodenough-Harris Drawing Test[c]	96.53	(13.17)	93.59	(11.88)	3.32
η_3	Achievement					
	—CAT Vocabulary[a]	32.41	(26.27)	37.43	(29.81)	-2.52
	—CAT Comprehension[b]	29.03	(23.71)	33.77	(24.69)	-2.77
	—CAT Mechanics[c]	27.89	(24.06)	39.81	(26.64)	-6.63
	—CAT Usage and Structure[c]	29.21	(20.76)	35.40	(23.34)	-3.96
	—CAT Spelling[c]	26.08	(23.70)	40.30	(27.91)	-7.75
	—CAT Computation[c]	23.14	(22.07)	29.05	(23.64)	-3.66
	—CAT Concepts and Problems	24.76	(22.35)	28.51	(22.36)	-2.37

TABLE 2 (cont.)

Variable		Males		Females		t
		Mean	(S.D.)	Mean	(S.D.)	(df = 798)
η_4	Number of Offenses[c]	.82	(2.17)	.18	(.71)	5.61
	(N)	(119)		(47)		
	N	410		390		

[a] $p < .05$ [b] $p < .01$ [c] $p < .001$

Independent factors changed radically and for interesting reasons. Aside from Mother's Age (ξ_1) and Birth Weight (ξ_2), most prenatal and perinatal indicators of birth stress showed only very low correlations with dependent factors and thus could not be retained in the model. Mother's Age (ξ_1) remained as a single indicator of prenatal and perinatal conditions because it correlated with birth-related events and dependent factors; Birth Weight (ξ_2) remained as a single indicator of perinatal condition. SES at Registration and at Age 7 were best represented by two single indicators, Family Income (ξ_3, ξ_9) and Husband or Father Presence in the Household (ξ_4, ξ_{10}). Although family income and father presence are correlated, they demonstrate both theoretically and statistically somewhat separate effects on dependent measures. In turn, only the two strongest correlates of Cerebral Dominance (ξ_8), hand and foot preference, were retained. The factor of Physical Development (ξ_7) was confirmed, however, along with the three dependent factors: Verbal Intelligence (η_1), Spatial Intelligence (η_2), and Achievement (η_3).

RESULTS AND DISCUSSION

SAMPLE CHARACTERISTICS

Values of independent and dependent variables in Table 2 show that, on the average, CPP subjects were from families in the

lower-middle to lower income ranges. They scored in the lower-average or average ranges in intelligence tests at ages 4 and 7 and fell in the bottom one-third in achievement test scores at age 15. About 25 percent of the total sample evidenced an official police contact of some kind. In general, then, the CPP sample was skewed toward the lower income and achievement levels.

Results of t-tests indicate significant sex differences in some independent variables: Males are significantly heavier at birth; and they are heavier, taller, and have higher blood pressure at age 7. They score somewhat lower on the Stanford-Binet at age 4 and have higher enrollments in programs for the retarded and remedial disciplined. Significant sex differences exist on most dependent variables, although the directions of the differences are inconsistent for intelligence tests at age 7. For example, males score higher on some tests (e.g., WISC comprehension and vocabulary) and lower on others (e.g., WISC coding and WRAT reading). In contrast, males score consistently lower on achievement tests at age 15 and, expectedly, are more apt to have an offense record: 29 percent of the males and 12 percent of the females experienced an officially recorded police contact. Male offenders also evidence 4.5 times more mean number of offenses than female offenders.

Overall, the results in Table 2 support earlier research indicating generally greater weight and height for males at birth and at age 7 (Nichols and Chen, 1981), as well as research indicating

inconsistent sex differences in intelligence at young ages (McGlone, 1980). The finding of significantly higher achievement levels among females at adolescence has some empirical support, particularly among samples experiencing environmental stress. However, studies of sex differences in achievement are limited and their results are variable (Wittig and Petersen, 1979). The greater tendency for males to engage in delinquency was expected.

The longitudinal interrelationships among independent and dependent variables are shown in the standardized solution for the male and female final structural equation (comparison) model in Table 3. Parameter estimates and model fitting were conducted first for separate male and female models until chi square results reached a level of nonsignificance. The initial, highly significant chi square results for these separate models are shown along with the nonsignificant chi-square results of the final model comparing parameter estimates of the male and female samples. The "good fit" of the final sex comparison model is reflected in its nonsignificant chi square. It is to be emphasized, however, that the variables selected as correlates of delinquency do not represent the full range of potentially relevant effects; the final model is only one possible explanation of the interrelationships.

Coefficient effects in Table 3 can be interpreted in the same way as OLS regression. The effects of independent variables upon dependent variables are represented by γ; the effects of dependent variables upon other dependent variables are represented by β.

TABLE 3. FINAL STRUCTURAL EQUATION (COMPARISON MODEL: STANDARDIZED SOLUTION - MALES AND FEMALES

		Dependent Variables							
		Males				Females			
		Verbal IQ	Spatial IQ	Achievement	Offenses	Verbal IQ	Spatial IQ	Achievement	Offenses
β_1	Verbal IQ	-	-	.734[c] (4.35)	-	-	-	.314[a] (2.43)	-
β_2	Spatial IQ	-	-	.026 (0.16)	-	-	-	.458[b] (3.13)	-
β_3	Achievement	-	-	-	-.158[a] (-2.46)	-	-	-	-.026 (-1.27)
γ_1	Mother's Age	.097[a] (2.28)	.049 (1.20)	-.040 (-1.31)	.005 (.28)	-.020 (-.45)	.049 (1.20)	-.040 (-1.31)	.005 (.28)
γ_2	Birth Weight	-.007 (-.20)	.069 (1.63)	.007 (.22)	.041[a] (2.17)[b]	-.007 (-.20)	.069 (1.63)	.007 (.22)	.041[a] (2.17)
γ_3	Income at Registration	.050 (1.46)	.014 (.35)	.030 (.98)	-.265[b] (-2.67)	.050 (1.46)[a]	.014 (.35)	.030 (.98)	.014 (.88)
γ_4	Husband in Household, Registration	.079[a] (2.20)	.035 (.81)	.003 (.10)	-.138[a] (-2.00)	.079[a] (2.20)	.035 (.81)	.003 (.10)	.029 (1.40)
γ_5	Stanford-Binet	.473[c] (9.55)	.560[c] (12.28)	-.077 (-1.87)	.012 (.62)	.588[c] (12.06)	.600[c] (12.28)	-.077 (-1.87)	.012 (.62)
γ_6	Nursery School Attendance	.064[a] (1.93)	.039 (.96)	-.049 (-1.66)	-.003 (-.14)[b]	.064[a] (1.93)[a]	.039 (.96)	-.049 (-1.66)	-.003 (-.14)[b]
γ_7	Physical Development	.099[a] (2.52)	-.012 (-.25)	-.012 (-.34)	-.058[b] (-2.63)	.099[a] (2.52)	-.012 (-.25)	-.012 (-.34)	-.058[b] (-2.63)
γ_8	Cerebral Dominance	-.057 (-1.27)	-.019 (-.34)	.019 (.48)	-.020 (-.59)	-.057 (-1.27)	-.019 (-.34)	.019 (.48)	-.020 (-.59)
γ_9	Income at 7 Years	.056 (1.44)	-.018 (-.37)	-.008 (-.23)	-.011 (-.51)	.056 (1.44)[b]	-.018 (-.37)	-.008 (-.23)	-.011 (-.51)
γ_{10}	Husband in Household, 7 Years	.010 (.21)	-.079 (-1.60)	-.011 (-.31)	.122 (1.82)	-.146[b] (-.288)	-.079 (-1.60)	-.011 (-.31)	.038 (1.65)

TABLE 3 (cont.)

	Dependent Variables							
	Males				Females			
	Verbal IQ	Spatial IQ	Achievement	Offenses	Verbal IQ	Spatial IQ	Achievement	Offenses
γ_{11} Disciplinary Code in School	-.017	-.016	-.089[b]	.256[c]	-.017	-.016	-.089[b]	.925[c]
	(-.53)	(-.40)	(-3.04)	(5.66)	(-.53)	(-.40)	(-3.04)	(11.58)
γ_{12} Retardation Code in School	-.158[c]	-.111[b]	.031	-.023	-.158[c]	-.111[b]	.031	-.023
	(-4.71)	(-2.75)	(.99)	(-.86)	(-4.71)	(-2.75)	(.99)	(-.86)
R^2	.37	.37	.47	.13	.42	.37	.49	.29

Note: The t-statistic is reported in parentheses (2-tailed test) N = 410 (males); 390 (females)

[a] $p < .05$ [b] $p < .01$ [c] $p < .001$

Sex Comparison Model χ^2 (1035) = 1081.82; p = .152

Initial Male Model χ^2 (554) = 1450.53; p < .001

Initial Female Model χ^2 (554) = 1673.59; p < .001

Interrelationships among the significant ($p \leq .05$) direct and indirect effects from Table 3 comparing males and females are illustrated in Figure 1. A single coefficient on an arrow indicates that the relationship from one variable to another is identical for both sexes; two coefficients on an arrow, identified by exponents "M" and "F," indicate different relationships for males and females, respectively. The significance of a direct effect is shown by the t-value in parentheses (a t-value ≥ 1.96 is significant at the .05 level). The following discussion will emphasize primarily the direct and intervening effects of selected variables on the final dependent variable, delinquency (Number of Offenses).

DELINQUENCY PREDICTORS

Direct and indirect effects on Number of Offenses in Figure 1 indicate some sex differences. Disciplinary Code in School, represented in the model as the number of times an individual was enrolled in a disciplinary program, shows the most highly significant association with delinquency for both males and females (.256 and .925, respectively). The effect for females is particularly striking. These results demonstrate that, not unexpectedly, school-related aggression and behavioral disturbance are strong predictors of an official delinquency status. Moreover, it appears that delinquents evidence fewer attachments and commitments to conforming and normative behavior, at least in the school setting.

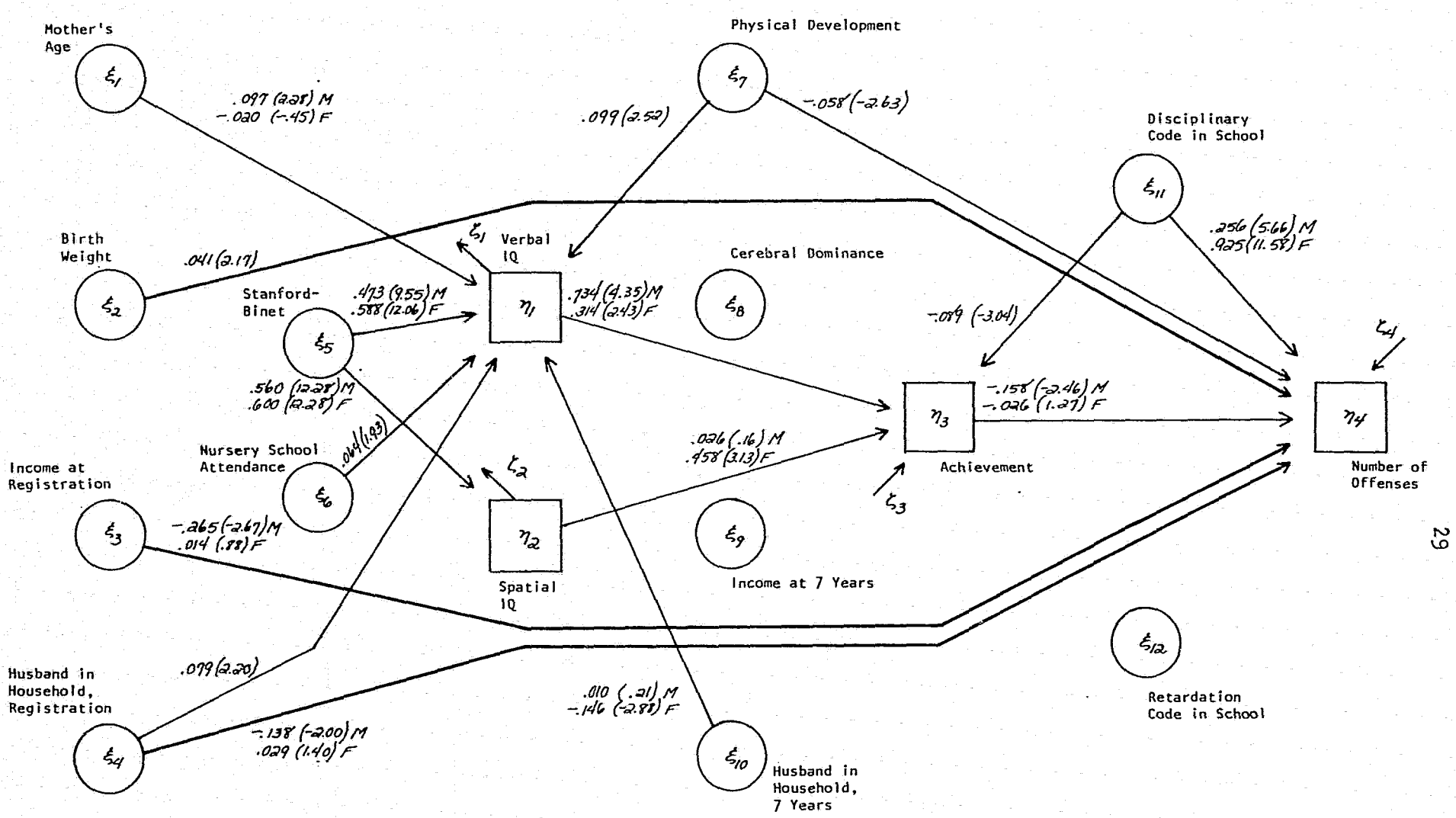

FIGURE 1: Final Structural Equation (Comparison) Model, Standardized Solution, Significant Effects Only

M = Males F = Females

Behavioral disturbance is not only linked with delinquency, however. Disciplinary Code has the same magnitude of negative effect for both sexes on Achievement (-.089), which, in turn, is negatively associated with Number of Offenses for males (-.158) but not for females (-.026). It appears, therefore, that behavioral disturbance among males extends to their abilities to achieve in school which may further inhibit normative bonds and "legitimate opportunities." The negative effect of Disciplinary Code on Achievement among females, however, does not indirectly lead to an official delinquency status. These results are consistent with past research indicating strong links between school achievement and delinquency among males (Kirkegaard-Sorenson and Mednick, 1977; Wolfgang et al., 1972) but no such links among females (Climent et al., 1973; Offord and Poushinsky, 1982).

What other factors may affect the association between male delinquency and Achievement? The only significant direct effect on Achievement for males is Verbal IQ at age 7 (.734), whereas both Verbal and Spatial IQ are significantly associated with delinquency for females (.314 and .458, respectively). Contrary to some past research (Hirschi and Hindelang, 1977; Moffitt et al., 1981; West and Farrington, 1973; Wolfgang, 1972), early intelligence scores show no direct effect on delinquency for either sex although scores do show an indirect effect on delinquency through Achievement for males. The link between Achievement and intelligence is expected; the

dominant effect of Verbal IQ relative to Spatial IQ among males, however, is surprising. It appears, as some studies have suggested, that poor verbal ability (one indicator of left hemisphere deficit) may be an important factor in academic underachievement (Reitan and Davison, 1974).

Other sex differences also exist. For example, Income at Registration and Husband in the Household are significantly negatively related to male offense behavior (-.265 and -.138, respectively), although these variables show no significant effect on the offense behavior of females (.014 and .029, respectively). These results are consistent with past research, indicating strong links between delinquency and low income among males (Elliott and Ageton, 1980; Wolfgang et al., 1972). Notably, such associations run counter to evidence linking delinquency and father absence among males (Virkkunen, 1976) as well as studies showing broken home to be one of the strongest predictors of delinquency among females (Cowie et al., 1968; Datesman and Scarpitti, 1980). As Datesman and Scarpitti (1980) note, however, no major research on broken homes distinguishes between types of male and female offenders or a possible sex-by-race interaction, although such distinctions may be important. For example, broken homes may be associated with the generally minor delinquency characteristic of white females because most of their offenses (e.g., runaway, truancy) reflect escape from a poor environment.

In turn, results in the present study associating male delinquency with Husband in the Household at Registration may be an artifact of several situations: a tendency for single women to lie about their marital status when they are pregnant (particularly during the time this study took place), a practice of some of the CPP women to live with parents and relatives (and thus potential father figures) at the time of their pregnancy, a possibility that a number of women were married soon after the birth of their child. As Table 2 shows, a higher proportion of women are living with a husband or father figure when their child is age 7, although for some women this discrepancy may reflect a number of changes in marital status during the seven-year period between CPP exams.

Evidence of a negative association between Income at Registration and Number of Offenses for males, but not for females, may be attributed to a variety of factors particular to the present study. For example, this study incorporated social structure and learning indicators at different points during development with the assumption that the timing of certain events is an important contributing factor to later behavior. This assumption has some support. It appears that negative environmental effects early in life may have more serious ramifications for males than environmental effects during early childhood. Such time-related associations are consistent with research indicating a mental and physiological transformation in a child's development, particularly around age 7:

> The normal child of 7± 1 has reached a level of maturation and development that permits autonomy. He is less emotionally dependent on his family, has at his disposal a neuromuscular apparatus that is ready for the challenge of environmental mastery; and he has a new set of cognitive strategies to outwit and control his environment [Shapiro and Perry, 1976: 97].

Indeed, there is evidence in Figure 1 that developmental types of variables at age 7 are predictors of delinquency. For example, Physical Development at age 7 is significantly negatively related to Number of Offenses for both sexes (-.058). However, the few previous studies which have examined associations between growth factors and crime report conflicting results. One review of the literature, for example, concludes that both delinquent girls and boys "are usually found to be on average better grown than control series, and to be above population averages for height and weight" (Cowie et al., 1968). In contrast, other research indicates that correlates of delayed growth, such as MBD and poor nutrition, have been linked to delinquency as well as behavioral disorders and problematic childhood temperament (Denno, 1982).

Past research on associations among physical characteristics, temperament, and behavior has been flawed, however, by both measurement and methodological difficulties (Shah and Roth, 1974). Furthermore, considerable evidence points to early environmental factors which could strongly affect temperament, despite arguments to the contrary (Cortés and Gatti, 1972). According to Cameron (1978), for example, preschool children's temperament scores show negative temperament

changes when observed parental behavior is inconsistent or conflicting. Alternatively, correlates of physical health, such as high blood pressure, may affect temperament as well as delinquency (Denno, 1982). Evidence in Figure 1 that Birth Weight is positively associated with Number of Offenses but Physical Development at age 7 is negatively associated points to contradictory results in developmental factors within the same sample. However, as the following discussion demonstrates, the significance of the Birth Weight variable disappears when indirect and direct effects are merged.

Standardized reduced form equations presented in Table 4 represent the total impact of independent upon dependent variables through the summation of indirect and direct effects. Essentially, each η is expressed exclusively in terms of ξ's. In the present structural equation model, all independent variables and the two Verbal and Spatial IQ dependent variables determine the ultimate dependent variables, Number of Offenses and Achievement. The reduced form equations for Verbal and Spatial IQ are identical to their structural form equations.

The strength of coefficients for reduced form equations is determined by comparisons with other coefficients in the equations. With regard to delinquency, sex differences are clear. For males, Number of Offenses is most strongly associated with Discipline Code in School and low Income at Registration. Husband in the Household is negatively related to offense behavior at registration but

TABLE 4

STANDARDIZED REDUCED FORM EQUATIONS FOR ACHIEVEMENT AND NUMBER OF OFFENSES

		Males		Females	
		Achievement	Offenses	Achievement	Offenses
γ_1	Mother's Age	.032	.0001	-.024	.006
γ_2	Birth Weight	.003	.041	.036	.040
γ_3	Income at Registration	.067	-.276	.052	.012
γ_4	Husband in Household, Registration	.062	-.148	.044	.028
γ_5	Stanford-Binet	.285	-.033	.364	.003
γ_6	Nursery School Attendance	-.001	-.002	-.011	-.002
γ_7	Physical Development	.060	-.067	.013	-.058
γ_8	Cerebral Dominance	-.023	-.017	-.007	-.020
γ_9	Income at 7 Years	.033	-.016	.001	-.011
γ_{10}	Husband in Household, 7 Years	-.006	.123	-.093	.040
γ_{11}	Disciplinary Code in School	-.102	.272	-.102	.927
γ_{12}	Retardation in School	-.088	-.009	-.070	-.021
	N	410		390	

positively related at 7 years. In other words, mothers who report not having a husband at birth are more likely not to have delinquent children. However, when direct and indirect effects are combined, the reverse situation exists at age 7 and Husband in the Household appears to inhibit delinquency.

The magnitudes of total effects on Achievement among males are not surprising: Stanford-Binet at age 4 predicts later Achievement the most strongly, followed by the negative effects of Disciplinary and Retardation Codes at age 15.

The order of magnitude of these three total effects on Achievement are the same for females. However, Disciplinary Code in School has a clear dominating effect on predicting Number of Offenses. A negative association with Physical Development follows in importance; remaining effects are weak in comparison.

SUMMARY AND CONCLUSIONS

Overall, consideration of the direct, indirect, and total effects on Number of Offenses and Achievement demonstrate differences between the sexes and across time. For both males and females, the dominant effect on delinquency and Achievement is a Disciplinary Code in School. The next strongest effects on delinquency among males are Achievement, Income at Registration, and Husband or Father in the Household with conflicting effects between birth and age 7 measures. Physical Development was the next strongest effect on delinquency

among females. For both sexes Achievement was most strongly predicted by Stanford-Binet at age 4, followed by a Disciplinary and Retardation Code at age 15.

These results did not confirm entirely initial expectations in the present study that factors associated with the economic and social stability of the family would be the dominant predictors of repeat offense status for both males and females. Indicators of social structure and bonding (e.g., Family Income and Husband in the Household) did have a considerable, but not an overriding, impact on delinquency for males, but no impact for females. To some extent, biological variables (e.g., as measured by Physical Development) were relatively more important predictors of offense behavior for females, although, again, this association was not predominant.

Results of the present study also did not confirm findings in past research of direct relationships between delinquency and intelligence, retardation, cerebral dominance (e.g., left-handedness), or early central nervous system dysfunction. Early Nursery School Attendance in the present study did have some effect on verbal ability at age 7, but it had no significant effect on delinquency. The lack of strong, significant associations among these variables and delinquency may be due to several factors: the cultural and demographic characteristics of the CPP sample, the infrequent occurrence of some of the independent variables (e.g., early CNS dysfunction) which could underestimate true associations, or the simultaneous analyses of both

sociological and human developmental variables which could negate more "traditional" findings.

Results of the present study do suggest, however, that both sociological and human developmental variables contribute independent effects on delinquency and that further interdisciplinary research is necessary to decipher their more complex associations. Indeed, the policy implications of significant ties between school behavior and Number of Offenses could have both sociological and human developmental explanations.

For example, associations among delinquency, behavior disturbance, and low school achievement have been frequently linked to subtle health disorders such as minimal brain dysfunction and hyperactivity. The term hyperactivity in particular describes the heterogeneous behaviors of children who may evidence overactivity, attentional deficits, perceptual-motor impairments, and antisocial responses. By definition, children with below-normal intelligence or very severe neurological problems are excluded. Etiological explanations of MBD include prenatal or birth trauma, neurodevelopmental lag, and poor living environment (Rie and Rie, 1980).

Problem behaviors among MBD children appear to correspond with age. For example, young children (2 to 6 years) may show lack of discipline and hyperactivity; older children (during elementary school and adolescence) may demonstrate reading and learning disorders, academic underachievement, and delinquent or aggressive behaviors (Wender, 1971). Longitudinal follow-up studies indicate

that children who do not outgrow such behavioral disorders may retain antisocial conduct into adulthood (Shah and Roth, 1974).

Most public schools do not have adequate facilities for treating children with learning or behavioral disorders; consequently these children's prospects for future "legitimate opportunities," such as employment, may be hindered (Zinkus et al., 1979). For example, there is no strong evidence to suggest that employment programs for delinquent adolescents or adults may deter crime or enhance marketability, particularly among high-risk populations (Vera Institute of Justice, 1979: 3). Recent results of the NBER Young Black Men Employment Survey, on the other hand, did show that enrollment in schooling, in addition to other factors, had a significant deterrent effect on criminal behavior (Viscusi, 1983). The importance of education is highlighted in most studies on employment and crime (Thompson et al., 1981).

It appears that expenditures in maintaining youth enrollment in school, as well as in promoting programs for the learning disabled, may provide more successful alternatives to potential labor market problems than employment per se. Early intervention for the learning disabled, in particular, may be one of the most effective factors in the prevention of juvenile delinquency (Zinkus et al., 1979). Intervention programs are not suggested as substitutes for employment training or job services. However, provisions for training in fundamental skills and basic education appear to be crucial for

ensuring continual employment opportunities, particularly for high-risk youth.

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APPENDIX III

VICTIM, OFFENDER, AND SITUATIONAL CHARACTERISTICS OF REPEAT OFFENSE BEHAVIOR

ABSTRACT

VICTIM, OFFENDER AND SITUATIONAL CHARACTERISTICS
OF REPEAT OFFENSE STATUS

The purpose of the present study was twofold: (1) assess possible differences between "one-time" and "repeat" offenders on select victim, offender and situational characteristics associated with their first victim-related offense; and (2) determine which of these characteristics are the strongest predictors of repeat offense status with or without a victim, or repeat status with a victim only. "One-time" offenders were those who engaged in no other offense after their first victim-related offense; "repeat" offenders were those who engaged in at least one other offense after their first victim-related offense. The study sample comprised 60 black male juvenile delinquents whose offense histories were analyzed for ages 10 through 17.

Results showed that, relative to one-time offenders, repeat offenders had a longer total juvenile offense career. Repeat offenders were also significantly more apt to injure their first victim, to engage in their first victim-related offense at a younger age, to have younger first victims and victims closer to their own age and to victimize their demographic peers: nonwhite males. Repeat offenders also scored lower on verbal intelligence at age 7 and total achievement and language achievement at age 15.

Results of logistic multiple regression models showed that the strongest predictors of repeat offense status were those factors associated with the type or severity of the first victim-related offense, followed by the closeness in age between the offender and the victim, and the offender's lower total and verbal intelligence. In these models, demographic characteristics of the victim, the type of victim-offender relationship and other situational components of the offense (e.g., presence of a weapon) were not found to be significant.

In models examining victim-related repeat offense status, however, lower total and verbal intelligence were found to be the strongest of all predictors. Situational characteristics of the offense were of secondary predictive significance. In general, then, cognitive attributes of the offender predominate when the subsequent offense status involves at least one offense with another victim.

Given that a portion of interpersonal conflicts involve incidents of verbal aggression, it can be expected that those offenders who are less successful verbally may depend more on physically aggressive means of communication. Poor verbal ability has also been linked to cognitive deficits associated with potentially offense-related characteristics, e.g., impulsive and unplanned behaviors.

Overall, evidence that some characteristics of the offender in the first victim-related offense strongly predict subsequent offense behavior suggests that victim or situational dynamics in certain offenses may not be of overriding predictive importance. It is necessary in future victimology research to include as factors the personal attributes of all parties involved in an offense to assess more accurately the contribution of victim and situational components to recurrent offense behavior.

INTRODUCTION

Research in the field of victimology has contributed a considerable amount of information regarding victim characteristics and participation in different kinds of offenses (Drapkin and Viano, 1975; Hentig, 1948; McDonald, 1976; Mulvihill et al., 1969; Schafer, 1968; Wolfgang, 1982). For example, substantial evidence suggests that some victims may precipitate or encourage an offender's behavior (Amir, 1971; Avison, 1975; Normandeau, 1968; Wolfgang, 1958). Other research has focused on the sociodemographic characteristics of victims and types of victim-offender relationships (Amir, 1971; Sparks, 1975; Wolfgang, 1958).

More recently, victimology research has emphasized the situational characteristics of certain offenses which could possibly contribute to the initiation of an offense, or to extent of physical harm involved. According to Monahan and Klassen (1982:295), "the current view of situations recognizes that persons and situations are not independent." In other words, the behaviors of individuals are assessed in terms of their interactions with their immediate situation or environment. Situational factors which have been found to influence the type and seriousness of an offense include the closeness of the victim-offender relationship (Amir, 1971; Weiner and Wolfgang, 1985; Wolfgang, 1958); family income, stress and stability (Denno, 1982; Humphrey and Palmer, 1980); location of the offense (Schafer, 1968); the sociodemographic characteristics of the individuals involved (see Sparks, 1982 for a review); and the availability of weapons (Berkowitz and Le Page, 1967; Buss et al., 1972; Cook, 1981).

Much of the recent emphasis on situational events in victimology research, however, has been theoretical. Acknowledging some exceptions (e.g., Wolfgang,

1958 and a sizeable research on the death penalty), the few empirical studies that have been conducted have focused mostly on analyzing a limited number of victim or situational variables relative to offense careers or patterns. The examination of offenses only often excludes the potential importance of the individual characteristics or backgrounds of offenders. Furthermore, it is likely that the consideration both of offender and situational types of variables would be important predictors of offense behavior.

Other issues cloud empirical attempts to assess situational influences in crime. For example, few definitions of "situation" are provided in the literature and the boundary between what is considered to be relevant to the person as opposed to the situation is left indistinct, particularly when it is assumed that the two are interrelated. Compounding this vagueness is evidence that certain biological or psychological characteristics of offenders or victims may influence the outcome of particular encounters even though they may not be part of the situation itself (Mednick, 1982).

The purpose of the present study was twofold: (1) assess possible differences between "one-time" and "repeat" offenders on select victim, offender and situational characteristics associated with their first victim-related offense; and (2) determine which of these characteristics are the strongest predictors of repeat offense status with or without a victim, or repeat status with a victim only. "One-time" offenders are those who engage in no other offenses after their first victim-related offense; "repeat" offenders are those who engage in at least one other offense after their first victim-related offense.

This assessment raises a number of questions. For example, to what extent do particular situational components of one offense predict future offense

patterns? Do characteristics of the victim or the victim-offender relationship remain important when they are examined together with personal characteristics of the offender?

It is expected that repeat offenders will have more disadvantaged psychological characteristics and will evidence more provoking victim and situational characteristics in their first victim-related offense relative to one-time offenders. It is also expected that personal characteristics of the offender will be strong predictors of future behavior relative to victim and situational factors.

In the present study, "offender" and "situational" variables can be distinguished temporally. "Offender" variables comprise biological, psychological, sociological or behavioral measures gathered independently of the offense event (e.g., achievement test scores) or at a time preceding the offense event (e.g., intelligence test scores and per capita income at an early age). "Victim" and "situational" variables comprise characteristics of the victim or of the situation or environment which may have contributed to the offense event (e.g., victim-offender relationship or presence of a weapon). Some situational characteristics may be more immediate than others (e.g., a gun may appear instantly, whereas an offender may have known a victim for many years), and in these cases the distinction between "person" and "situation" becomes blurred. However, all variables in this study are analyzed simultaneously so that any possible interaction effects that occur between variable types may be recognized.

METHOD

Subjects

Sixty black male juvenile offenders constituted the total number of subjects in this study. These subjects were selected from a sample of 151 black male offenders whose mothers participated in the Philadelphia Collaborative Perinatal Project (CPP) at Pennsylvania Hospital between 1959 and 1962. Pennsylvania Hospital was one of twelve medical centers included by the National Institute for Neurological Diseases and Stroke (NINDS) in a nationwide study of genetic, biological and environmental influences upon child development (for a description of the study, see Niswander and Gordon, 1972). Thus, the total sample reflects, in part, the characteristics of children born to a self-selected group of women who were interested in receiving inexpensive maternity care.

The sample of 60 juvenile offenders fit the following criteria: (i) located in a Philadelphia public school; (ii) stayed in Philadelphia from ages 10 through 17; (iii) received selected intelligence tests at ages 4 and 7 years (± six months) and achievement tests at ages 14 or 15 years; and (iv) were not among sibling members excluded from the sample to prevent possible biases in multiple family membership. The 60 offenders experienced at least one police contact that involved a victim who was not an institution or a police officer. Thus, offenses characterized by shoplifting from a store, for example, or burglarizing an empty building or stealing from a member of the police officers' "granny squad" were not included in analyses.

A comparison of mean differences between the included sample of 60 offenders and the excluded sample of 91 offenders on key variables is provided in Table 1 (Appendix). Altogether, the included sample had a significantly higher mean number of offenses over their juvenile careers, significantly lower mean WISC (Wechsler Intelligence Scale for Children) verbal intelligence at age 7 and significantly lower total achievement test scores at age 15. No significant differences existed between groups on per capita family income or WISC total (Full Scale) intelligence at age 7. Thus, the final sample of 60 offenders included for this study were more apt to be repeat offenders and to score less well on some tests of intelligence and achievement. These differences are not surprising when considering that offenses which involve victims are more likely to be serious.

Measures

Collaborative Perinatal Project (CPP) Variables. For the present study, the WISC Verbal and Full Scale (total) intelligence tests administered at the 7-year examination of the CPP were analyzed as indicators of verbal and total aptitude. Per capita family income was included as a measure of socioeconomic status. Presence of a father in the household at age 7 was used as an indicator of family stability during preschool development. Selection of these particular measures are based on extensive prior analyses of CPP data.

School Report Variables. For the present study, California Achievement Test (CAT) scores administered in grades seven and eight (ages 14 and 15) in the Philadelphia public schools were analyzed as indicators of school aptitude. Enrollment at any time in a school for youths with disciplinary problems was used as an indicator of behavioral disturbance during adolescence.

Police Record and Victim Variables. Measures of juvenile delinquency were based on official police record data collected by the Center for Studies in Criminology and Criminal Law. Data were collected in Philadelphia for all study subjects between the ages of 10 and 18. Police records detail the nature of the offense (e.g., injury, theft or damage), the number of offenders and victims involved, as well as information on the sociodemographic characteristics of victims, the type of victim-offender relationships and the presence of a weapon during the offense.

RESULTS

COMPARISONS BETWEEN ONE-TIME AND REPEAT OFFENDERS ON VARIABLES AT FIRST VICTIM-RELATED OFFENSE

Means and standard deviations of those independent and dependent variables selected for analyses are shown in Table 2 (Appendix). The primary dependent variable for the present study was dichotomous: one-time offenders comprised those individuals who had no subsequent offense after their first offense involving a victim (n=23); repeat offenders comprised those individuals who had one or more subsequent offenses after their first offense involving a victim (n=37). These subsequent offenses may or may not have involved a victim. The significance of the differences in Table 2 between one-time and repeat offenders on variables at their first victim-related offense were determined using *t*-test statistics.

1. Total Number of Offenses. The sample of 60 offenders averaged a total of nearly five (4.80) offenses during their entire juvenile offense careers. Repeat offenders averaged nearly three times more the mean number of offenses (6.38) relative to one-time offenders (2.26), a highly significant difference. This difference is due, however, in part, to a small number of outlier offenders

who had an unusually large number of offenses (e.g., six individuals whose number of offenses ranged from 14 to 27); about half of the total sample averaged three or fewer offenses.

2. Repeat Offense. Altogether, 37, or more than half (61.67 percent) of the 60 selected offenders engaged in at least one other offense after their first offense involving a victim. This group of offenders constitutes the repeat offenders examined in Table 2. In turn, 38.33 percent of the 60 selected offenders did not engage in another offense after their first victim-related offense. This group of offenders constitutes the one-time offenders examined in Table 2.

3. Repeat Offense With Victim. Nearly two thirds (65 percent) of the repeat offenders engaged in at least one other offense involving a victim after their first victim-related offense.

4. Prior Offense Record. Over half (55 percent) of the total sample had engaged in an offense prior to their first offense involving a victim. Although one-time offenders had a higher proportion of prior offenses (61 percent) relative to repeat offenders (51 percent), the differences between groups were not statistically significant.

5. Number of Offenders. The total sample of offenders, as well as the two groups of repeat offenders and one-time offenders, had an average number of one and one-half offenders at the first victim-related offense. Thus, no significant differences existed among groups in the number of offenders involved in a first-time victim offense.

6. Offender Age. The mean age for the total sample of offenders at the time of their first victim-related offense was nearly 15 years. However, repeat offenders were over a year younger (age 14.46 years) than one-time offenders (age 15.61 years), a difference which is highly significant.

7. Offender WISC Full Scale (Total) IQ. The total sample of offenders scored lower than the national average on the WISC Full Scale IQ at age 7. Repeat offenders scored about 1.5 points lower than one-time offenders, a difference which is not statistically significant.

8. Offender WISC Verbal IQ. The total sample of offenders also scored lower than the national average on the WISC Verbal IQ at age 7. Repeat offenders scored five points lower than one-time offenders, a difference which is statistically significant.

9. Offender Total Achievement. School achievement was measured in terms of Philadelphia public school-wide percentile rankings on the California Achievement Test. "Total Achievement" was the total summary score on all the subtests of the CAT which covered language, reading and mathematical abilities. The total sample of offenders scored in the lower 15th percentile. Repeat offenders scored significantly lower (11th percentile) than one-time offenders (21st percentile).

10. Offender Language Achievement. The total sample of offenders scored in the lower 19th percentile of the Language subtest of the CAT. Repeat offenders scored significantly lower (14th percentile) than one-time offenders (26th percentile).

11. Offender Reading Achievement. The total sample of offenders scored in the lower 21st percentile of the Reading subtest of the CAT. Repeat offenders scored lower (17th percentile) than one-time offenders (27th percentile), although this difference was not statistically significant.

12. Offender Disciplinary Problem in School. One fifth of the total sample of offenders was enrolled in a program for disciplinary problems at some time during ages 10 through 17. Although a higher proportion of repeat offenders was enrolled in a program relative to one-time offenders, the difference between groups was not significant.

13. Offender Father Absent in Family. Over one half (55 percent) of the offenders in the sample did not have a father or father-figure present in their household at age 7, a good general indicator of family stability. Although a higher proportion of repeat offenders did not have a father present, this figure was not significantly different from that reported for one-time offenders.

14. Offender Per Capita Family Income. Family income was translated into June 1970 dollars, the midpoint year of the 7-year CPP examinations, using the consumer price index (CPI) for Philadelphia. Per capita income was calculated by dividing the total family income at the 7-year examination by the total number of persons in a family supported by that income. Although per capita income was somewhat lower for the repeat offenders, it was not significantly different from the amount reported for one-time offenders.

15. Number of Victims. The total sample averaged about one and one-third number of victims for the first victim-related offense. The average of one and one-half victims for repeat offenders was not significantly different from the average of one victim for one-time offenders.

16. Victim Age. The mean age for the total sample of victims at the time of the offender's first offense involving a victim was nearly 30 years, twice the mean age for the total sample of offenders. However, the victim's age for repeat offenders (24.57 years) was nearly 14 years younger than the victim's age for one-time offenders (38.09 years), a difference that is highly significant,

17. Victim-Offender Age Differences. The difference between the ages of victims and offenders was calculated by subtracting victim's age from offender's age. Although the mean age differences for the total sample was 15 years, significant differences existed between the offender groups. The age gap for repeat offenders (10 years) was significantly less than the age gap for one-time offenders (22 years).

18. Victim Sex. In the total sample, 40 percent of the victims were female. Although the proportion of female victims for one-time offenders (48

percent) was higher than the proportion for repeat offenders (35 percent), the difference between groups was not significant.

19. Victim Race. In the total sample, 63 percent of the victims were nonwhite. The slightly greater proportion of nonwhite victims for the repeat offender group was not significantly different from the proportion for the one-time offender group.

20. Victim Sex and Race. Sex and race combinations for victims are as follows:

a. Nonwhite Male. Overall, 42 percent of the total sample of victims comprised nonwhite males. The proportion for repeat offenders (54 percent) was significantly higher than the proportion for one-time offenders (26 percent).

b. White Male. In the total sample, 18 percent of the victims were white males. The slightly higher proportion of white male victims for one-time offenders was not significantly different from the proportion for repeat offenders.

c. Nonwhite Female. In the total sample, 20 percent of the victims were nonwhite females. The higher proportion of nonwhite female victims for the one-time offenders was not significantly different from the proportion for repeat offenders.

d. White Female. In the total sample, 20 percent of the victims were white females. The higher proportion of white female victims for the one-time offenders was not significantly different from the proportion for repeat offenders.

21. Victim-Offender Relationship. Relationships between victims and offenders were dichotomized into "stranger" and "nonstranger" (e.g., parent, other relative, acquaintance, neighbor, schoolmate, teacher). Victims such as institutions and police officers were not included in analyses. In the total sample, nearly three quarters (72 percent) of the victim-offender relationships were between strangers, with no significant differences in proportions between repeat and one-time offenders.

22. Offense Location. In the total sample, 40 percent of the offenses occurred inside. However, more than half (56 percent) of the offenses for one-time offenders took place inside relative to less than one third for repeat offenders, a difference which is statistically significant.

23. Weapon Present at Offense. In the total sample, 18 percent of the offenses involved a weapon of some sort (knife, blunt instrument, handgun, other type of gun, any other type of weapon). Repeat offenders were involved with a higher proportion of weapons, although this involvement did not differ significantly from one-time offenders.

24. Injury Involved in the Offense. In the total sample, 40 percent of the offenses involved personal injury of some degree to the victim. However, more than half (54 percent) of the offenses for repeat offenders involved injury relative to less than one fifth (17 percent) of the offenses for one-time offenders. This difference is highly statistically significant.

25. Theft Involved in the Offense. In the total sample, 60 percent of the offenses involved a theft of some degree, although the incidence of theft did not differ significantly between repeat and one-time offenders.

26. Damage Involved in the Offense. In the total sample, nearly one quarter (23 percent) of the offenses involved damage of some degree, although the incidence of damage did not differ significantly between repeat and one-time offenders.

PREDICTION AND CLASSIFICATION OF REPEAT OFFENSE STATUS

Analyses of the significance of each variable in Table 2 provide preliminary information on the importance of individual factors relative to the one-time and repeat offender groups. Intercorrelations among these variables are shown in Table 3 (Appendix). Determination of the relative importance of all variables examined simultaneously in predicting repeat offense status or in discriminating between one-time or repeat offender groups, however, can best be assessed using multivariate methods.

In the present study, predictions of repeat offense status were determined using the logistic multiple regression method. The primary purpose of this regression technique is to classify, using maximum likelihood estimates, each individual in a population according to one of (most commonly) two groups. The independent variables selected for the technique should provide maximal discriminating power for correct classification (for a discussion, see Lee, 1980; Walker and Duncan, 1967).

The logistic regression method is often recommended over other techniques (e.g., discriminant analysis) for assessing ordinal or binary dependent variables because it does not require the assumption of a multinormal distribution for independent variables (for a discussion of this and other advantages, see Press and Wilson, 1978). In the present study, predictions and classifications of repeat offense status were conducted by fitting a series of logistic multiple regression models to a single binary (0-1) dependent variable: "0" represented the group of 23 one-time offenders; "1" represented the group of 37 repeat offenders. Independent variables used for prediction consisted of variables 4 through 26 discussed in the previous section.

A backward, stepwise elimination procedure was used to determine the most significant predictors in the model. The stepwise procedure starts first with a regression equation model incorporating all independent variables, and then proceeds to eliminate sequentially each variable which provides the least significant gain in discrimination (based on the likelihood ratio test) after adjusting for variables already included in the model. In the present study, significance levels for included independent variables were based at the $p < .1$ level. Maximum-likelihood estimates were computed by the Newton-Raphson method. Logistic multiple regression models were conducted using Harrell's (1983) "LOGIST Procedure" program in SAS.

Repeat Offense Status With or Without a Victim

Six stepwise logistic models were computed incorporating sixteen of the independent variables listed in Tables 2 and 3. All models regressed the binary dependent variable of one-time offender status (0) and repeat offender status (1) against the sixteen independent variables. Six models were calculated in order

to avoid any possible bias due to multicollinearity which might have occurred by including in the same model subtests or total tests of the WISC or California Achievement Test. Thus, the WISC total (Full Scale) IQ was analyzed with each of the three achievement tests separately in the first three models, whereas the WISC Verbal IQ was analyzed with each of the three achievement tests separately in the last three models. "Race by Sex" was the only interaction variable included in each of the models.

All models resulted in an insignificant residual chi square, thereby satisfying the requirement that all variables excluded in the stepwise procedure could not significantly contribute to greater discriminating power. Only those models with the best discriminating power are reported in Tables 4 and 5 (Appendix).

The three models incorporating WISC total (Full Scale) IQ had virtually identical results since each of the three achievement tests did not reach the .1 level of significance for inclusion in the model. The final parameter estimates reported in Table 4 demonstrate that evidence of an injury or a theft in the first victim-related offense is the strongest predictor of repeat offense status. However, closeness in age between victim and offender and offender's lower intelligence at an early age are the next strongest predictors, followed by evidence of damage at the offense. Offense location and offender's father absence are relatively weak contributors.

Looking at the classification table, it can be seen that those independent variables that are significant in the model have a relatively low error rate in assigning an individual to one of the two offender groups. The "correct classification rate" in the table (80 percent) is based upon the observed versus

the predicted probabilities of correctly classifying an individual to a particular group. In other words, the logistic regression model classified 48 (17 + 31) of the 60 offenders in the sample correctly for an 80 percent (48/60) correct classification rate.

There are two primary types of misclassification rates. The first rate, "sensitivity", refers to proportion of observed repeat offenders (n=31) who were predicted to be repeat offenders (n=37); i.e., 31/37 or 83.8 percent. The second rate, "specificity", refers to the proportion of observed one-time offenders (n=17) who were predicted to be one-time offenders (n=23); i.e., 17/23 or 73.9 percent. According to these rates, the results of the classification table are good.

A less arbitrary method for classifying individuals, however, is provided by the "fraction of concordant pairs." This statistic counts the number of pairs in which the predicted probabilities are concordant with the observed values of the dependent variables, and thus provides an index of rank correlation between predicted and observed probabilities (for a discussion, see Harrell, 1983). In the group classification in Table 4, the fraction of concordant pairs is .87, indicating a high concordance between observed and predicted values. Overall, then, those independent variables that are significant in Table 4 are strong predictors of future offense behavior and good discriminators for classifying offender groups.

The three models incorporating WISC Verbal IQ had somewhat different results according to which achievement test was included. The model with the best classification rate is shown in Table 5. Looking first at parameter

estimates, it can be seen that evidence of an injury at the first victim-related offense, as well as closeness in age between offender and victim, are the strongest predictors of a subsequent offense. Low language achievement and family income, as well as low verbal intelligence, are the next strongest predictors. Evidence of a prior record has only marginally significant impact.

The classification table is good, demonstrating an 83 percent correct classification rate and a .87 concordance between observed and predicted probabilities.

Victim-Related Repeat Offense Status

In light of these results, another question to be considered is: do the same factors predicting the probability of engaging in another offense of any kind also predict the probability of engaging in another offense involving a victim? As noted in Table 2, 24, or 65 percent of the 37 repeat offenders engaged in at least one other victim-related offense. It is not unlikely that the characteristics of these offenders may be considerably different from the characteristics of those individuals who never engaged in another offense or in another victim-related offense.

Tables 6 and 7 (Appendix) support this conclusion. As before, six logistic multiple regression models were computed, with the first three models containing the WISC total (Full Scale) IQ with the three achievement tests, and the latter three models containing the WISC Verbal IQ with the different achievement tests.

Results of the three models with the WISC total (Full Scale) intelligence were very similar, as before, since achievement tests were not strong predictors. Surprisingly, however, the previously strong predictors of the offense situation, evidence of theft and damage, were not significant. As Table 6 demonstrates, lower total intelligence test scores is the single most highly significant predictor of engagement in a subsequent offense involving a victim. Evidence of injury in a first victim-related offense is less highly significant.

The correct classification and concordance rates in Table 6 are not as high relative to the rates in Tables 4 and 5, although they are still quite good. In other words, there is a greater likelihood of error in classifying individuals who engage in another victim-related offense. It must be recognized, however, that the Table 6 model has only one third of the number of significant variables evidenced in the previous two tables. The likelihood of accurate classification improves with the number of independent variables contained in a given equation.

All three models using WISC verbal intelligence showed that evidence of injury, theft or damage in the first victim-related offense was not a significant predictor of another victim-related offense. In all models, verbal intelligence was the most highly significant predictor, followed by offense location, as shown in Table 7. The correct classification and concordance rates are not as high as in other tables, so that some caution must be taken in interpreting results. However, the consistency in results between Tables 6 and 7 provides considerable confidence in the reliability of the parameters of the model.

SUMMARY AND DISCUSSION

The purpose of the present study was to assess possible differences between one-time and repeat offenders according to select victim, offender and situational characteristics associated with their first victim-related offense, and to determine which of these characteristics were the strongest predictors of repeat offense status with or without a victim and repeat status with a victim only. One-time offenders were those who engaged in no other offense after their first victim-related offense; repeat offenders engaged in at least one other offense after their first victim-related offense.

The sample in the present study comprised 60 black male juvenile delinquents whose offense histories were analyzed for ages 10 through 17. Altogether, 62 percent of the sample consisted of repeat offenders and nearly two thirds of the repeat offenders engaged in another victim-related offense. It was expected that repeat offenders would have more disadvantaged personal and background characteristics than one-time offenders and that these characteristics would be relatively strong predictors of a subsequent offense. Results of the present study supported in part these expectations. Repeat offenders showed relatively greater evidence of disadvantage, although other factors characterized the nature of their first victim-related offense as well.

Compared to one-time offenders, repeat offenders averaged nearly three times more offenses over their juvenile careers. Repeat offenders were also significantly more likely to injure their first victim, to engage in their first victim-related offense at a younger age, to have younger first victims and victims closer to their own age, and to victimize their demographic

peers: nonwhite males. Significantly more of their first victim-related offenses occurred inside. Repeat offenders also scored lower on verbal intelligence at age 7 and total achievement and language achievement at age 15. Although not statistically significant, repeat offenders did score slightly lower on total intelligence at age 7 and reading achievement at age 15. A higher (though not significant) proportion of repeat offenders was also enrolled in a program for disciplinary problems, had a father absent in the family, came from a family with lower per capita income and engaged in a higher proportion of offenses with weapons involved.

It is interesting to note, however, that repeat offenders did not have a longer prior record before their first victim-related offense, although it is recognized that they were a year younger. Furthermore, repeat and one-time offenders did not differ in their types of victim-offender relationships; most victims in the present study were strangers in both groups. However, it is to be emphasized that a portion of the offenses analyzed in the present study have been found in past research to involve victims who are predominantly strangers to the offender, e.g., theft or property offenses (Landau, 1974) and robbery offenses (Normandeau, 1968; Weiner and Wolfgang, 1985). In contrast, violent offenses, e.g., rape and homicide, have been more likely to involve victims who have a close relationship with the offender (Amir, 1971; Wolfgang, 1958). This type of offense difference may explain why a significantly higher proportion of the offenses for repeat offenders occurred inside without an accompanying higher proportion of offenses occurring between nonstrangers. In other words, location of the offense and closeness of the victim-offender relationship need not be related to the

same extent reported in crimes of homicide (Wolfgang, 1958). As Schafer (1968:93) notes, "no places are more frequently the objects of theft with violence than shops and stores, and no places can rank as high as family houses and apartments in the incidence of criminal homicides." Both theft from strangers and violence between intimates can occur disproportionately inside.

In the present study, it appears that one-time offenders victimized what may be considered as more vulnerable types of individuals—females of either race or white males—although the differences between offender groups on these victim characteristics were not significant. Repeat offenders were significantly more likely to victimize their demographic peers: nonwhite males who were relatively closer to them in age.

There is no evidence to suggest, however, that victim vulnerability is a major incentive to engage in an offense. As Landau (1974:145) reports from his interviews with different kinds of offenders, about one third of the violent offenders in his study estimated their victims to be equal or even greater in strength than themselves; in turn, the "great majority of property and fraud offenders report that estimation of the victim's strength was not taken into consideration at all." The finding in the present study that offenders in both groups were, as a whole, younger than their victims is consistent with previous research on homicides (Wolfgang, 1958) and on offenses ranging from theft to personal violence (Landau, 1974).

In general, then, one-time and repeat offenders differed on a number of victim, offender and situational characteristics of their first victim-

related offense, although strongly significant differences were more limited. What factors most strongly predicted repeat offense status?

Instances of injury or theft in the first victim-related offenses were the strongest predictors of repeat offense status with or without a victim. This result is not surprising, considering that individuals who engage in some types of injury or theft-related crimes are among those most likely to recidivate (Greenfeld, 1985). As Olweus (1979) also points out, aggressive behavior and reaction patterns within individuals are relatively stable over time. Like intelligence, aggressive behavior can be predicted from an early age and it remains consistent over the life span. Thus, juveniles who evidence aggression in one situation (an offense) are more likely to demonstrate aggression once again.

The next strongest predictor of repeat offense behavior was the age discrepancy between victim and offender. The smaller the discrepancy, the greater the likelihood of a repeat offense, indicating, perhaps, that offenders who victimize age-related peers possess characteristics that predispose them to future offending. These characteristics may be linked to certain types of intellectual ability because, in the present study, both total and verbal intelligence were negatively associated with repeat offense behavior, i.e., low levels of ability were the stronger predictors of a subsequent offense. In models with verbal (rather than total) intelligence, lower language achievement and lower family income followed in predictive ability, whereas prior record had only a marginally strong impact.

Overall, then, the strongest predictors of repeat offense status were those factors associated with the type or severity of the first victim-related offense, followed by the closeness in age between the offender and the victim and lower total and verbal abilities of the offender. In these models, demographic characteristics of the victim, the type of victim-offender relationship and other situational components of the offense (e.g., presence of a weapon) were not found to be significant. It appears, in general, that those factors related to type of offense and personal attributes of the offender were most important.

Predictors of a victim-related repeat offense status were quite different, however. Lower total and verbal intelligence were the strongest of all predictors in their respective models. Situational characteristics of the offense, such as evidence of injury (in the total intelligence models), or outside location of the offense (in the verbal intelligence models), were the only other significant predictors and they had less predictive impact. In general, then, cognitive attributes of the offender, and not characteristics of the situation or the victim, predominate when subsequent offense behavior involves at least one offense with another victim.

The importance of intellectual ability can be interpreted in a number of different but related ways. Crimes with victims are frequently confrontations with distinct patterns of interaction among the individuals involved. The situational dynamics of these interactions have been predominantly studied for crimes of violence (Felson and Steadman, 1983; Wolfgang, 1958; Wolfgang and Ferracuti, 1967). However, it may be assumed that such dynamics are similar for nonviolent crimes because it is most likely the

degree, rather than the kind, of human emotion or interactional pattern that varies across types of criminal behavior.

Given that a portion of interpersonal conflicts involves incidents of verbal aggression, it can be expected that those offenders who are less successful verbally may depend on more physically aggressive means of communication (see Wolfgang, 1967). Not unexpectedly, poor verbal skills could contribute to inappropriate physical aggression in a number of different interpersonal situations regardless of the types of victim or situational dynamics involved.

Poor verbal ability has also been linked to other potentially offense-related characteristics. For example, some evidence suggests that individuals who score lower on tests of verbal aptitiude are more apt to have deficits of the left cerebral hemisphere and consequently rely more on the right cerebral hemisphere in cognitive tasks and behavior. In turn, pathological dominance of the right cerebral hemisphere is more strongly associated with impulsivity, poor planning and the lack of sequential and analytical thought (see Denno, 1984 for a review of the literature). Although this association between cognition and behavior is considerably more complex than the discussion presented here, it is not unlikely that the impulsive and unplanned behaviors that accompany a disproportionate number of offenses may be related to particular cognitive deficits. Results of the present study support the feasibility of this link by demonstrating that cognitive characteristics of the offender, assessed at an age prior to the start of delinquency, are the primary determinants of a subsequent offense with a victim.

The limitations of the present study are recognized. The sample comprised only black males of predominantly lower socioeconomic status; consequently, the results may not be generalizable to other samples. The present study contained no detailed data on offender-victim interactions or precipitation, so that important predictor variables may have been omitted. Background and personal characteristics of the victim were also not included in the analyses; consequently, those characteristics of the offender that were included may be exaggerated in the extent of their impact. However, it is to be considered that there is limited logic in analyzing some like characteristics of the victim (e.g., should the first victim's verbal ability strongly predict whether an offender will repeat an offense with another victim?).

Overall, evidence that personal characteristics of the offender predict more strongly subsequent offense behavior relative to some characteristics of the offense suggests that situational dynamics in certain offenses may not be of overriding importance. It is necessary in future victimology research to include as factors the personal attributes of all parties involved in an offense to more accurately assess the contribution of victim and situational components to repeat offense behavior.

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APPENDIX

TABLE 1

COMPARISONS BETWEEN INCLUDED AND EXCLUDED OFFENDERS ON SELECT STUDY VARIABLES

Study Variables*	Included Offenders Mean	(S.D.)	Excluded Offenders Mean	(S.D.)	t (df = 148)
Total Number of Offenses[c]	4.80	(5.21)	1.86	(1.70)	-4.23
WISC Verbal IQ[b]	90.03	(9.43)	94.67	(11.12)	2.66
WISC Total (Full Scale) IQ	91.22	(9.84)	94.27	(10.59)	1.78
Total Achievement[a]	15.02	(17.74)	23.74	(21.91)	2.57
Per Capita Family Income	1050.84	(702.45)	1286.31	(765.12)	1.91
N	60		91		

[a] $p < .05$ [b] $p < .01$ [c] $p < .001$

*WISC - Wechsler Intelligence Scale for Children

TABLE 2

COMPARISONS BETWEEN ONE-TIME AND REPEAT OFFENDERS ON VARIABLES AT FIRST VICTIM-RELATED OFFENSE

	One-Time Offender		Repeat Offender		t	Total Sample	
Variables at First Victim-Related Offense	Mean	(S.D.)	Mean	(S.D.)	(df = 58)	Mean	(S.D.)
1. Total Number of Offenses[c]	2.26	(1.51)	6.38	(6.03)	-3.95	4.80	(5.21)
2. Repeat Offense	--	--	1.00	(0)	--	.62	(.49)
0 = No Repeat Offense 1 = Repeat Offense							
3. Repeat Offense with Victim	--	--	.65	(.48)	--	.40	(.49)
0 = No Repeat Offense 1 = Repeat Offense with Victim							
4. Prior Offense Record	.61	(.50)	.51	(.51)	.71	.55	(.50)
0 = No Record 1 = Prior Record							
5. Number of Offenders	1.54	(1.87)	1.54	(1.54)	.01	1.54	(1.66)
6. Offender Age[b]	15.61	(1.41)	14.46	(1.21)	3.35	14.90	(1.40)
7. Offender WISC Total (Full Scale) IQ	92.22	(9.11)	90.59	(10.35)	.62	91.22	(9.84)
8. Offender WISC Verbal IQ[a]	93.78	(9.96)	87.70	(8.40)	2.54	90.03	(9.43)
9. Offender Total Achievement[a]	21.43	(22.00)	11.03	(13.23)	2.05	15.02	(17.74)
10. Offender Language Achievement[a]	25.74	(21.63)	14.30	(15.58)	2.38	18.68	(18.82)
11. Offender Reading Achievement	27.04	(24.87)	17.19	(15.13)	1.71	20.97	(19.84)
12. Offender Disciplinary Problem	.17	(.39)	.22	(.42)	-.39	.20	(.40)
0 = No Problem 1 = Disciplinary Problem							

TABLE 2 (cont.)

Variables at First Victim-Related Offense	One-Time Offender Mean	(S.D.)	Repeat Offender Mean	(S.D.)	t (df = 58)	Total Sample Mean	(S.D.)
13. Offender Father Absence in Family	.48	(.51)	.59	(.50)	-.87	.55	(.50)
0 = Father Present 1 = Father Absent							
14. Offender Per Capita Family Income (1970 dollars)	1114.21	(586.68)	1011.44	(770.83)	.58	1050.84	(702.45)
15. Number of Victims	1.00	(.00)	1.49	(1.73)	-1.35	1.30	(1.37)
16. Victim Age[b]	38.09	(15.50)	24.57	(15.65)	3.27	29.75	(16.82)
17. Victim-Offender Age Difference[b]	22.48	(16.14)	10.11	(15.43)	2.97	14.85	(16.71)
18. Victim Sex	.48	(.51)	.35	(.48)	.97	.40	(.49)
0 = Male 1 = Female							
19. Victim Race	.61	(.50)	.65	(.48)	-.31	.63	(.49)
0 = White 1 = Nonwhite							
20. Victim Sex by Race							
0 = No 1 = Yes							
a. Nonwhite Male[a]	.26	(.45)	.54	(.50)	-2.17	.42	(.50)
b. White Male	.22	(.42)	.16	(.37)	.53	.18	(.39)
c. Nonwhite Female	.30	(.47)	.13	(.35)	1.60	.20	(.40)
d. White Female	.22	(.42)	.17	(.39)	-.39	.20	(.40)

TABLE 2 (cont.)

Variables at First Victim-Related Offense	One-Time Offender Mean	(S.D.)	Repeat Offender Mean	(S.D.)	t (df = 58)	Total Sample Mean	(S.D.)
21. Victim-Offender Relationship 0 = Nonstranger 1 = Stranger	.70	(.47)	.73	(.45)	-.28	.72	(.45)
22. Offense Location[a] 0 = Outside 1 = Inside	.56	(.51)	.30	(.46)	2.10	.40	(.49)
23. Weapon Present at Offense 0 = No Weapon 1 = Weapon Present	.09	(.29)	.24	(.43)	-1.67	.18	(.39)
24. Injury Involved in Offense[b] 0 = No Injury 1 = Injury	.17	(.39)	.54	(.50)	-2.97	.40	(.49)
25. Theft Involved in Offense 0 = No Theft 1 = Theft	.61	(.50)	.59	(.50)	.11	.60	(.49)
26. Damage Involved in Offense 0 = No Damage 1 = Damage	.26	(.45)	.22	(.42)	.39	.23	(.43)
N	23		37			60	

[a] $p < .05$ [b] $p < .01$ [c] $p < .001$

TABLE 3

ZERO ORDER CORRELATION COEFFICIENTS FOR VARIABLES AT FIRST VICTIM-RELATED OFFENSE

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20a}	X_{20b}	X_{20c}	X_{20d}	X_{21}	X_{22}	X_{23}	X_{24}	X_{25}	X_{26}
X_1	----																												
X_2	.39[b]	----																											
X_3	.53[c]	.64[c]	----																										
X_4	.41[b]	-.09	.05	----																									
X_5	-.07	-.00	-.04	-.07	----																								
X_6	-.27[a]	-.40[b]	-.28[a]	.15	-.09	----																							
X_7	-.26[a]	-.08	-.36[b]	.05	.17	.18	----																						
X_8	-.17	-.32[a]	-.38[b]	.16	-.02	.32[b]	.74[c]	----																					
X_9	-.14	-.29[a]	-.30[a]	-.19	.32[b]	.28[a]	.38[b]	.35[b]	----																				
X_{10}	-.21	-.30[a]	-.34[b]	-.19	.28[a]	.25[a]	.36[b]	.35[b]	.94[c]	----																			
X_{11}	-.18	-.24	-.32[b]	-.17	.28[a]	.30[a]	.39[b]	.35[b]	.89[c]	.81[c]	----																		
X_{12}	.04	.05	.02	.20	-.07	.01	.06	-.16	-.16	-.22	-.17	----																	
X_{13}	-.07	.11	.05	.06	-.24	-.23	-.13	-.04	-.16	-.17	-.03	.03	----																
X_{14}	.03	-.07	-.09	-.06	.05	-.03	.25	.21	.03	-.01	.06	.15	-.29[a]	----															
X_{15}	-.06	.17	.22	-.15	.03	-.04	-.01	-.25[a]	-.01	.04	.08	.01	-.15	-.03	----														
X_{16}	-.10	-.39[b]	-.34[b]	-.02	.16	.12	.16	.33[b]	.18	.15	.15	-.15	-.02	-.14	-.16	----													
X_{17}	-.08	-.36[b]	-.31[a]	-.04	.17	.04	.15	.31[a]	.16	.13	.13	-.15	.01	-.14	-.15	.99[c]	----												
X_{18}	.02	-.13	-.18	.19	-.13	.21	.12	.22	-.02	.07	.04	.10	.19	-.18	-.01	.29[a]	.28[a]	----											
X_{19}	-.02	.04	.06	-.20	.14	.05	-.01	-.14	-.08	-.07	-.09	-.05	-.34[b]	.15	.04	-.35[b]	-.36[b]	-.23	----										
X_{20a}	.07	.27[a]	.18	-.22	.06	-.23	-.09	-.19	-.13	-.15	-.15	-.02	-.22	.18	.10	-.38[b]	-.37[b]	-.65[c]	.67[c]	----									
X_{20b}	-.12	-.07	.05	.08	-.07	.03	.02	.02	.10	.07	.03	-.02	.08	.02	.02	.10	.10	-.30[a]	-.62[c]	-.41[c]	----								
X_{20c}	-.10	-.21	-.15	.03	-.01	.31[a]	.17	.14	-.01	.04	.01	-.04	-.13	.02	-.02	.05	.03	.61[c]	.38[b]	-.35[b]	-.24	----							
X_{20d}	.13	.05	-.07	.20	-.14	-.05	-.02	.13	-.02	.04	.04	.17	.37[b]	-.24	.01	.30[a]	.31[a]	.61[c]	-.66[c]	-.44[c]	-.13	-.25	----						
X_{21}	.02	.04	-.02	-.12	.15	.01	.09	-.05	.16	.19	.18	-.06	-.05	-.01	.14	.14	.14	.14	-.25	-.20	.11	-.06	.22	----					
X_{22}	-.02	-.27[a]	-.25[a]	-.01	-.21	-.01	-.12	.01	-.11	-.06	.01	-.07	.19	-.05	-.10	.34[b]	.34[b]	.38[b]	-.01	-.30[a]	-.12	.36[b]	.10	-.17	----				
X_{23}	-.09	.19	.23	-.26[a]	-.22	.13	-.16	-.11	-.19	-.24	-.19	-.13	.08	-.14	-.04	-.35[b]	-.36[b]	-.12	.27[a]	.19	-.11	.09	-.24	-.18	-.12	----			
X_{24}	.18	.36[b]	.31[a]	-.15	-.21	-.11	-.22	-.10	-.04	-.05	-.12	-.15	-.08	.12	-.08	-.27[a]	-.27[a]	-.18	.13	.32[b]	-.12	-.15	-.07	-.17	-.18	.32[b]	----		
X_{25}	.15	-.01	-.10	.15	.13	-.13	.24	.25[a]	.01	-.01	.05	-.02	-.05	-.05	.08	.20	.21	.32[b]	-.20	-.18	-.14	.07	.32[b]	.17	.04	-.32[b]	-.31[a]	----	
X_{26}	-.02	-.05	-.13	.02	.13	.07	-.01	-.06	-.04	-.01	-.05	-.18	-.13	-.08	-.09	.37[b]	.38[b]	.03	.01	-.16	.04	.12	-.08	-.01	.19	-.16	-.29[a]	-.03	----

TABLE 3 (cont.)

$^{a}p < .05$ $^{b}p < .01$ $^{c}p < .001$

X_1 = Total Number of Offenses
X_2 = Repeat Offense
X_3 = Repeat Offense with Victim
X_4 = Prior Offense Record
X_5 = Number of Offenders
X_6 = Offender Age
X_7 = Offender WISC Total (Full Scale) IQ
X_8 = Offender WISC Verbal IQ
X_9 = Offender Total Achievement
X_{10} = Offender Language Achievement
X_{11} = Offender Reading Achievement
X_{12} = Offender Disciplinary Problem
X_{13} = Offender Father Absence in Family
X_{14} = Offender Per Capita Family Income
X_{15} = Number of Victims
X_{16} = Victim Age
X_{17} = Victim-Offender Age Difference
X_{18} = Victim Sex
X_{19} = Victim Race
X_{20a} = Nonwhite Male Victim
X_{20b} = White Male Victim
X_{20c} = Nonwhite Female Victim
X_{20d} = White Female Victim
X_{21} = Victim-Offender Relationship
X_{22} = Offense Location
X_{23} = Weapon Present
X_{24} = Injury Involved in Offense
X_{25} = Theft Involved in Offense
X_{26} = Damage Involved in Offense

TABLE 4

FINAL PARAMETER ESTIMATES OF LOGISTIC MULTIPLE REGRESSION (TOTAL INTELLIGENCE) MODEL FOR REPEAT OFFENSE STATUS WITH OR WITHOUT A VICTIM

Variable	Beta	Standard Error	Chi-Square
Intercept[a]	11.41	5.47	4.35
Injury Involved[b]	3.49	1.19	8.59
Theft Involved[a]	2.95	1.28	5.26
Damage Involved[a]	2.31	1.12	4.24
WISC Total (Full Scale) IQ[b]	-.15	.06	5.13
Offense Location	-1.79	.90	3.93
Offender Father Absence	1.58	.82	3.68
Victim-Offender Age Difference[b]	-.07	.03	5.14

[a] $p < .05$ [b] $p < .01$

CLASSIFICATION TABLE OF ONE-TIME (0) AND REPEAT (1) OFFENDERS BY LOGISTIC MULTIPLE REGRESSION

		Predicted		
		0	1	Total
Observed	0	17	6	23
	1	6	31	37
	Total	23	37	60

SENSITIVITY: 83.8% SPECIFICITY: 73.9% CORRECT CLASSIFICATION RATE: 80.0%

FRACTION OF CONCORDANT PAIRS OF PREDICTED PROBABILITIES AND RESPONSES: .87

TABLE 5

FINAL PARAMETER ESTIMATES OF LOGISTIC MULTIPLE REGRESSION (VERBAL INTELLIGENCE) MODEL FOR REPEAT OFFENSE STATUS WITH OR WITHOUT A VICTIM

Variable	Beta	Standard Error	Chi-Square
Intercept	-5.28	4.14	1.62
Victim/Offender Relationship	1.58	.93	2.87
Injury Involved[b]	3.28	1.15	8.18
WISC Verbal IQ[a]	-.10	.05	4.28
Language Achievement[b]	-.10	.04	6.84
Weapon Present at Offense	-2.59	1.43	3.33
Per Capita Family Income[a]	-.002	.001	5.94
Victim-Offender Age Difference[b]	-.08	.03	7.50
Prior Offense Record[a]	-1.88	.95	3.89

[a] $p < .05$ [b] $p < .01$

CLASSIFICATION TABLE OF ONE-TIME (0) AND REPEAT (1) OFFENDERS BY LOGISTIC MULTIPLE REGRESSION

		Predicted		
		0	1	Total
Observed	0	16	7	23
	1	3	34	37
	Total	19	41	60

SENSITIVITY: 91.9% SPECIFICITY: 69.6% CORRECT CLASSIFICATION RATE: 83.3%

FRACTION OF CONCORDANT PAIRS OF PREDICTED PROBABILITIES AND RESPONSES: .87

TABLE 6

FINAL PARAMETER ESTIMATES OF LOGISTIC MULTIPLE REGRESSION (TOTAL INTELLIGENCE) MODEL FOR REPEAT OFFENSE STATUS WITH VICTIM ONLY

Variable	Beta	Standard Error	Chi-Square
Intercept[b]	8.68	3.35	6.69
Injury Involved[a]	1.22	.62	3.82
WISC Total (Full Scale) IQ[b]	-.10	.04	7.56
Offense Location	-1.16	.66	3.08

[a] $p < .05$ [b] $p < .01$

CLASSIFICATION TABLE OF ONE-TIME (0) AND REPEAT (1) OFFENDERS BY LOGISTIC MULTIPLE REGRESSION

		Predicted		
		0	1	Total
Observed	0	28	8	36
	1	9	15	24
	Total	37	23	60

SENSITIVITY: 62.5% SPECIFICITY: 77.8% CORRECT CLASSIFICATION RATE: 71.7%

FRACTION OF CONCORDANT PAIRS OF PREDICTED PROBABILITIES AND RESPONSES: .79

TABLE 7

FINAL PARAMETER ESTIMATES OF LOGISTIC MULTIPLE REGRESSION (VERBAL INTELLIGENCE) MODEL FOR REPEAT OFFENSE STATUS WITH VICTIM ONLY

Variable	Beta	Standard Error	Chi-Square
Intercept[b]	9.35	3.32	7.95
WISC Verbal IQ[b]	-.10	.04	8.02
Offense Location[a]	-1.51	.66	5.34

[a] $p < .05$ [b] $p < .01$

CLASSIFICATION TABLE OF ONE-TIME (0) AND REPEAT (1) OFFENDERS BY LOGISTIC MULTIPLE REGRESSION

		Predicted		
		0	1	Total
Observed	0	29	7	36
	1	10	14	24
	Total	39	21	60

SENSITIVITY: 58.3% SPECIFICITY: 80.6% CORRECT CLASSIFICATION RATE: 71.7%

FRACTION OF CONCORDANT PAIRS OF PREDICTED PROBABILITIES AND RESPONSES: .76

APPENDIX IV

VIOLENCE AND SCHOOL FAILURE

ABSTRACT

VIOLENCE AND SCHOOL FAILURE

Recent evidence in the pediatric and psychological literature suggests a strong link between poor academic performance and delinquency. The present study examined biological, psychological and sociological correlates of achievement and delinquency collected prospectively from birth to age 18 on a sample of 987 black youths whose mothers participated in the Collaborative Perinatal Project (CPP) in Philadelphia. Multivariate analyses showed that violent and persistent offenders of both sexes scored significantly lower on high school achievement test scores. However, no significant differences were found among offender groups in intelligence scores at early ages or enrollment in programs for the mentally retarded during adolescence. Violent offenders were disproportionately enrolled in programs for the remedial disciplined, however. Analyses of different biosocial variables across ages suggested that socioeconomic factors were the strongest predictors of delinquency for both sexes. It appears that low achievement test scores may be related to behavioral disorders which occur during adolescence and impede learning ability. In terms of policy, school programs geared toward decreasing delinquency should concentrate on disorders associated with behavior and hyperactivity, while encouraging the normal intellectual capacity of most problem adolescents.

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INTRODUCTION

A conflicting literature exists on the extent to which delinquents or criminals differ from nondelinquents in cognitive (intellectual) functioning (Bach-y-Rita et al., 1971; Gabrielli and Mednick, 1980; Gordon, 1976; Hirschi and Hindelang, 1977; Kirkegaard-Sørenson and Mednick, 1977b; Lewis and Balla, 1976; Offer et al., 1979; Shapiro, 1968; Spellacy, 1978; Wolfgang et al., 1972) or school achievement (Blanchard and Mannarino, 1978; Elliott, 1966; Kirkegaard-Sørenson and Mednick, 1977a; Marshall et al., 1978; Wolfgang et al., 1972). Other literature has shown no group differences in ability (Lewis et al., 1979; Murray, 1976; Prentice and Kelly, 1963). Early studies reporting lower intelligence scores among delinquents (reviewed in Vold, 1979) frequently lacked nondelinquent comparisons, or controls, for race, socioeconomic status (SES), and involvement in the criminal justice system. However, associations between low intelligence scores and delinquency remain in recent studies where many of these factors are controlled.

According to Hirschi and Hindelang's (1977:571) review of research, the relationship between delinquency and intelligence is

> at least as strong as the relation of either class or race to official delinquency...the relation is stronger than the relation of either class or race to self-reported delinquency.

They suggest that school factors may be important. Using Wechsler Intelligence Scales for Children (WISC) and adults (WAIS), Kirkegaard-Sørenson and Mednick (1977b) confirm in their Danish sample that "adolescents who later commit criminal acts" have lower tested intelligence than nondelinquents, and eventually perform more poorly in school (Kirkegaard-Sørenson and Mednick, 1977a). Subsequent analyses on Danish samples indicate similar relationships with intelligence while controlling for SES (Moffitt et al., 1981).

In their longitudinal study of a Philadelphia birth cohort, Wolfgang, Figlio, and Sellin (1972) report a consistent link between delinquency, intelligence, and achievement not only within different socioeconomic classes, but also within different races. In turn, West and Farrington (1973) demonstrate the delinquency-intelligence relationship while controlling for the effects of income, family size, and parental criminality.

The nature and source of specific differences in intellectual functioning are not clear, however. Evidence of lower scores in general aptitude among delinquents or criminals has been attributed to a diffuse or global intellectual deficit (Virkkunen, 1977). In turn, other researchers suggest an intellectual imbalance evidenced by considerably lower verbal relative to spatial intelligence among delinquents (Andrew, 1974; McCord and McCord, 1964). Wechsler (1939) suggested some time ago that this imbalance may be related to sociopathic personality. Results of other studies have varied, however, or shown evidence of an opposite pattern of verbal and spatial performance (see, for example, Lewis and Balla, 1976; Mayers et al., 1974).

Such discrepancies may be due to confounding effects. For example, in one report a verbal-spatial imbalance was found among white, but not black, delinquents (Henning and Levy, 1967). Another explanation is that delinquency may be linked to a cognitive imbalance which is not related to a particular direction or discrepancy in verbal or spatial skills (Andrew, 1978). The substantial literature citing evidence of reading or learning disabilities among delinquent and violent offenders suggests the importance of investigating verbal and language processes in general (for a review, see Andrew, 1979 and Fogel, 1976).

Consideration of the direct and indirect correlates of learning or reading disabilities may provide further explanations for the intelligence-delinquency relationship. For example, poor reading ability has been linked to environmental factors such as complications during pregnancy (Kawi and Pasamanick, 1958) and large family size (Zajonc and Markus, 1975), as well as to biological factors such as mixed cerebral dominance (Carter-Saltzman, 1979) and minimal brain dysfunction (Curman and Nylander, 1976; Denhoff, 1973; Menkes et al., 1967). As yet, however, no study has examined a number of these key correlates simultaneously among different offender groups, particularly violent and persistent offenders. Longitudinal research and studies on demographically "high-risk" individuals are also limited.

In light of the findings and flaws of past research, the present study was designed to investigate the nature and extent of selected biological and environmental correlates of intelligence and behavior. (Definitions of "biological" and "environmental" correlates may be found in Denno, 1982.) Due to the nature of the sample and data, some of the research which is described is unprecedented. Perhaps most notable is the prospective focus of the design which uses data collected, for the most part, before the onset of delinquency on subjects who, demographically and environmentally, are at a "high risk" for cognitive, learning, and behavioral disorders—i.e., black and of lower SES (Wolfgang et al, 1972:246-255).

In the present study, two major findings in past research were examined: (1) Offenders evidence lower intelligence and achievement test scores, particularly verbal ability, than nonoffenders at different age points. These differences are greatest for the more violent and persistent offenders. (2) Correlates of learning disability and delinquency are predominantly environmental for both

sexes. However, biological factors may be relatively more influential in the delinquency of females in light of the generally greater sociological and cultural constraints on female behavior, particularly aggression.

METHOD

Subjects

Subjects were selected from a sample of 2958 black children whose mothers participated in the Philadelphia Collaborative Perinatal Project (CPP) at Pennsylvania Hospital between 1959 and 1962. Pennsylvania Hospital was one of 12 medical centers included by the National Institute of Neurological Diseases and Stroke (NINDS) in a nationwide study of genetic, biological, and environmental influences upon child development. (For a description of the study, see Niswander and Gordon, 1972.) Thus, the total sample reflects, in part, the characteristics of children born to a self-selected group of women who were interested in receiving inexpensive maternity care.

The sample of 987 subjects used for analyses fit the following criteria: i. located in a Philadelphia public school; ii. stayed in Philadelphia from ages 10 through 17; iii. received selected intelligence or achievement test scores; and iv. were not among sibling members excluded from the sample to prevent possible biases of multiple family membership. Comparisons between the final sample of 987 subjects and the excluded sample of 1971 subjects showed no significant differences on six key variables: i. the distribution of males and females; ii. total family income at registration; iii. total family income at 7 years; iv. per capita income at 7 years; v. number of prenatal examinations the mother attended; and vi. mother's age. In general, the final sample appeared

to be representative of the sample from which it was drawn. (A more detailed description of this selection process may be found in Denno, 1982.)

On the average, CPP subjects were from families in the lower-middle or lower-income ranges. They scored in the lower-average or average ranges in intelligence tests at ages 4 and 7, and fell in the bottom one-third in achievement test scores in adolescence. About 25 percent of the subjects evidenced an official police contact at some point during their juvenile years. Thus, the CPP sample was skewed toward the lower income and achievement levels, representing a "high-risk" group in terms of learning and behavioral disorders. (A more thorough description of the CPP sample can be found in Denno, 1982.)

CPP Variables

Data collection for the CPP reflected a prospective design. Upon registration, each mother was administered a battery of interviews and physical examinations. Data recorded for each pregnancy included information on the mother's reproductive history, recent and past medical history, prenatal examination and laboratory test results, all drugs taken during pregnancy, and labor and delivery events. Data recorded for each child included information on neurological and medical examinations at birth, throughout the hospital stay, at 4 months, and at 1 and 7 years. Psychological test batteries and behavioral data were collected at 8 months, 4 and 7 years. Socioeconomic and family data were collected during the mother's registration and at the child's 7-year examination. The forms used for collecting data, as well as procedures for assessing coder reliability, have been described in detail (U.S. Department of Health, Education, and Welfare, 1966, 1970).

For the present study, psychological tests administered at the 4- and 7-year examinations were analyzed as indicators of intellectual and learning ability. Psychological tests included the Stanford-Binet Intelligence Scale, the Wechsler Intelligence Scale for Children (WISC), and the Wide Range Achievement Test (WRAT). The mother's condition at birth, pregnancy complications, child's birth order, and family SES were analyzed as indicators of early life variables. The child's physical development, cerebral dominance, family constellation and SES at age 7, served as later-event biological and environmental measures. A listing of selected CPP variables and their means and standard deviations for males and females is provided in Appendix A.

School Record Variables

Philadelphia public school records contain a variety of retrospective data which are complementary to the CPP data collected during the child's first 7 years. For the present study, California Achievement Test (CAT) scores for grades seven and eight—ages 14 and 15—were analyzed. Participation in special programs for the mentally retarded and remedial disciplined, i.e., conduct disturbed, was also examined. A description of the reliability and validity of the CAT plus the criteria used to determine participation in special programs can be found in Denno, 1982. Means and standard deviations for CAT scores are provided in Appendix A.

Police Record Variables

Delinquency measures were based on official police record data collected by the Center for Studies in Criminology and Criminal Law, University of Pennsylvania. Data were collected in the city of Philadelphia for all study

subjects between the ages of 10 and 18 years. Data collection techniques were similar to those used in Delinquency in a Birth Cohort (Wolfgang et al., 1972). A detailed description of the arrest data collection and coding procedure, the inter-coding reliability check, major variables, and offender categories, has been documented (Center for Studies in Criminology and Criminal Law, 1981).

In the present study, three major categories of delinquency were examined:

- Type of delinquency status: Very Violent, Violent, Theft, Damage, Non-index, and Nonoffender.
- Number of offenses.
- Age at onset of delinquency.

Means and standard deviations of delinquency variables are listed in Appendix A.

RESULTS

OFFENSE STATUS DIFFERENCES IN ABILITY AND ACHIEVEMENT

Mean score differences for various categories of male and female offenders were analyzed for the CPP psychological examinations at ages 4 and 7, and the CAT at ages 14 and 15. Offense status differences in linear combinations of groups of cognitive tests were examined using multivariate analysis of variance (MANOVA). Score differences for individual tests were examined using analysis of variance (ANOVA) and Duncan's multiple range test. The Duncan's multiple range test is one of the most powerful of several techniques appropriate for a posteriori contrasts of all possible pairs of group means (Winer, 1971). In tables discussed in Appendix B, between-group differences

with the Duncan (DN) are indicated by changes in the letters A and B which order group means respectively from largest to smallest.

Test Score Differences: Offender Categories

Mean differences in test scores for different categories of offenders are shown in Appendix B, Tables B.1 to B.5; these differences are illustrated in Figures 1 through 5. In general, it was hypothesized that violent and persistent offenders would have a higher incidence of intellectual and learning difficulties, paritcularly verbal ability, in comparison to nonviolent and nonoffenders. With some exceptions, hypotheses were supported for a number of different offender categories for the CAT at adolescence.

Concerning an offender/nonoffender dichotomy (Table B.1), few significant differences were apparent at ages 4 and 7 for either males or females. At adolescence, however, offenders scored significantly lower on nearly all CATs. Test score differences for both sexes were strongest on the Vocabulary and Mechanics CAT subtests, in addition to the Spelling, Total Battery, Total Language, and Total Reading CATs. Whereas males showed no significant differences on the Math CAT, females showed highly significant differences. Thus, offenders of both sexes scored considerably lower on verbally-related abilities although female offenders showed some differences as well on spatially-related abilities.

As expected, achievement test scores differed according to degrees of offense severity which spanned six levels: very violent, violent, damage, theft, and nonindex offenders, and nonoffenders (Tables B.2-B.5). Whereas few significant differences in test scores existed at early ages for both sexes,

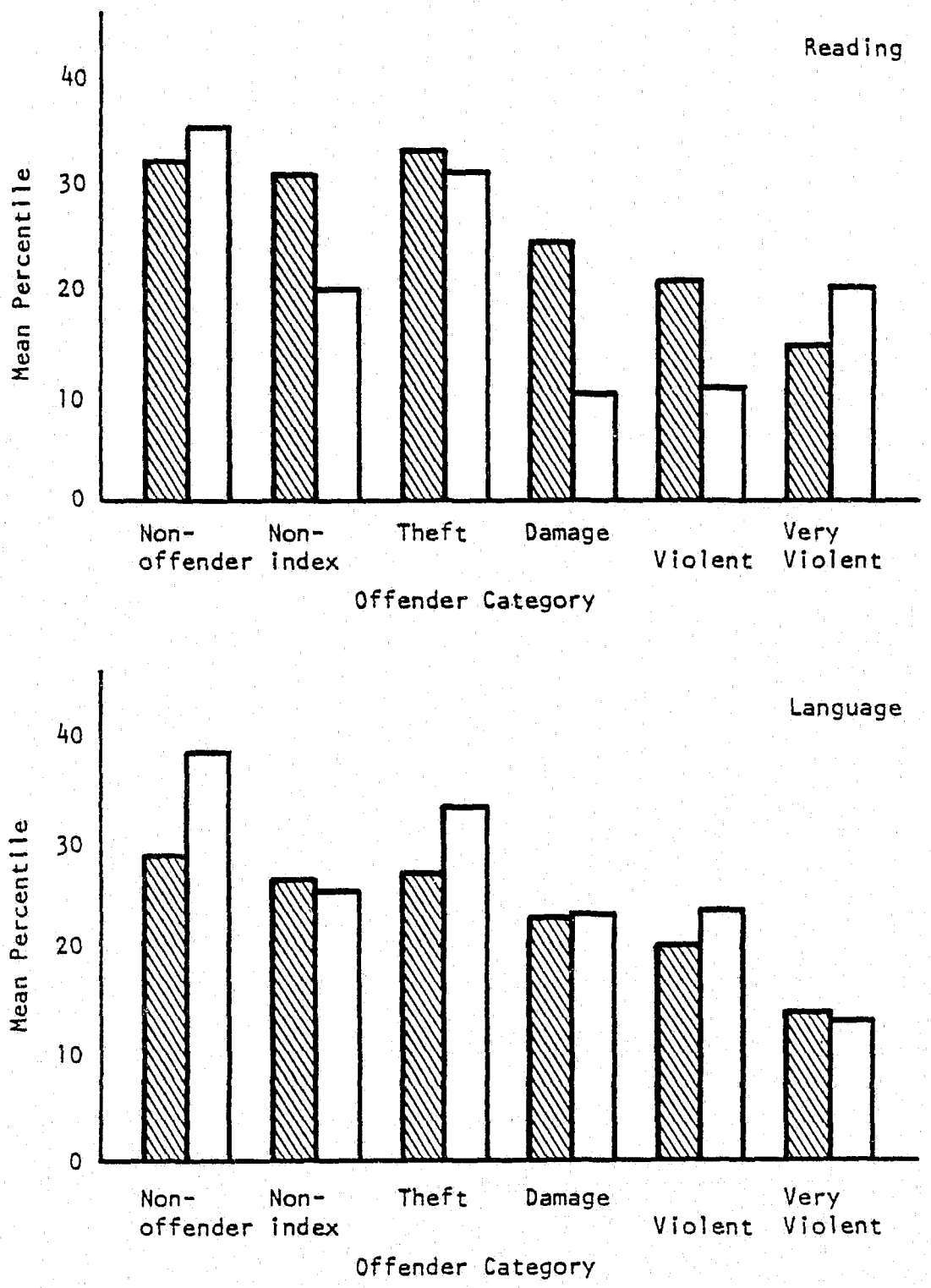

FIGURE 1

Total Reading CAT and Total Language CAT Percentiles (Grades 7 and 8) by Sex and Offender Category

Male Female

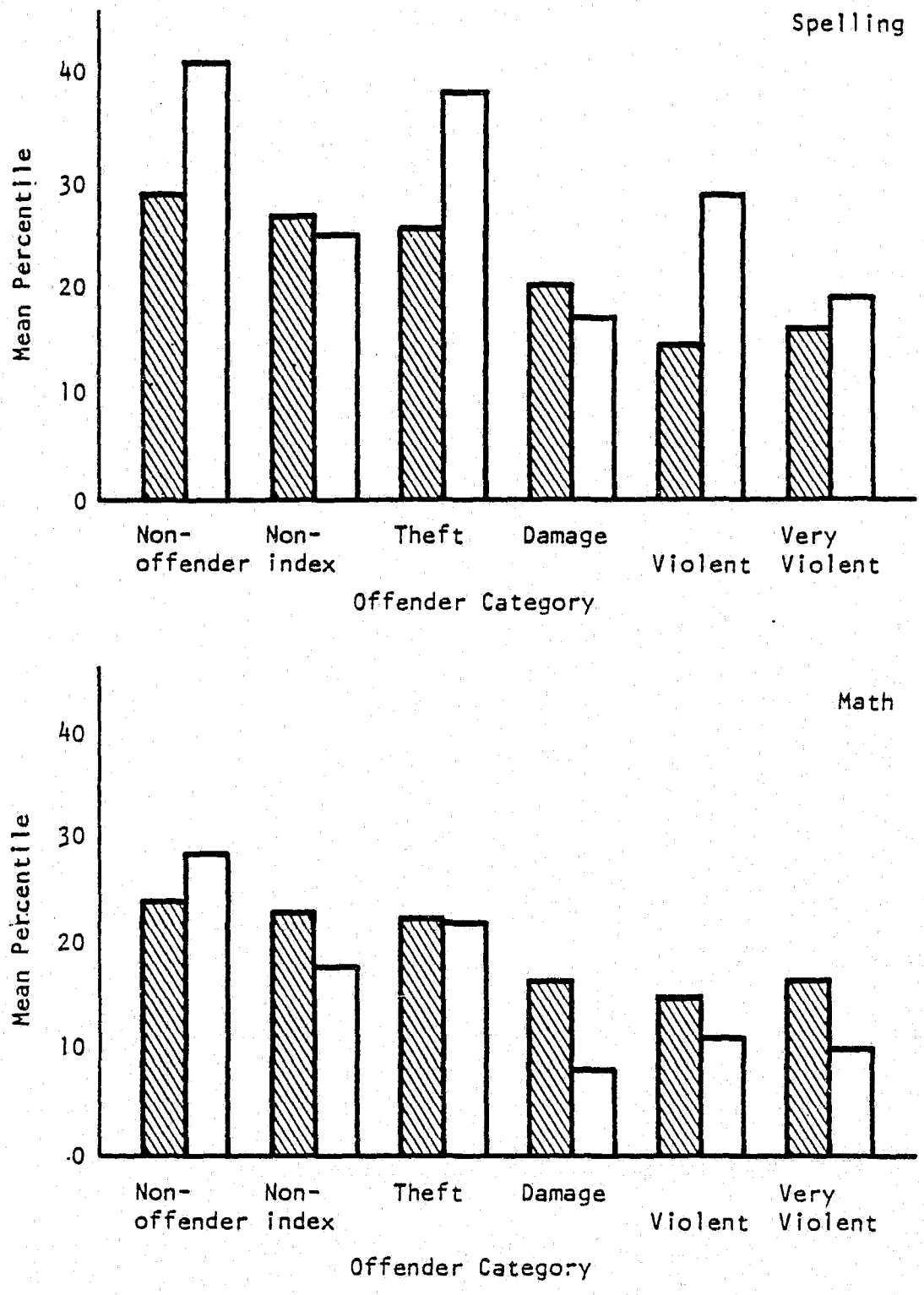

FIGURE 2

Spelling CAT and Total Math CAT Percentiles (Grades 7 and 8) by Sex and Offender Category

Male Female

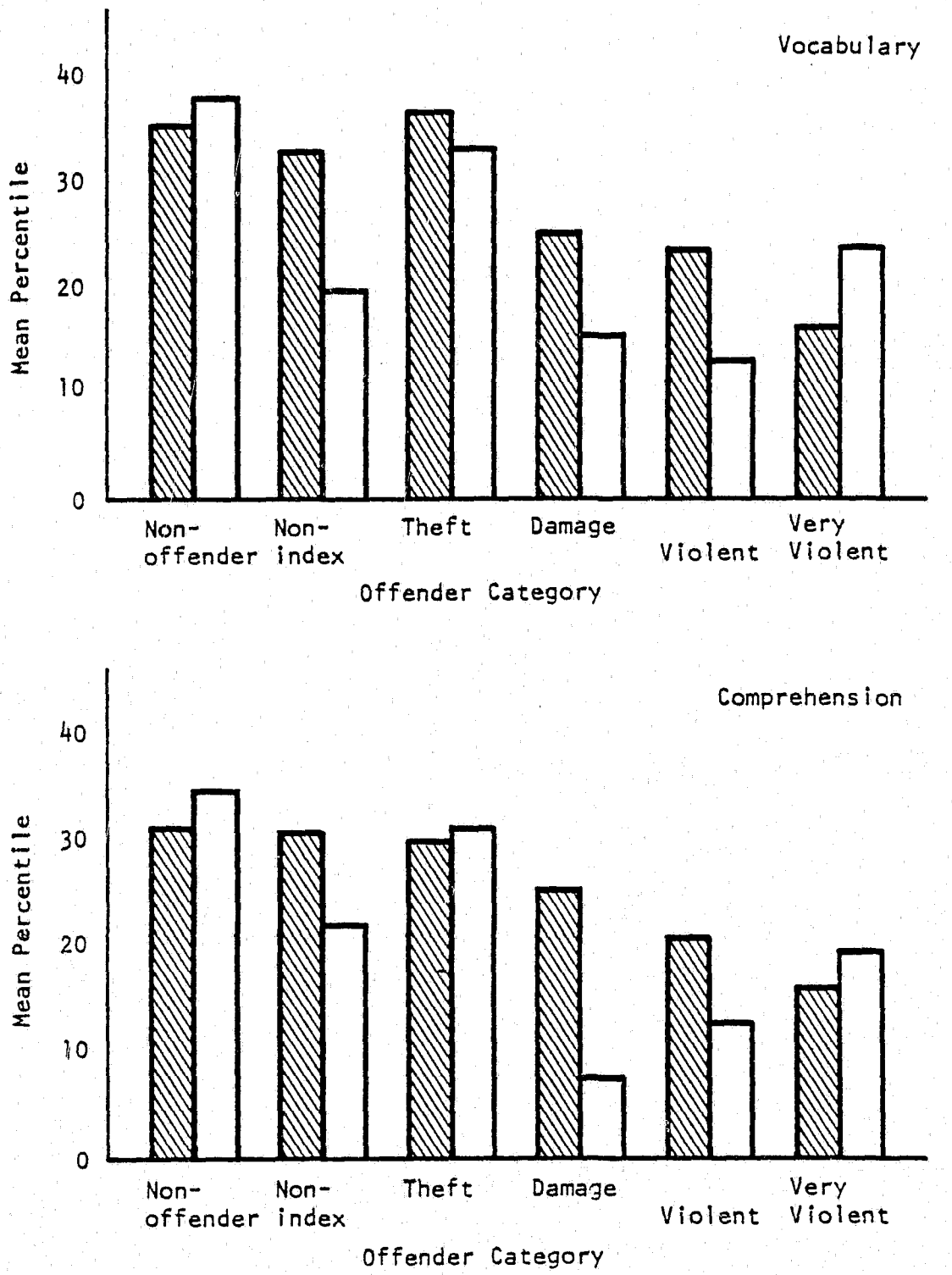

FIGURE 3

Vocabulary and Comprehension Subtest Percentiles of Total Reading CAT (Grades 7 and 8) by Sex and Offender Category

Male Female

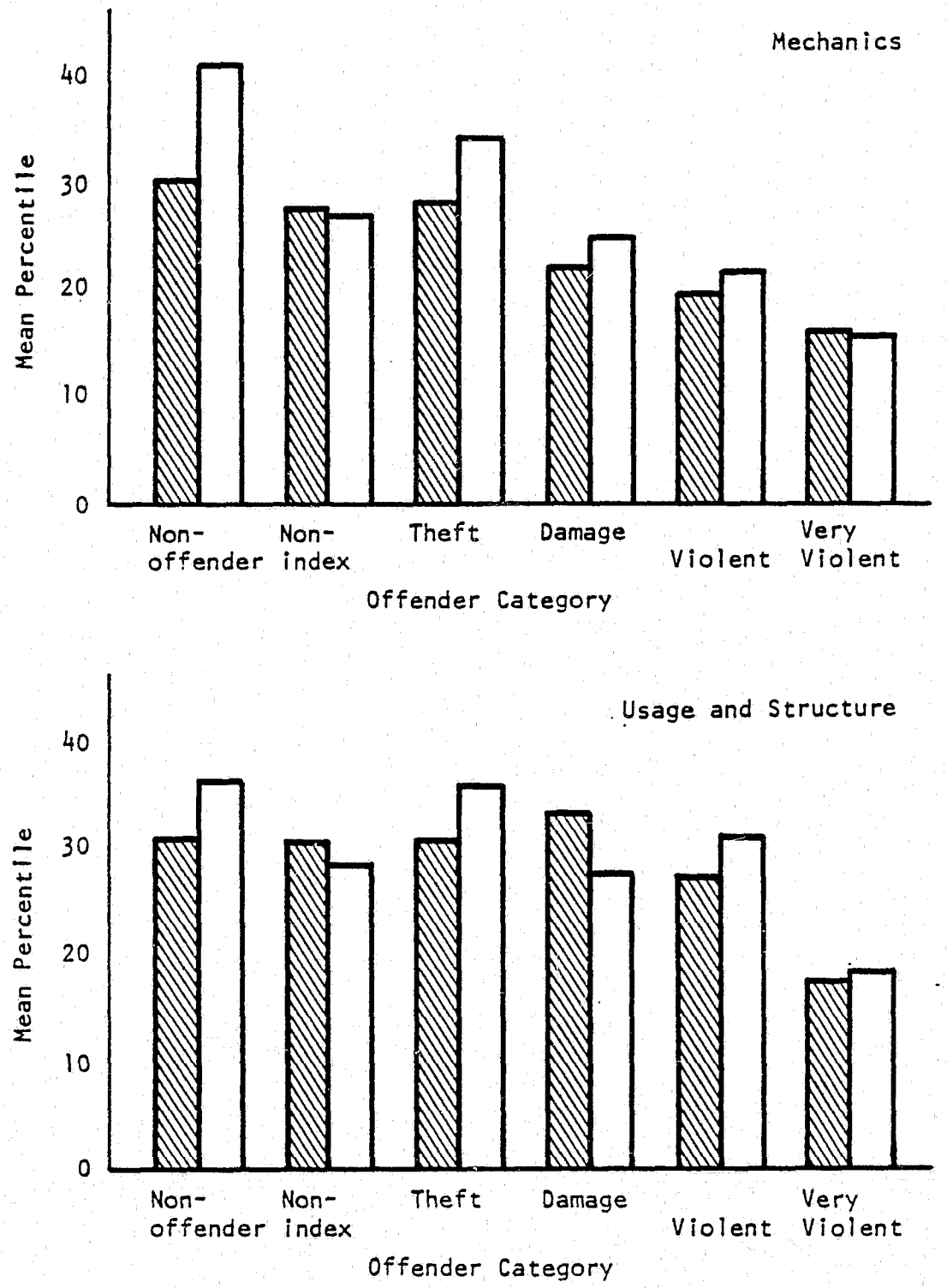

FIGURE 4

Mechanics Subtest, Usage and Structure Subtest Percentiles of Total Language CAT (Grades 7 and 8) by Sex and Offender Category

Male Female

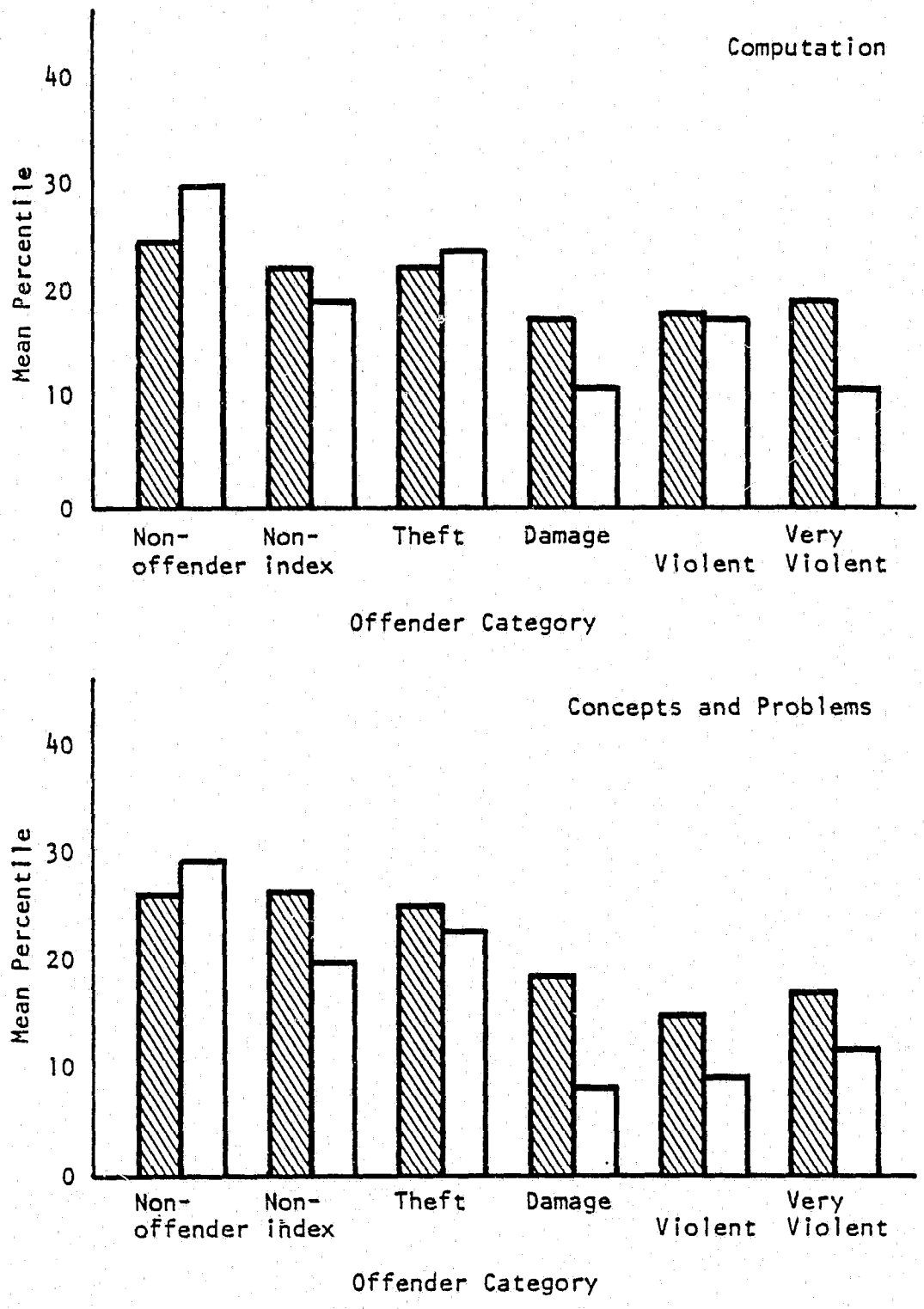

FIGURE 5

Computation Subtest, Concepts and Problems Subtest Percentiles of Total Math CAT (Grades 7 and 8) by Sex and Offender Category

Male Female

strong differences were present at adolescence. Particularly striking were the low levels of achievement among violent offenders.

For males (Table B.2), test scores generally decreased with the increasing severity of offender categories. Highly significant differences appeared on the Total Reading and Vocabulary CATs and other subtests of verbal ability. For example, the scores of very violent offenders were 13 to 19 percentiles lower than the scores of nonoffenders. No significant differences appeared on the Total Math CAT or its subtests. Aggregation of the six offender groups into four categories (injury, nonviolent, and nonindex offenders, and non-offenders) in Table B.3 showed similar but less striking declines in test scores with increasing offense severity.

Test score differences among female offender groups were less consistent than those among male groups, although small sample sizes for the more serious offenders limited comparisons and statistical reliability. In general, significant differences in Table B.4 existed on all CATs aside from one (Usage and Structure); the largest differences were found on the Total Battery CAT and verbally-related subtests. For the most part, damage, violent, and very violent offenders scored lower than theft, nonindex, and nonoffenders, although the hierarchy of differences within groups varied according to particular tests.

Aggregation of the six female offender groups into four categories in Table B.5 allowed for more reliable comparisons. Relative to nonoffenders, injury (very violent and violent) offenders scored nearly 24 percentiles lower on the Mechanics subtest, and 23 to 17 percentiles lower on the Total Language, Total Battery, Spelling, Total Math and its two subtests, and the Total Reading CAT and its two subtests.

Overall, both female and male violent offenders were the most discrepant from nonoffenders on the same tests. In turn, female violent offenders appeared to deviate the most on achievement test scores in comparison to other female groups.

Test Score Differences: Repeat Offenders

Regardless of the type of offense category, multiple and chronic offenders of both sexes had consistently lower scores at adolescence than first time offenders or nonoffenders. These findings are shown in Tables B.6 to B.9; they are illustrated in Figures 6 to 10.

For males in Tables B.6 and B.7, nonoffenders and first time offenders scored higher on most CATs than multiple (two to four time) offenders, who in turn scored higher than chronic (five or more time) offenders. Test score discrepancies were even greater among females in Tables B.8 and B.9. Comparisons between nonoffenders and chronics were particularly striking: chronic offenders scored between 30 and 20 percentiles lower on the Spelling CAT, the Mechanics subtest, and the Language, Total Battery, and Reading CATs.

In general, for both males and females, test score discrepancies between different repeat offender categories were greatest for the same tests. Declines in test scores were consistent across increasing levels of multiple offense categories; declines were striking among chronic offenders.

Special School Programs: Mentally Retarded

In light of the considerably lower CAT scores for the more violent and persistent offenders, it was expected that serious delinquents would be dis-

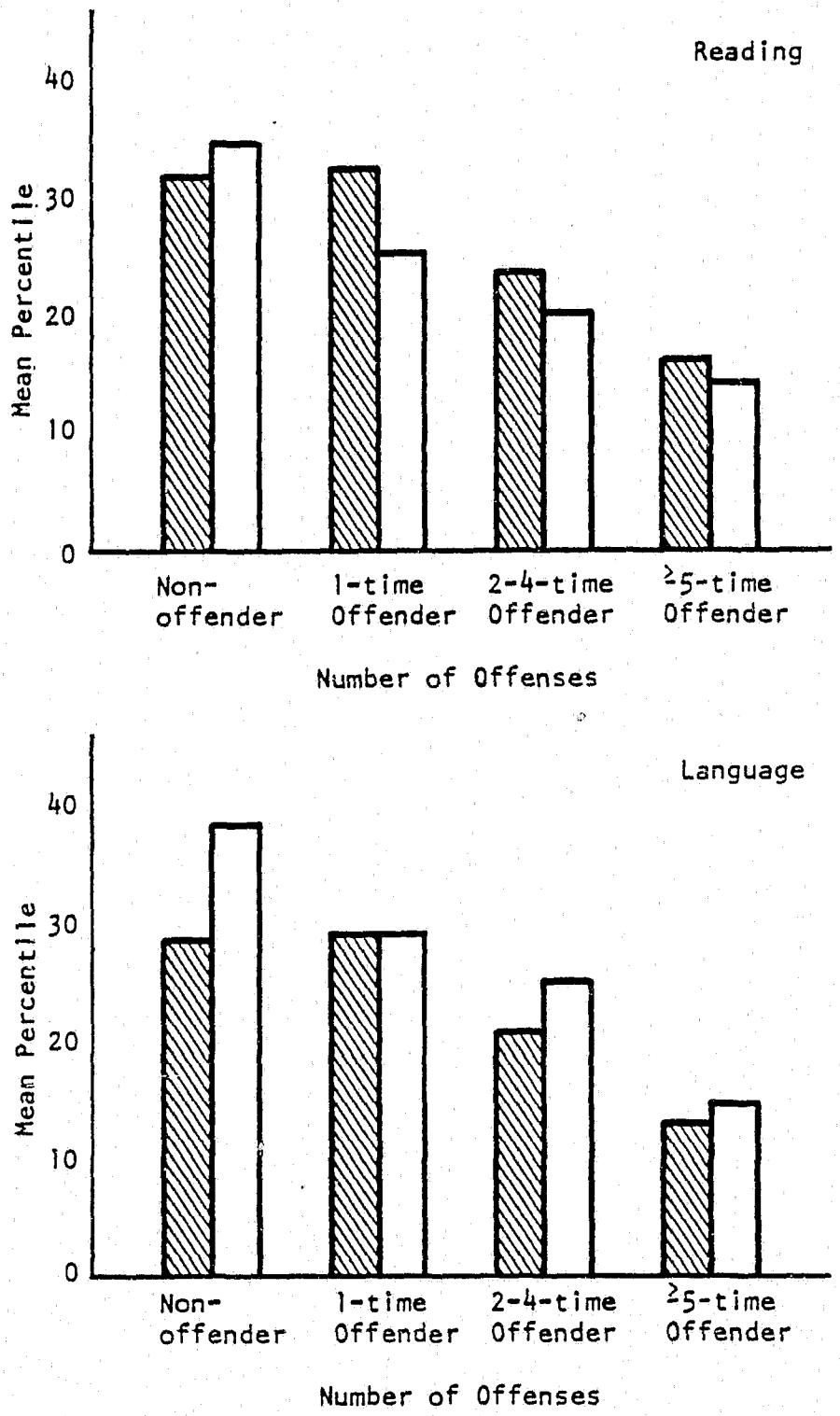

FIGURE 6

Total Reading CAT and Total Language CAT Percentiles (Grades 7 and 8) by Sex and Number of Offenses

Male Female

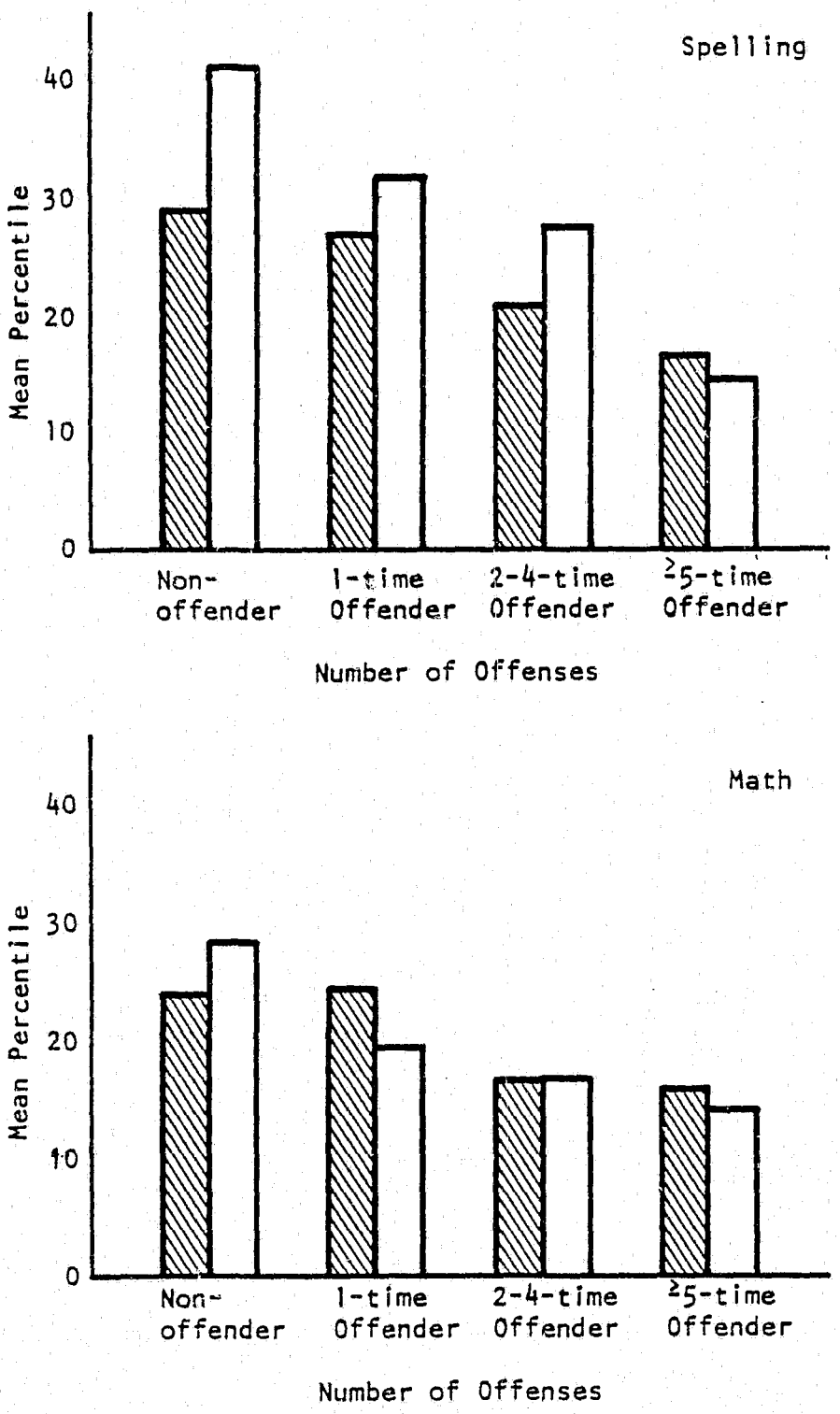

FIGURE 7

Spelling CAT and Total Math CAT Percentiles (Grades 7 and 8) by Sex and Number of Offenses

Male Female

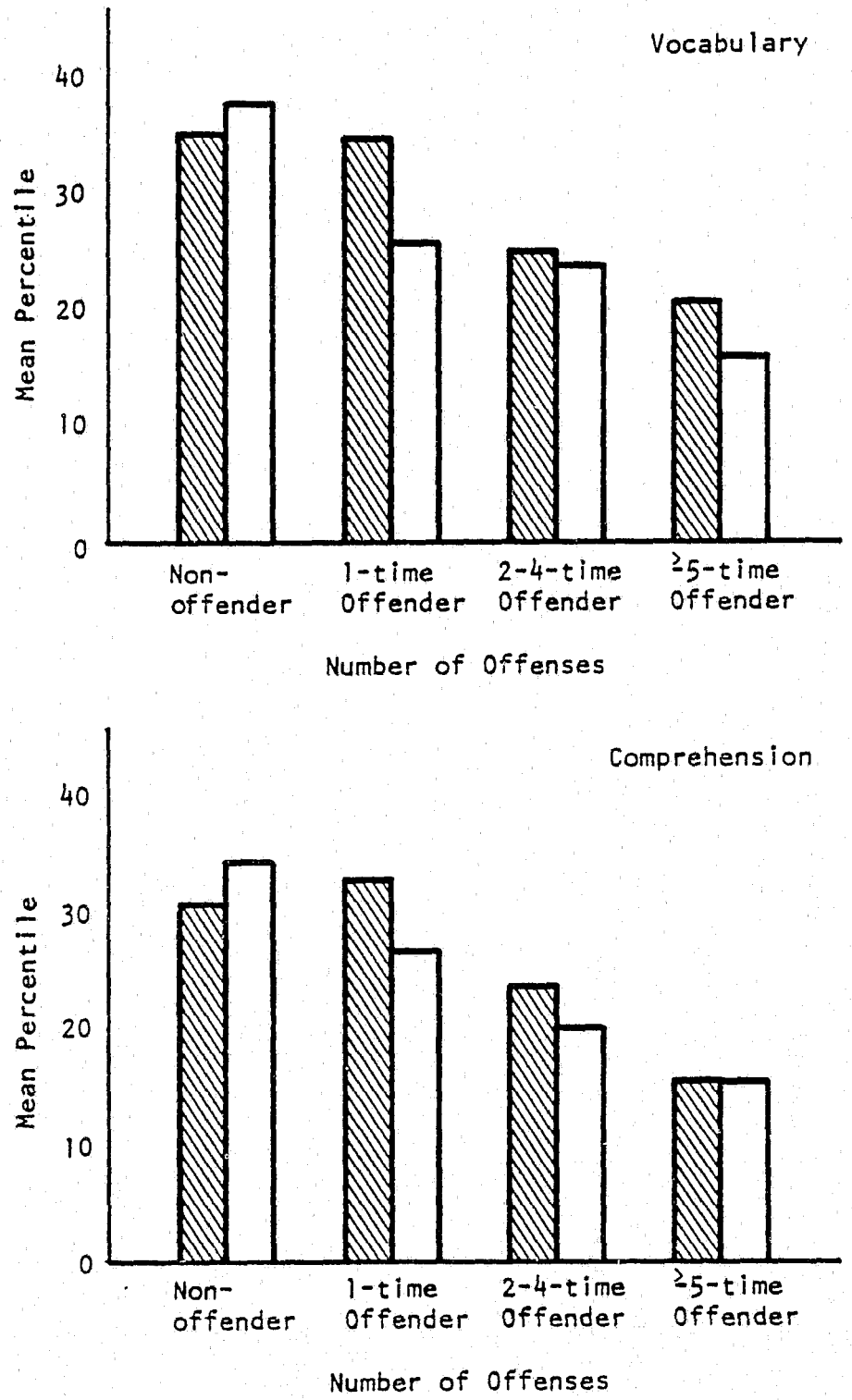

FIGURE 8

Vocabulary and Comprehension Subtest Percentiles of Total Reading CAT (Grades 7 and 8) by Sex and Number of Offenses

Male Female

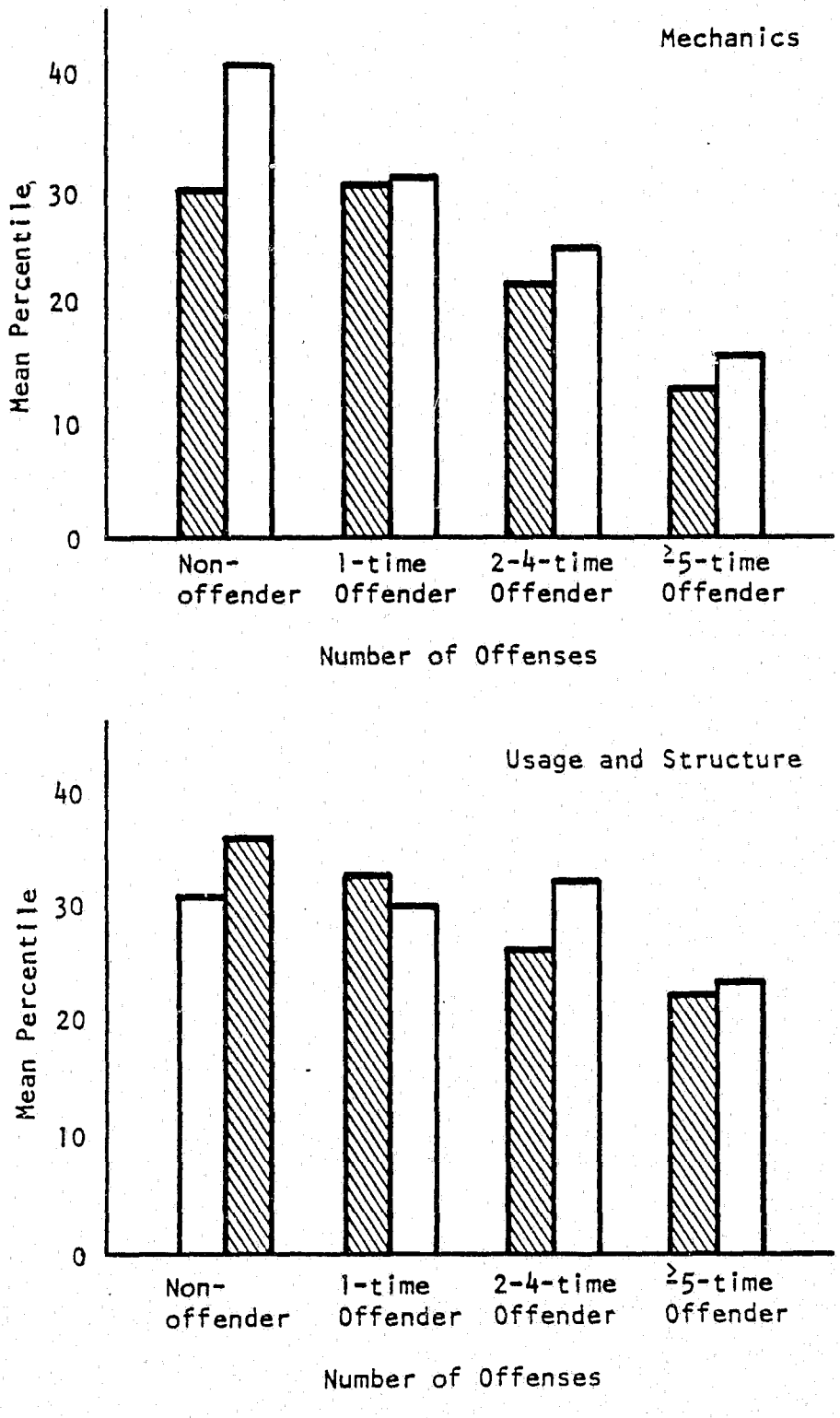

FIGURE 9

Mechanics Subtest, Usage and Structure Subtest Percentiles of Total Language CAT (Grades 7 and 8) by Sex and Number of Offenses

Male Female

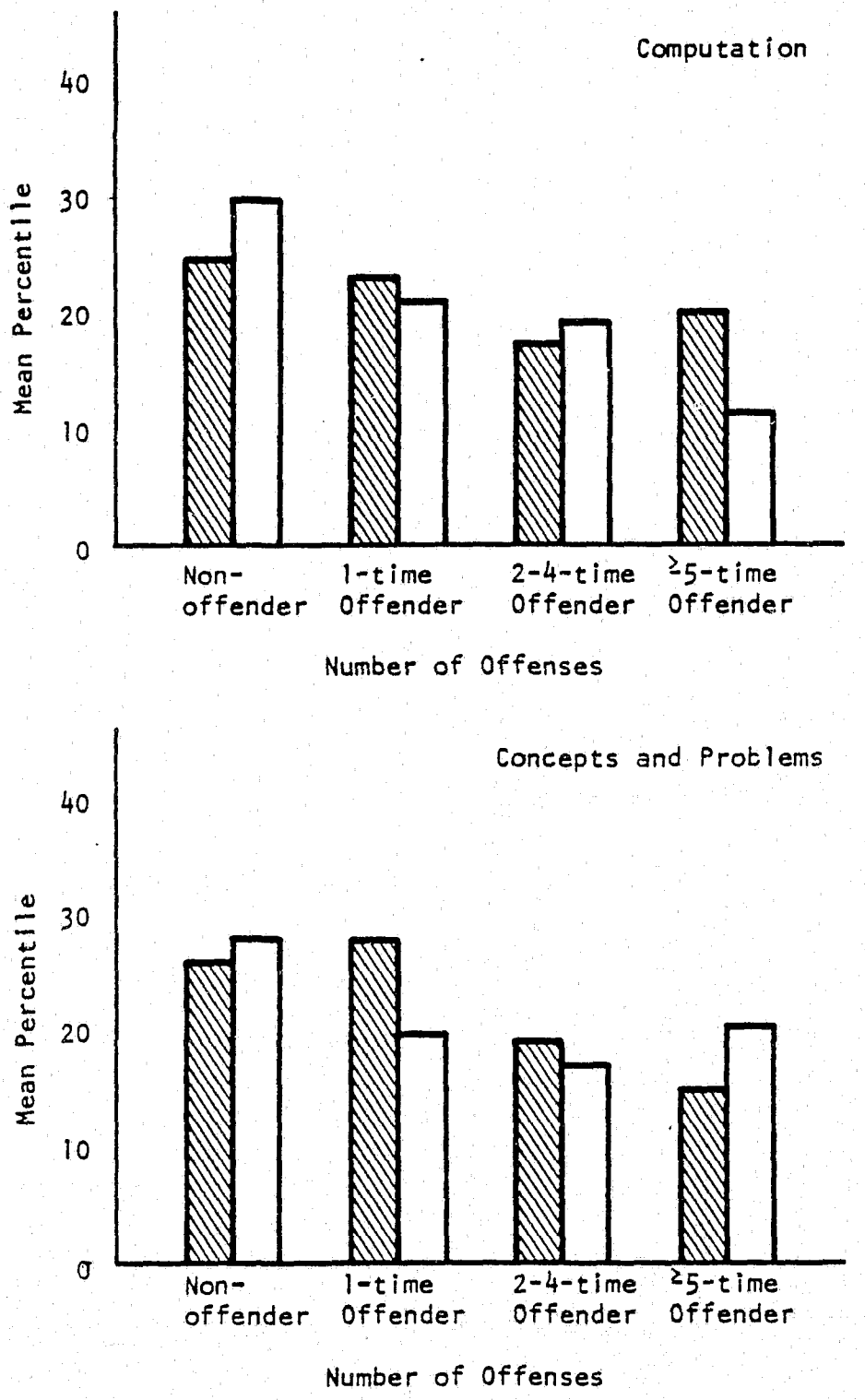

FIGURE 10

Computation Subtest, Concepts and Problems Subtest Percentiles of Total Math CAT (Grades 7 and 8) by Sex and Number of Offenses

Male Female

proportionately enrolled in public school programs for the mentally retarded. It was also expected that delinquents would have higher enrollments in programs for the remedial disciplined, which focus on children who show disruptive behavior in school.

With one exception, however, neither male nor female offenders—or their more violent and persistent subgroups—were disproportionately placed in programs for the mentally retarded, as shown in Appendix C. In Table C.1 nearly equal percentages of offenders and nonoffenders were placed in programs for the mentally retarded. Placement did not differ significantly for males ($\underline{\chi}^2[1] = .04$; $p > .1$) or for females ($\underline{\chi}^2[1] = .18$; $p > .1$). Placement in Table C.2 was also not significantly disproportionate according to the persistence of offense behavior for males ($\underline{\chi}^2[2] = 1.89$; $p > .1$) or for females ($\underline{\chi}^2[2] = .46$; $p > .1$).

Likewise in Table C.3, counts of the mean number of times children were placed in such programs did not differ significantly for males ($\underline{t}[485] = .10$; $p > .1$) or for females ($\underline{t}[498] = .72$, $p > .1$). Nor did these counts vary by the persistence of offense behavior, as demonstrated by ANOVA and Duncan results in Table C.4 for males ($\underline{F}[2484] = .05$; $p > .1$) and for females ($\underline{F}[2497] = 1.72$; $p > .1$). Significant ANOVA results were not evident as well in Table C.5 for males ($\underline{F}[5481] = .52$; $p > .1$) or for females ($\underline{F}[5494] = 1.13$; $p > .1$) for specific offender categories. Duncan results for females, however, showed significantly more placements for nonindex offenders relative to other offender groups. Thus, some tendency exists for the least serious female offenders to have a higher number of placements for special programs, although small sample sizes for the more serious offenders limit between-group comparisons.

Special School Programs: Remedial Disciplined

Consistently significant differences existed in the program placement of both sexes for the remedial disciplined. As Table C.6 demonstrates, nearly six times more male offenders ($\chi^2[1]=18.72$; $p<.001$) and nearly 25 times more female offenders ($\chi^2[1]=18.61$; $p<.001$) were placed relative to nonoffenders. This placement was dominated by multiple offenders for both males ($\chi^2=[2]=37.67$; $p<.001$) and females ($\chi^2=[2]=20.99$; $p<.001$), as shown in Table C.7.

Similarly, counts of the mean number of times offenders were placed in remedial disciplinary programs were significant for both males ($t[485]=2.96$; $p<.001$) and females ($t[498]=1.86$; $p<.001$) in Table C.8. ANOVA and Duncan results in Table C.9 show that these counts are significant for persistent (multiple) offense behavior, for males ($F[2484]=18.24$; $p<.001$) and for females ($F[2497]=13.00$; $p<.001$). According to Duncan results, male multiple offenders differed significantly from nonoffenders and first-time offenders, who in turn did not differ significantly from one another. However, both female multiple offenders and first-time offenders differed significantly from nonoffenders and from one another.

Counts for the six categories of offense behavior were significantly different according to ANOVA results (Table C.10) for males ($F[5481]=6.37$; $p<.001$) and for females ($F[5494]=5.84$; $p<.001$). However, Duncan results indicated that the patterns varied between the sexes. For males, very violent, theft, and damage offenders had significantly higher mean numbers of placements in comparison to violent and nonindex offenders and nonoffenders. For females, nonindex offenders had significantly higher mean numbers of placements in comparison to the remaining offender groups. Generally, then, the more serious

male offenders and the less serious female offenders had more placements for disciplinary programs.

Summary and Discussion

In summary, violent and persistent offenders of both sexes showed a significantly higher incidence of intellectual and learning difficulties—particularly verbal ability—in comparison to nonviolent and nonoffenders. These discrepancies in abilities among different types of offenders were greater for females, and occurred mostly at adolescence.

Unexpectedly, female offenders also showed significant differences in mathematical ability, whereas male offenders did not. However, the differences in mathematical ability were considerably smaller than the differences in verbal skills. In turn, for both sexes, only slight differences between offender groups were found for the Usage and Structure subtest of the Total Language CAT. This subtest measures a student's ability to distinguish between standard and nonstandard English, to recognize sentence transformations, and to identify total sentence structure and type.

It is interesting to note that for nearly all offender groups, few or negligible differences were found in test scores at 4 or 7 years. This contrast between no test score differences at early ages and the considerable differences at adolescence may be attributable to one or more factors:

i. Tests at early ages may be cruder measures of intellectual or achievement abilities relative to tests at adolescence. However, it has been found that early test scores are generally strong predictors of later abilities. For example, Bloom (1964:88) concludes that 80 percent of intelligence

at age 17 has developed by age 8; 50 percent develops between conception and age 4. It is likely that situational or developmental events which occur after age 7 influence achievement test scores at adolescence.

ii. Low achievement test scores may be related to behavioral problems which occur during adolescence and impede learning ability. For example, different categories of offenders were not disproportionately enrolled in programs for the mentally retarded; however, a significantly greater number of male and female offenders were enrolled in programs for the remedial disciplined. It appears, then, that the problems faced by offenders in school may often be behavioral than intellectual. This explanation receives support from intelligence test scores at early ages which showed no or few differences between offender groups.

iii. The same or similar factors which have been found to influence intellectual functioning at adolescence may also influence offense status differences in achievement. Based on the literature (see Denno, 1982 for a review), these differences may be attributable in part to early developmental, biological, or sociological factors, such as maturation or physical development, SES, or early birth injury. In turn, similar factors may be important determinants of different levels of achievement among offenders.

The next section examines a number of possible correlates of intelligence, achievement, and delinquency to assess whether particular factors may be influential in mental and behavioral development.

LONGITUDINAL CORRELATES OF OFFENSE STATUS DIFFERENCES

Longitudinal relationships among selected variables were examined using structural equation models which combine features of both factor analysis and regression analysis. The models are referred to by a number of different terms such as simultaneous equation systems, linear causal schemes, etc. The models are especially appropriate for analyzing longitudinal panel data because each equation represents a "causal link", in contrast to other techniques such as ordinary least squares (OLS) regression where each equation represents an empirical association (Goldberger, 1973:2). OLS regression is also based upon the assumption that measurement error in explanatory variables does not exist. However, in the social sciences, valid and reliable single indicators for theoretical concepts such as intelligence and cerebral dominance are frequently unavailable. Consequently, the errors in the equations representing the omitted variables may be biased.

Jöreskog (1973) has developed a general linear model for the analysis of covariance structures which allows for both error in the equations and error in the variables. The general model is a system of equations relating both unobservable and observable independent and dependent variables with an underlying causal structure. The model assumes multivariate normality and linearity, and comprises two parts:

(1) the measurement model, which "specifies how the latent variables or hypothetical constructs are measured in terms of the observed variables..."; and

(2) the structural equation model, which "specifies the causal relationships among the latent variables and are [sic] used to describe the causal effects and the amount of unexplained variance" (Jöreskog and Sörbom, 1978:4).

The measurement model can be regarded as a restricted confirmatory factor analysis as opposed to an unrestricted explanatory factor analysis. Thus, hypothesis testing for the model is identical to testing a confirmatory factor model.

Initial Structural Equation Model

The initial structural equation model which was used as a theoretical framework for relationships among males and females is presented in Figure II. Direct and indirect associations are illustrated across three different points in time for eight independent factors and three dependent factors. The relationships among factors are represented in three ways: (1) the expected correlations among the eight independent factors are represented by ϕ; (2) the effects of independent factors upon dependent factors are represented by γ; and (3) the effects of one dependent factor upon another dependent factor is represented by β. As is shown, ξ indicates a latent independent factor and η indicates a latent dependent factor.

Generally, the theoretical model relates a number of variables to intellectual ability and delinquency, recognizing the possibility of differential effects during the developmental process. For example, biological vulnerability, in particular central nervous system (CNS) functioning, is dependent on gender, the environment, and related effects including prenatal and perinatal events,

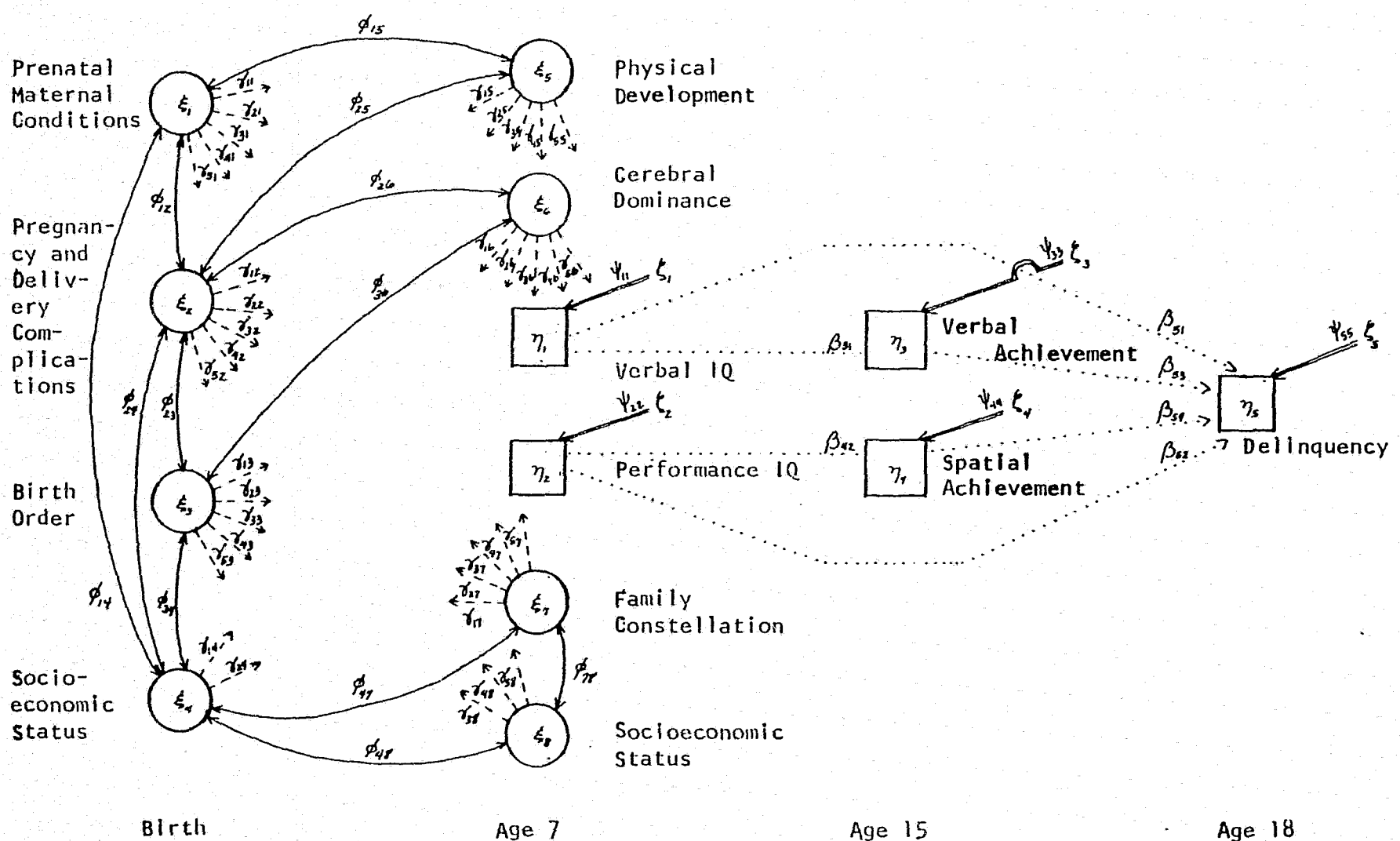

FIGURE 11: Structural Equation Model for Latent Independent and Dependent Factors

gestation, physical growth, indicators of cerebral dominance, family size, and SES.

The cumulative effects of indicators of early CNS trauma and subsequent ability and behavior may be viewed longitudinally as risk factors. Children with prenatal and perinatal complications are at a greater risk for later CNS-related difficulties such as minimal brain dysfunction (MBD), impaired physical growth, problems associated with cerebral dominance and impulsivity, or intellectual and academic difficulties.

CNS-related difficulties for both sexes may be conpounded by other factors such as large family size, absence of the father, late birth order, and low SES. In other words, individuals with a cumulatively vulnerable CNS may be relatively more susceptible to negative environmental or subcultural influences. Notably, such individuals may also be at a greater risk for behavioral disorders or delinquency, as well as persistent or violent behavior.

The extent to which the interrelationships among these variables influence ability, achievement, or delinquency has not been thoroughly investigated. Longitudinally, it is expected that differences in ability and behavior would become most pronounced during adolescence, when both physiological and environmental effects appear to be strongest. However, the great majority of research pinpoints single, rather than multiple or interactive, times and effects. Further, very few studies have focused on black, lower SES subjects and contradictory findings in the great majority of research exist. (A review of the literature discussed in this section may be found in Denno, 1982.)

Initial Measurement Model

The initial measurement model, illustrated in Figure 12, consisted of eight latent independent factors with 28 indicators, and five latent dependent factors with 28 indicators. Indicators for the latent independent and dependent factors are specified as "x" or "y", respectively, in Table 1. The first subscript refers to the latent factor; the second subscript refers to the indicator. A description of the validity, reliability, and composition of individual indicators, and how they contribute to latent factors, may be found in Denno, 1982.

Testing of the Measurement and Structural Equation Models

Testing of the measurement and structural equation models involved examining each of the 13 factors separately by confirmatory factor analysis. The procedure involved in determining the appropriate "fit" of each model is described in Denno, 1982 and Jöreskog and Sörbom, 1974.

In general, factors for the final structural equation model, particularly independent factors, were considerably different from those hypothesized initially. Altogether, the final model comprised six independent and four dependent factors, as shown in Table 2.

Independent factors changed radically, and for interesting reasons. Aside from Mother's Age (ξ_1) and Birth Weight (ξ_2), most prenatal and perinatal indicators of birth stress showed only very low correlations with intelligence, and thus could not be retained in the model. Mother's Age remained as a single indicator of prenatal and perinatal conditions because it correlated with birth-related events and with dependent factors; Birth Weight remained as an

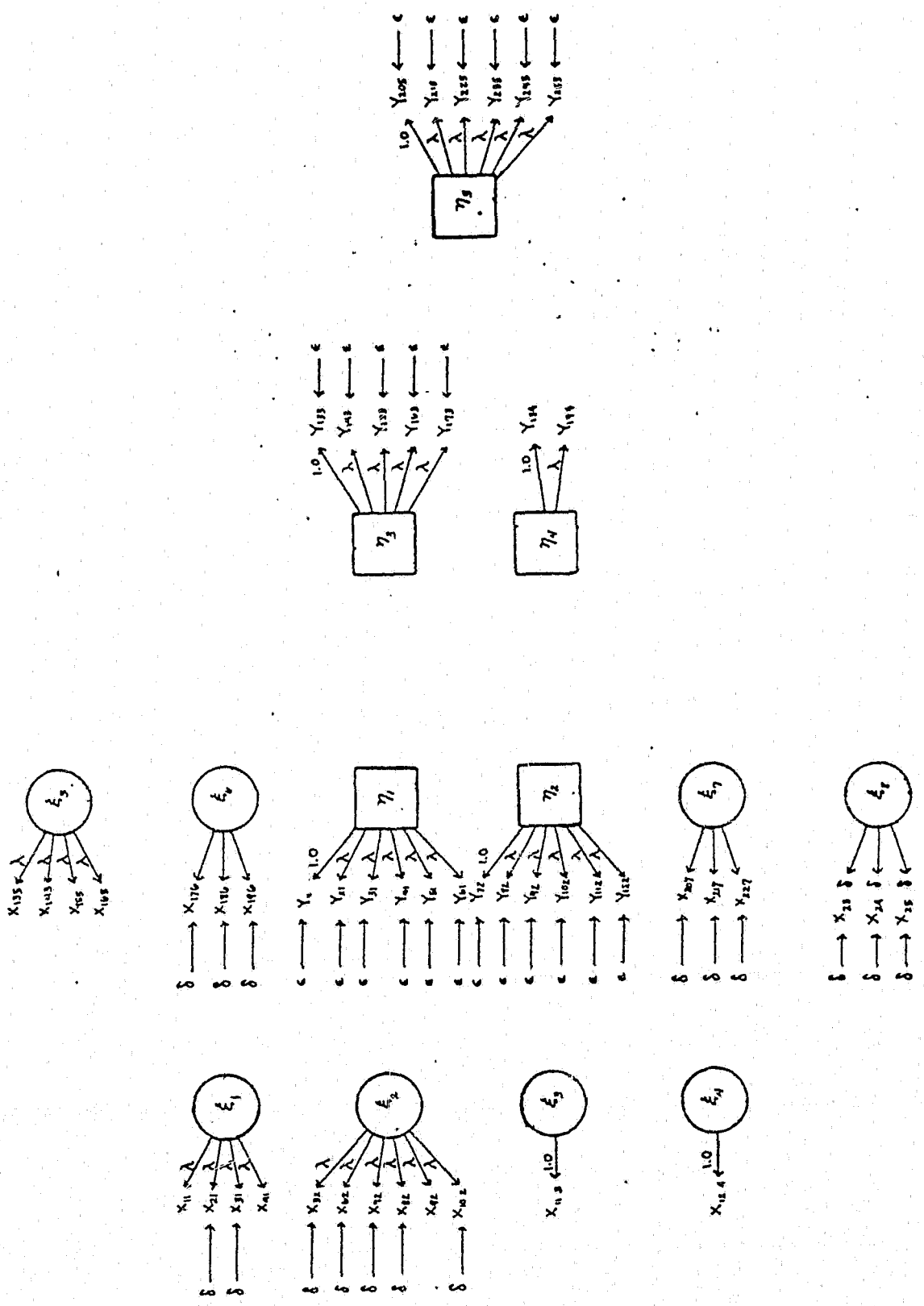

FIGURE 12: Measurement Model for Latent Independent and Dependent Factors

TABLE 1
INDEPENDENT AND DEPENDENT FACTORS

Latent Independent Factors

ξ_1 Prenatal Maternal Conditions

X_{11} Number of Prenatal Examinations

X_{12} Number of Prenatal Conditions - A sumscore of 8 items: heavy smoker, use of sedatives, single marital status, diabetic, hypertensive, veneral disease, neurological or psychiatric conditions, infectious conditions.

X_{13} Poor Obstetrical History - A sumscore of 4 items: prior number of stillbirths, abortions, premature siblings, or neonatal death of siblings.

X_{14} Mother's Age at Registration

X_{15} Number of Prior Pregnancies

ξ_2 Pregnancy and Delivery Complications

X_{21} Total Birth Complications - A count of 17 pregnancy and birth complications: placenta previa; abruptio placentae; marginal sinus rupture; uterine bleeding, first trimester; uterine bleeding, second trimester; uterine bleeding, third trimester; anesthetic shock; other anesthetic accident; caesarean or breech delivery; prolapsed cord; irregular fetal heart rate; meconium during labor; multiple birth; use of oxytocic during labor; cord around the neck, tight; cord around the neck, loose; forceps marks at delivery.

X_{22} Duration of Labor - Sum of stages 1 and 2

X_{23} Apgar at One Minute

X_{24} Apgar at Five Minutes

X_{25} Birth Weight in pounds

X_{26} Gestational Age

ξ_3 Birth Order

X_{31} Parity and Birth Order - Number of older siblings

ξ_4 Socioeconomic Status at Registration

X_{41} Income at Registration into CPP

X_{42} Mother's Education

ξ_5 Child's Physical Development at Age 7

X_{51} Blood Pressure, Systolic

X_{52} Blood Pressure, Diastolic

X_{53} Weight in pounds at 7-year exam

X_{54} Height in cms. at 7-year exam

ξ_6 Child's Laterality at Age 7

X_{61} Hand Preference (dummy)

X_{62} Eye Preference (dummy)

X_{63} Foot Preference (dummy)

ξ_7 Family Constellation at Age 7

X_{71} Family Size

X_{72} Husband or Father in the Household (dummy)

X_{73} Foster, Adoptive Parents; Guardian (dummy)

X_{74} Marital Stability

ξ_8 Socioeconomic Status at Age 7

X_{81} Family Income

X_{82} Education of Head of Household

X_{83} Occupation of Head of Household

Latent Dependent Factors

η_1 Verbal Intelligence

Y_{11} Information scales, WISC verbal

Y_{12} Conprehension scaled, WISC verbal

Y_{13} Vocabulary scaled, WISC verbal

Y_{14} Digit Span scaled, WISC verbal

Y_{15} Spelling WRAT

Y_{16} Reading WRAT

η_2 Spatial Intelligence

Y_{21} Block Design scaled, WISC performance

Y_{22} Coding scaled, WISC performance

Y_{23} Picture Arrangement, WISC performance

Y_{24} Arithmetic WRAT

Y_{25} Bender-Gestalt Test, total score

Y_{26} Goodenough-Harris Draw-A-Man Test, standard score

η_3 Verbal Achievement

Y_{31} Vocabulary CAT

Y_{32} Comprehension CAT

Y_{33} Mechanics CAT

Y_{34} Usage and Structure CAT

Y_{35} Spelling CAT

η_4 Spatial Achievement

Y_{41} Computation CAT

Y_{42} Concepts and Problems CAT

η_5 Delinquency

Y_{51} Age at First Arrest

Y_{52} Age at First Offense

Y_{53} Age at Last Offense

Y_{54} Total Number of Arrests

Y_{55} Total Number of Offenses

Y_{56} Total Number of Injury Offenses

Y_{57} Total Number of Damage Offenses

Y_{58} Total Number of Theft Offenses

Y_{59} Total Number of Nonindex Offenses

TABLE 2
FINAL FACTORS

Latent Independent Factors

ξ_1 Mother's Age

ξ_2 Birth Weight

ξ_3 Income at Registration into CPP

ξ_4 Child's Physical Development at Age 7
- Blood Pressure, Systolic
- Blood Pressure, Diastolic
- Weight
- Height

ξ_5 Child's Laterality at Age 7
- Hand Preference
- Foot Preference

ξ_6 Socioeconomic Status at Age 7
- Husband or Father in the Household
- Family Income at the 7-Year Exam
- Occupation of the Head of Household

Latent Dependent Factors

η_1 Verbal Intelligence

WISC	Information
	Comprehension
	Vocabulary
	Digit Span
WRAT	Spelling
	Reading
	Arithmetic

η_2 Spatial Intelligence

WISC	Block Design
	Coding
	Picture Arrangement
Bender-Gestalt	
Goodenough-Harris Drawing Test	

η_3 Achievement

CAT	Vocabulary
	Comprehension
	Mechanics
	Usage and Structure
	Spelling
	Computation
	Concepts and Problems

η_4 Delinquency

- Age at First Arrest
- Age at First Offense
- Total Number of Arrests
- Damage Offender
- Injury Offender

indicator of both perinatal condition and physical maturation at an early age. Socioeconomic Status at Registration (ξ_3) was a single indicator only of family income. Cerebral dominance (ξ_5) at age 7 finally comprised only hand and foot preference since eye preference was not highly correlated with intelligence. The single factor of Physical Development (ξ_4) was confirmed, however, whereas the more stable indicators of the two factors of family constellation and SES at age 7 were combined (ξ_6).

Dependent factors changed only slightly. Verbal and spatial factors at age 7 (η_1 and η_2) were confirmed; both verbal and spatial measures of the CAT loaded onto one CAT factor—Achievement (η_3). The delinquency factor (η_4) ultimately comprised indicators of the most violent and persistent offense behavior.

Sex Differences: Individual Indicators

Sex differences in the mean values of individual indicators are noted in Appendix A. In general, t-test results showed few differences in independent indicators, although males had significantly heavier birth weight and higher blood pressure, height and weight at age 7. Females had a significantly higher incidence of variable foot preference. However, no sex differences existed in indicators of prenatal and perinatal stress, in family constellation, or in socioeconomic status. Thus, it can be assumed that the sexes are similar on key environmental factors and early events.

Significant sex differences existed on most dependent indicators, however. Differences in intelligence test scores at ages 4 and 7 were not of a great magnitude and were inconsistent. Differences at age 15, though, were both con-

siderable and consistent. Females scored significantly higher on all achievement tests, aside from Total Reading and Vocabulary, where their mean scores were higher but not significant. Concerning Total Battery scores, for example, females scored 7 percentiles higher than males; they scored 13 percentiles higher on Spelling and 10 percentiles higher on Mechanics (language). Expectedly, males showed significantly higher incidences of police contacts on all offense indicators.

Sex Differences: Structural Equation Models

Parameters for the unstandardized sex comparison model and chi-square results of the model's good fit are shown in Appendix D, Table D.1. (Details of the model fitting procedure are described in Denno, 1982.) The final standardized measurement model for males for dependent and independent factors is presented in Tables D.2 and D.4, respectively; the final standardized model for females is presented in Tables D.3 and D.5, respectively.

The final structural equation model comparing males and females is shown in Figure 13. A single coefficient on an arrow indicates that the relationship from one factor to another is identical for both sexes; two coefficients on an arrow, identified by exponents "M" and "F", indicate different relationships for males and females, respectively. The t-values for coefficients are in parentheses. The standardized solutions for male and female models are in Tables D.6 and D.7, respectively.

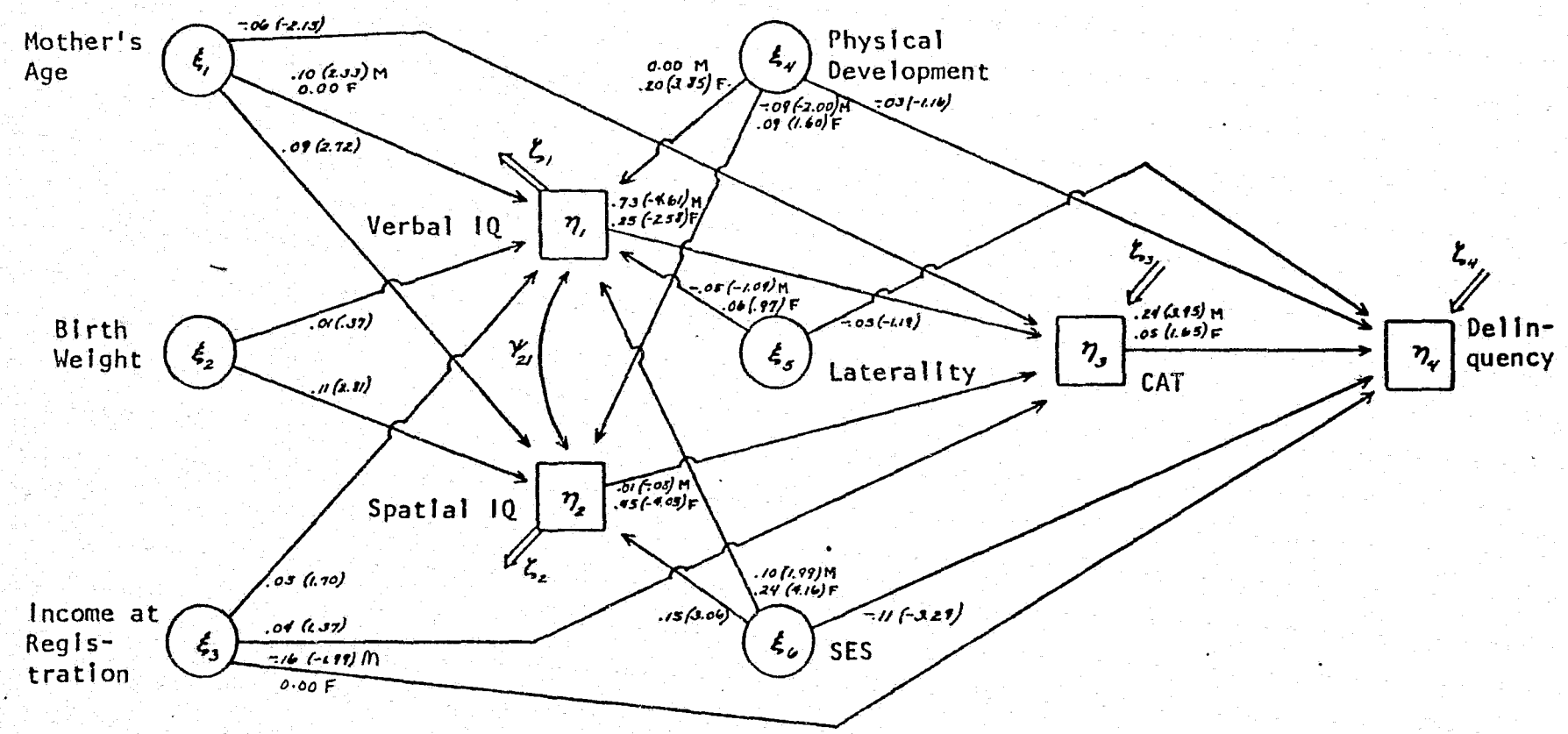

FIGURE 13

Final Structural Equation (Comparison) Model: Standardized Solution. Males and Females
M = Males F = Females

Relationships Among Dependent Factors

Clear sex differences existed in the relationships between Verbal and Spatial IQ and the CAT in Figure 13. For males, Verbal IQ showed a highly significant direct relationship (.73) with the CAT, whereas Spatial IQ showed no direct relationship (.01). For females, both Verbal and Spatial IQ showed highly significant direct relationships (.25 and .45, respectively) with the CAT, although the relationship with Spatial IQ was stronger. Comparing the sexes, the effect of Verbal IQ on the CAT was about three times greater for males; the effect of Spatial IQ on the CAT mas markedly greater for females. Concerning the relationship between the CAT and delinquency, the sexes clearly differed. The highly significant negative relationship (-.24) between the CAT and Delinquency among males is about five times greater than the nonsignificant relationship (.05) among females.

Altogether, then, both Verbal and Spatial IQ showed direct effects on the CAT for females whereas only Verbal IQ showed direct effects on the CAT for males. Whereas a strong negative relationship between the CAT and Delinquency existed for males, no significant relationship existed for females.

Relationship Among Independent and Dependent Factors

Relationships among independent and dependent factors showed specific sex differences. In general, sex differences were greatest for the independent effects on Verbal IQ. Whereas Mother's Age showed a highly significant direct relationship (.10) with Verbal IQ among males, it showed no effect among females; in turn, Physical Development had a significant direct relationship (.20) with Verbal IQ among females but not among males. The effect of SES at

Age 7 was significant for both sexes, but was about 2.5 times stronger for females.

With Spatial IQ, the same significant and positive direct relationships (.11, .15, and .09, respectively) existed for Birth Weight, SES at Age 7, and Mother's Age, for both sexes. A significant and direct negative effect (-.09) existed with Physical Development at Age 7 for males, but the effect (.09) was not significant for females.

For the CAT, only one significant independent effect appeared: for both sexes, a negative relationship (-.06) existed with Mother's Age. With Delinquency, the same significant and negative direct relationship (-.11) existed for both sexes with SES at Age 7. Whereas a significant and negative direct relationship (-.16) appeared between Income at Registration and Delinquency for males, no such relationship appeared for females. Thus, independent effects on Delinquency were the same for both sexes aside from the negative direct effect of early income for males which did not appear for females.

The standardized reduced form equations represent the total impact of independent upon dependent factors, through the summation of direct and indirect effects. Essentially, each η is expressed exclusively in terms of ξs. In the present structural equation model, all independent factors and the two 7-year dependent factors (Verbal and Spatial IQ) determine the ultimate dependent factors, CAT and Delinquency. However, the reduced form equations for Verbal and Spatial IQ are identical to their structural form equations.

Coefficients for reduced form equations are shown in Table 3. For the CAT, the total effect for males appeared to be strongest for SES at Age 7 and

Income at Registration; the effect was weakest for Physical Development. The total effect for females was strongest for SES at Age 7 and Physical Development; the effect was weakest for Cerebral Dominance and Mother's Age.

TABLE 3

COEFFICIENTS FOR REDUCED FORM EQUATIONS FOR MALES AND FEMALES

	Dependent Variables			
	Achievement		Delinquency	
Independent Variables	Males	Females	Males	Females
Mother's Age	.013	.017	.003	.001
Birth Weight	.001	.054	-.003	-.003
Income at Registration	.070	.048	-.181	-.002
Physical Development	.001	.093	-.031	-.036
Laterality	.034	.016	-.041	-.050
SES	.077	.127	-.127	-.115

For Delinquency, the total effects for males were, once again, strongest for Income at Registration and SES at Age 7; the effects were weakest for Mother's Age and Birth Weight. The total effects for females were strongest for SES at Age 7 and Cerebral Dominance; the effects were weakest for Mother's Age, Birth Weight, and Income at Registration.

Altogether, then, the strongest total effects on both the CAT and Delinquency for males were related to socioeconomic variables (i.e., income and SES). However, the strongest total effects for females were related to both socioeconomic and biological variables for the CAT (i.e., SES and Physical Development) and for Delinquency (i.e., SES and Cerebral Dominance).

Summary and Discussion

Some significant differences appeared in the final structural equation model comparing males and females. Concerning dependent factors, Verbal IQ showed a direct relationship with the CAT for males, whereas both Verbal and Spatial IQ showed direct relationships with the CAT for females. In comparing the sexes, the effects of Verbal IQ on the CAT were clearly stronger for males whereas the effects of Spatial IQ were markedly stronger for females. In turn, a highly significant relationship between the CAT and Delinquency existed for males whereas no such relationship existed for females.

Concerning relationships among independent and dependent factors, sex differences were clearest for Verbal IQ. Whereas Mother's Age showed a direct effect with Verbal IQ among males, Physical Development showed a direct effect among females. The effect of SES at Age 7 on Verbal IQ, which was significant for both sexes, was relatively stronger for females.

For Spatial IQ, the same direct effects appeared for both sexes for Birth Weight, SES at Age 7, and Mother's Age. Whereas a direct negative effect existed with Physical Development for males, no significant effects appeared for females.

For both sexes, only one direct effect appeared for the CAT: a negative relationship with Mother's Age. For Delinquency, the same negative relationship existed with SES at Age 7 for both sexes. The negative relationship between Income at Registration and Delinquency for males did not appear for females, however.

Results of the reduced form equations also showed sex differences, although the importance of socioeconomic factors was clear for both groups. For males, the total effects of SES at Age 7 and Income at Registration were strongest for both the CAT and Delinquency. For females, the total effect of SES at Age 7 was also strong for the CAT and Delinquency; however, the second strongest effects, respectively, were Physical Development and Cerebral Dominance.

In general, then, the major total effects on both the CAT and Delinquency for males were related only to socioeconomic or environmental variables. However, the major total effects for females were related to both socioeconomic and biological or developmental variables.

Findings in the present study supported past research showing that correlates of learning disability and delinquency are primarily socioeconomic, or environmental (see Denno, 1982 for a review). Indeed, a striking result was that even within a demographically homogenous group of subjects—i.e., black, lower-to-lower-middle SES, socioeconomic factors remained the strongest predictors of both high school achievement and behavior. In turn, early developmental and environmental factors, such as prenatal and pregnancy complications and birth order, showed no significant associations with ability or behavior. Evidence that some biological factors were associated with the CAT and Delinquency for females supported past findings of relatively greater biological influences in female deviance (see Denno, 1982 for a review). However, socioeconomic factors considerably outweighed biological effects.

Contrasts between the findings in the present study and some of the findings reported in other research may be attributed to a number of factors:

i. Few studies have been conducted on black or demographically "high risk" individuals, although some evidence suggests that patterns of intellectual functioning and delinquency may vary among different ethnic groups (see Denno, 1982 for a review of the literature).

ii. Most studies of learning disability and delinquency have relied on cross-sectional rather than on longitudinal designs. With cross-sectional designs, assumptions of causality are limited, if not prohibited. As previous research has also shown, both school achievement and delinquency are strongly affected by age (Lane, 1980; Rankin, 1980), with problems generally increasing during the later juvenile years. Likewise, biological factors which appear to be important during early years may be less consequential during adolescence. In the present study, measures of interrelationships at multiple points in time revealed differential effects on achievement and delinquency.

iii. Measures of intelligence, socioeconomic status, delinquency, and other variables are considerably heterogenous. However, few attempts have been made to include multiple measures of variables, although factor analytic techniques have been shown to change results dramatically (Jöreskog and Sörbom, 1979). In the present study, multiple indicators of many different kinds of variables were included to specify more fully independent and dependent effects, as well as to insure reliability and validity.

iv. Statistical comparisons between different groups rarely investigate the possible biasing effect that heterogeneity of variance may have, although evidence exists that there may be differences in the variation of test scores, as an example. Such differences may also potentially bias attempts to determine the consistency or predictability of subjects' test scores over time,

using correlation coefficients as indicators of stability. As has been noted, correlation coefficients can be considerably influenced by the variances of correlated variables (Jöreskog and Sörbom, 1979). In the present study, structural equation modelling was applied to attempt to eliminate much of this potential error, enabling more reliable comparisons.

The present study faced a number of limitations which could also influence results. For example, the structural equation model which was used did not include factors found to be important in past research on ability and delinquency, such as measures of peer and teacher relationships, adjustment to school, student self-esteem, and school quality (for a review of the literature, see Isralowitz and Mayo, 1982). Likewise, the conclusion that socioeconomic or environmental factors were the predominant predictors of ability and behavior was made in light of no available data for testing genetic influences.

It appears, however, that programs and policy decisions concerned with the link between learning disabilities and delinquency should concentrate on examining the effects of multiple factors across different time points. So far, findings in the present study appear to support the conclusions of Prentice and Kelly, 1963, that delinquents are not significantly less intelligent than controls; they simply achieve less. In light of the higher enrollments of delinquents in programs for the behaviorally disordered in the present study, it may be recommended that school programs be geared toward hyperactive and impulsive adolescents. Stronger conclusions require more supporting data, however, and the replication of past research.

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APPENDIX A

UNTRANSFORMED VARIABLE MEANS AND STANDARD DEVIATIONS, BY SEX

VARIABLE NAME	VARIABLE LABEL	MALES MEAN	MALES (S.D.)	FEMALES MEAN	FEMALES (S.D.)
V2527	Stanford-Binet Intelligence Scale*	90.12	(12.11)	91.91	(13.53)
V2595	Graham-Ernhart Block Sort, Total Score***	31.28	(8.65)	33.49	(8.08)
V2680	Verbal IQ WISC	92.55	(11.14)	91.26	(11.49)
V2664	Information scaled, WISC verbal	9.18	(2.37)	9.10	(2.43)
V2666	Comprehension scaled, WISC verbal**	8.65	(2.45)	8.14	(2.33)
V2668	Vocabulary scaled, WISC verbal***	8.22	(2.38)	7.61	(2.30)
V2670	Digit span scaled, WISC verbal*	9.14	(2.83)	9.51	(3.05)
V2705_T	Spelling WRAT, raw score, square root transformed*	22.81	(4.67)	23.50	(4.66)
V2709_T	Reading WRAT, raw score, square root transformed*	31.36	(7.56)	32.68	(8.29)
V2682	Performance IQ WISC	94.39	(12.68)	94.33	(11.96)
V2675	Block design scaled, WISC performance*	9.09	(2.27)	8.73	(2.09)
V2677	Coding scaled, WISC performance***	9.63	(2.82)	10.54	(2.80)
PICTARR	Picture arrangement, WISC performance**	8.87	(2.74)	8.30	(2.60)
V2713_T	Arithmetic WRAT, raw score, square root transformed	20.12	(3.42)	20.43	(3.22)

VARIABLE NAME	VARIABLE LABEL	MALES MEAN	MALES (S.D.)	FEMALES MEAN	FEMALES (S.D.)
V2660	Bender-Gestalt Test, total score***	7.85	(3.36)	8.70	(3.60)
V2692	Goodenough-Harris Draw-A-Man Test, standard score***	96.63	(13.62)	93.70	(11.73)
V2684	Full Scale IQ WISC	92.79	(10.95)	92.03	(11.07)
DIQWISC	Difference IQ WISC	1.84	(13.02)	3.07	(11.92)
SC047_T	Total Reading, CAT, square root transformed	30.32	(24.53)	33.35	(25.76)
SC050_T	Total Math, CAT, square root transformed*	22.79	(21.82)	26.95	(22.55)
SC053_T	Total Language, CAT, square root transformed***	27.00	(23.43)	36.80	(25.58)
SC055_T	Total Battery, CAT, square root transformed***	23.68	(22.54)	30.67	(24.83)
NEW2662	Bender Time (seconds)	411.03	(184.01)	400.03	(176.72)
SC045_T	Vocabulary CAT, square root transformed	33.12	(26.43)	35.99	(28.91)
SC046_T	Comprehension CAT, square root transformed**	29.64	(23.81)	33.02	(24.11)
SC051_T	Mechanics CAT, square root transformed***	28.23	(24.12)	38.97	(26.73)
SC052_T	Usage and Structure, square root transformed***	30.01	(21.78)	35.16	(23.07)
SC054_T	Spelling CAT, square root transformed***	26.82	(23.74)	39.43	(28.04)
SC048_T	Computation, CAT, square root transformed***	23.29	(21.77)	28.41	(23.32)

VARIABLE NAME	VARIABLE LABEL	MALES MEAN	MALES (S.D.)	FEMALES MEAN	FEMALES (S.D.)
SC049_T	Concepts and Problems, CAT square root transformed*	24.87	(22.31)	27.61	(22.01)
AGEARR1	Age at First Arrest	15.39	(1.37)	15.31	(1.57)
AGEOFNS1	Age at First Offense	13.95	(2.26)	14.15	(1.97)
AGEOFNSL	Age at Last Offense	15.44	(1.99)	15.04	(1.57)
ARTOT_T2	Total Number of Arrests, log transformed, with 0=.5***	.58	(1.80)	.13	(.59)
AR_DUM	Arrest Record: Arrests/no Arrests (1 = one or more arrests)***	.22	(.41)	.07	(.30)
COMPL_T2	Total Number of Offenses, log transformed, with 0=.5***	.91	(2.44)	.29	(1.11)
COM_DUM	Offense Record: Offenses/no Offenses (1 = one or more offenses)***	.31	(.46)	.14	(.34)
INUM_OBS	Total Number of Injury Offenses, observed or inferred***	.11	(.53)	.01	(.13)
TNUM_OBS	Total Number of Theft Offenses, observed or inferred***	.27	(1.03)	.08	(.45)
DNUM_TOT	Total Number of Damage Offenses, observed, inferred or estimated***	.13	(.52)	.01	(.10)
OBS_NI	Total Number of Nonindex Offenses, observed or inferred***	.45	(1.15)	.16	(.76)
VERYVIOL	Total Number of Very Violent Offenses**	.08	(.38)	.02	(.17)
MILDVIOL	Total Number of Less Violent Offenses**	.06	(.34)	.004	(.06)

VARIABLE NAME	VARIABLE LABEL	MALES MEAN	MALES (S.D.)	FEMALES MEAN	FEMALES (S.D.)
PN_EXAM	Number of Prenatal Examinations	4.52	(1.33)	4.50	(1.29)
PRECON1	Number of Prenatal Conditions A sumscore of 8 items:	.80	(.84)	.71	(.91)
	SMOKING2 (1=≥30 cigarettes per day)*	.01	(.12)	.002	(.04)
	DRUGTOT (1=sedatives were used)	.12	(.32)	.09	(.29)
	V109 (1=single)	.32	(.46)	.29	(.45)
	DIABETIC (1=present)	.01	(.10)	.01	(.10)
	NEW425 (1=hypertension)	.10	(.31)	.10	(.30)
	NEW431 (# of venereal conditions)	.12	(.45)	.12	(.45)
	NEW434 (# of neurological/ psychiatric conditions)	.05	(.23)	.06	(.27)
	NEW439 (# of infectious conditions)	.06	(.23)	.04	(.21)
POOROB1	Poor Obstetrical History A sumscore of 4 items:	.59	(1.02)	.70	(1.30)
	NEW2939 (# of fetal deaths <20 weeks)	.24	(.58)	.25	(.62)
	NEW2940 (# of fetal deaths ≥20 weeks)	.06	(.26)	.06	(.27)
	NEW2944 (# of premature siblings)	.24	(.60)	.33	(.86)
	NEW2947 (# of neonatal deaths of siblings)	.04	(.23)	.06	(.29)

VARIABLE NAME	VARIABLE LABEL		MALES MEAN	MALES (S.D.)	FEMALES MEAN	FEMALES (S.D.)
V111_T	Mother's Age at Registration, log transformed		24.18	(6.52)	24.56	(6.26)
ALLCOM	Total Birth Complications A count of 17 pregnancy and birth complications (PREGNCOM - excluding ANEMIA and DELIVCOM):		1.22	(1.08)	1.18	(1.13)
	V566	Placenta Previa	.01	(.08)	.01	(.08)
	V567	Abruptio Placentae	.02	(.13)	.01	(.12)
	V568	Marginal Sinus Rupture	.01	(.10)	.01	(.11)
	V569	Uterine Bleeding, first trimester	.10	(.30)	.10	(.31)
	V570	Uterine Bleeding, second trimester	.10	(.30)	.11	(.31)
	V571	Uterine Bleeding, third trimester	.17	(.38)	.19	(.39)
	V572	Anesthetic Shock	.02	(.13)	.03	(.17)
	V577	Other Anesthetic Accident	-	-	.002	(.04)
	DELCOM, V178	Caesarean or Breech Delivery	.05	(.23)	.07	(.26)
	NEW204	Prolapsed Cord	.01	(.11)	.01	(.08)
	NEW220	Irregular Fetal Heart Rate	.03	(.18)	.03	(.18)
	NEW221	Meconium During Labor	.24	(.43)	.22	(.41)
	NEW353	Use of Oxytocic During Labor	.10	(.30)	.10	(.30)

VARIABLE NAME	VARIABLE LABEL	MALES MEAN	MALES (S.D.)	FEMALES MEAN	FEMALES (S.D.)
NEW399	Cord around Neck, tight	.08	(.32)	.08	(.33)
NEW400	Cord around Neck, loose	.22	(.48)	.18	(.44)
NEW609	Forceps Marks at Delivery	.07	(.26)	.06	(.24)
V346	Multiple Birth	.01	(.09)	.01	(.08)
LABTOT_T	Duration of Labor - Sum of Stages 1 and 2, square root transformed	7.87	(5.46)	7.57	(5.74)
NEW625_T	Apgar at One Minute, arc sine transformed	7.69	(1.86)	7.82	(1.77)
NEW631_T	Apgar at Five Minutes, arc sine transformed	8.88	(1.18)	8.90	(1.14)
BRTHLBOZ	Birth Weight in pounds, V597***	7.05	(1.20)	6.68	(1.11)
NEW595	Gestational Age	38.33	(3.45)	38.22	(3.72)
NEW3076_T	Parity and Birth Order - Number of Older Siblings, square root transformed	2.16	(2.15)	2.44	(2.44)
REGINC_T	Income at Registration, square root transformed, V2825 or V2921, adjusted to 1970 dollars	4130.48	(1942.31)	3991.96	(1883.1)
NW2812_T	Mother's Education, arc sine transformed	10.31	(1.94)	10.41	(1.81)
NEW1788	Blood Pressure, Systolic*	101.57	(9.72)	100.10	(9.64)

VARIABLE NAME	VARIABLE LABEL	MALES MEAN	MALES (S.D.)	FEMALES MEAN	FEMALES (S.D.)
NEW1789	Blood Pressure, Diastolic*	61.79	(7.63)	60.62	(7.80)
WT_7YR	Weight in lbs. at 7-year exam, V1783***	54.80	(10.06)	51.73	(9.11)
V1785_T	Height in cms. at 7-year exam, log transformed***	124.31	(5.64)	122.49	(5.56)
PONIN	Ponderal Index(weight/height^3)	.00003	(.00003)	.00003	(.00003)
V1920	Hand Preference, 1=left-handed	.12	(.32)	.10	(.30)
V1922	Eye Preference, 1=left-eyed	.42	(.49)	.42	(.50)
V1924_1	Foot Preference, 1=left-footed (vs. right and variable)	.10	(.30)	.10	(.30)
V1924_2	Foot Preference, 1=left or variable footed (vs. right)**	.16	(.37)	.23	(.42)
FAMSIZ_T	Family Size (sum of older and younger siblings), square root transformed	5.88	(2.38)	6.05	(2.54)
V3012	Husband or Father in the Household (1=father figure absent)	.39	(.49)	.43	(.50)
V2986	Foster, Adoptive Parents; Guardian (1=a foster child)	.03	(.18)	.02	(.13)
MARSTAB	Marital Stability (1=mother who is single or married at registration but not married at the 7-year exam)	.55	(.50)	.54	(.50)
V3036_T	Number of Persons Supported in the Household	5.80	(2.14)	5.88	(2.04)
Y7RINC_T	Income at the 7-year exam, log transformed	6603.91	(3438.63)	6561.28	(3280.95)

VARIABLE NAME	VARIABLE LABEL	MALES MEAN (S.D.)	FEMALES MEAN (S.D.)
EDSCORE	Education of Head of Household	41.13 (20.86)	42.00 (20.30)
OCCSCORE	Occupation of Head of Household	30.31 (25.70)	32.08 (26.12)
*p<.05 **p<.01 ***p<.001	N	487	500

APPENDIX B

TABLE B.1 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS BY NONOFFENDER/ OFFENDER STATUS - MALES AND FEMALES

		MALES				FEMALES			
AGE (YRS)	TESTS (TEST RANGE)	NONOFFENDER MEAN (SD)	OFFENDER MEAN (SD)	F (1,403) (1,485)	WILKS' L	NONOFFENDER MEAN (SD)	OFFENDER MEAN (SD)	F (1,391) (1,498)	WILKS' L
4	Stanford-Binet Intelligence Scale (25-175)	89.91 (12.29)	90.60 (11.73)	.28	.998 F(2,402)= .38	92.12 (13.74)	90.37 (11.90)	.68	.998 F(2,390)= .35
	Graham-Ernhart Block Sort Test (0-45)	31.04 (8.93)	31.82 (7.96)	.69		33.56 (8.08)	33.30 (8.33)	.04	
7	Verbal IQ WISC (45-155)	92.42 (11.35)	92.83 (10.69)	.14	.999 F(2,484)= .08	91.48 (11.77)	89.88 (9.53)	1.15	.985 F(2,497)= 3.82[a]
	Performance IQ WISC (44-156)	94.27 (12.66)	94.65 (12.76)	.09		94.92 (12.08)	90.68 (10.49)	7.57[b]	
	Full Scale IQ WISC (25-154)	92.67 (11.22)	93.06 (10.37)	.13		92.45 (11.32)	89.39 (9.04)	4.56[a]	
7	Information-WISC Verbal (0-20)	9.14 (2.44)	9.29 (2.19)	.34	.998 F(4,482)= .17	9.14 (2.44)	8.82 (2.37)	1.02	.990 F(4,495)= 1.18
	Comprehension-WISC Verbal (0-20)	8.67 (2.41)	8.61 (2.56)	.07		8.15 (2.33)	8.03 (2.34)	.18	

TABLE B.1

	Vocabulary-WISC Verbal (0-20)	8.21	(2.49)	8.24	(2.12)	.02		7.60	(2.36)	7.68	(1.85)	.07	
	Digit Span-WISC Verbal (0-20)	9.10	(2.82)	9.23	(2.84)	.22		9.60	(3.07)	8.96	(2.89)	2.66	
7	Block Design-WISC Performance (0-20)	9.12	(2.26)	9.00	(2.30)	.32	.992 F(3,483)= 1.36	8.78	(2.08)	8.40	(2.16)	1.90	.985 F(3,496)= 2.56
	Coding-Wisc Performance (0-20)	9.49	(2.78)	9.94	(2.91)	2.61		10.64	(2.83)	9.88	(2.49)	4.43[a]	
	Picture Arrangement-WISC Performance (0-20)	8.92	(2.81)	8.74	(2.57)	.42		8.39	(2.62)	7.72	(2.38)	3.98[a]	
7	Bender-Gestalt (0-30)	7.72	(3.44)	8.13	(3.18)	1.57	.995 F(3,483)= .76	8.68	(3.60)	8.71	(3.46)	.00	.991 F(3,496)= 1.53
	Bender-Gestalt Time (Seconds)	415.53	(186.46)	401.02	(178.63)	.65		393.80	(158.86)	438.96	(260.39)	3.91[a]	
	Goodenough-Harris Draw-A-Man Test (49-151)	92.67	(11.22)	93.06	(10.37)	.13		93.85	(11.79)	92.71	(11.40)	.56	
7	Spelling WRAT (0-55)	22.73	(4.75)	22.99	(4.49)	.33	.979 F(3,483)= 3.52[a]	23.67	(4.69)	22.40	(4.30)	4.45[a]	.989 F(3,496)= 1.72

TABLE B.1

	Reading WRAT (0-84)	31.73	(7.81)	30.54	(6.92)	2.57		32.90	(8.39)	31.32	(7.56)	2.17	
	Arithmetic WRAT (0-49)	20.19	(3.54)	19.96	(3.14)	.50		20.48	(3.28)	20.11	(2.85)	.77	
14-15	Total Reading CAT	31.98	(25.05)	26.64	(22.99)	4.97[a]	.985 F(4,482)= 1.78	34.99	(26.16)	23.07	(20.46)	13.04[c]	.970 F(4,495)= 3.80[b]
	Total Math CAT	24.01	(22.29)	20.09	(20.52)	3.38		28.37	(22.96)	18.06	(17.42)	12.74[c]	
	Total Language CAT	28.63	(24.24)	23.38	(21.18)	5.28[a]		38.41	(25.97)	26.77	(20.46)	12.60[c]	
	Spelling CAT	28.69	(24.52)	22.67	(21.41)	6.77[b]		41.12	(28.22)	28.89	(24.52)	11.54[c]	
	Total Battery CAT	25.21	(23.17)	20.27	(20.74)	5.04[a]		32.33	(25.25)	20.26	(19.18)	14.44[c]	
14-15	Vocabulary-CAT Reading	35.09	(27.34)	28.72	(23.78)	6.12[a]	.979 F(5,481)= 1.98	37.87	(29.45)	24.25	(22.09)	13.54[c]	.965 F(5,494)= 3.60[b]
	Comprehension-CAT Reading	31.06	(24.08)	26.48	(22.96)	3.89[a]		34.47	(24.51)	23.97	(19.30)	11.52[c]	
	Mechanics-CAT Language	30.02	(24.98)	24.24	(21.65)	6.06[a]		40.73	(27.16)	28.00	(20.90)	13.83[c]	
	Usage and Structure-CAT Language	30.68	(22.49)	28.50	(20.09)	1.04		36.00	(23.48)	29.87	(19.69)	4.23[a]	
	Spelling CAT	28.69	(24.52)	22.67	(21.41)	6.77[b]		41.12	(28.22)	28.89	(24.52)	11.54[c]	
	Computation-CAT Math	24.54	(22.38)	20.54	(20.13)	3.53	.993 F(4,484)= 1.78	29.82	(23.74)	19.62	(18.34)	11.61[c]	.974 F(2,497)= 6.50[c]

TABLE B.1

Concepts and Problems-CAT Math	25.98 (22.73)	22.42 (21.21)	2.66	28.97 (22.36)	19.11 (17.59)	12.19[c]

[a] $p<.05$

[b] $p<.01$

[c] $p<.001$

Duncan is significant at $p<.05$

N-MALES	NONOFFENDER	OFFENDER	TOTAL
4 years	282	123	405
7/14-15 Years	336	151	487
N-FEMALES			
4 years	347	46	393
7/14-15 years	431	69	500

TABLE B.2 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS BY SIX OFFENDER CATEGORIES - MALES ONLY

AGE (YRS)	TESTS (TEST RANGE)	NONOFFENDER MEAN	(SD)	[DN]	NONINDEX OFFENDER MEAN	(SD)	[DN]	THEFT OFFENDER MEAN	(SD)	[DN]	DAMAGE OFFENDER MEAN	(SD)	[DN]	MILDLY VIOLENT OFFENDER MEAN	(SD)	[DN]	VERY VIOLENT OFFENDER MEAN	(SD)	[DN]	F (5,399) (5,481)	WILKS' L
4	Stanford-Binet Intelligence Scale (25-175)	89.91	(12.29)	[A]	91.39	(11.49)	[A]	91.52	(14.49)	[A]	91.69	(11.05)	[A]	86.60	(9.56)	[A]	88.55	(10.77)	[A]	.48	.992 F(10,796)= .33
	Graham-Ernhart Block Sort Test (0-45)	31.04	(8.93)	[A]	32.33	(8.05)	[A]	31.48	(7.77)	[A]	32.19	(8.00)	[A]	29.60	(9.88)	[A]	31.65	(7.48)	[A]	.32	
7	Verbal IQ WISC (45-155)	92.42	(11.35)	[A]	94.70	(11.32)	[A]	92.25	(11.17)	[A]	94.13	(9.83)	[A]	87.73	(8.44)	[A]	89.72	(9.29)	[A]	1.32	.975 F(10,960)= 1.22
	Performance IQ WISC (44-156)	94.27	(12.66)	[A]	94.14	(12.83)	[A]	97.25	(11.77)	[A]	98.56	(10.47)	[A]	91.36	(14.72)	[A]	90.88	(13.99)	[A]	1.31	
	Full Scale IQ WISC (25-154)	92.67	(11.22)	[A]	93.89	(10.97)	[A]	94.11	(9.24)	[A]	95.78	(7.60)	[A]	88.36	(11.23)	[A]	89.32	(10.97)	[A]	1.43	
7	Information-WISC Verbal (0-20)	9.14	(2.44)	[A]	9.55	(2.38)	[A]	8.93	(2.07)	[A]	9.30	(1.94)	[A]	8.09	(1.76)	[A]	9.44	(2.16)	[A]	.93	.950 F(20,1586)= 1.24
	Comprehension-WISC Verbal (0-20)	8.67	(2.41)	[AB]	8.55	(2.75)	[AB]	8.68	(2.52)	[AB]	9.39	(2.46)	[A]	9.00	(2.76)	[AB]	7.80	(1.94)	[B]	1.10	
	Vocabulary-WISC Verbal (0-20)	8.21	(2.49)	[A]	8.50	(2.28)	[A]	8.36	(2.06)	[A]	8.22	(1.98)	[A]	7.91	(1.92)	[A]	7.64	(1.99)	[A]	.53	
	Digit Span-WISC Verbal (0-20)	9.10	(2.83	[B]	9.97	(2.75)	[A]	9.00	(2.61)	[B]	9.26	(2.96)	[AB]	7.09	(2.81)	[B]	8.52	(2.72)	[B]	2.57[a]	

TABLE B.2

7	Block Design-WISC Performance (0-20)	9.12	(2.26)	[AB]	8.70	(2.28)	[B]	9.50	(2.17)	[AB]	9.96	(2.08)	[A]	9.18	(2.60)	[AB]	8.24	(2.31)	[B]	1.96	.956 F(15,1322)= 1.46
	Coding-WISC Performance (0-20)	9.49	(2.78)	[B]	9.73	(2.72)	[AB]	10.78	(2.97)	[A]	10.09	(2.95)	[AB]	8.91	(2.70)	[B]	9.84	(3.35)	[AB]	1.41	
	Picture Arrangement-WISC Performance (0-20)	8.92	(2.81)	[A]	9.05	(2.67)	[A]	8.53	(2.83)	[A]	9.30	(1.74)	[A]	8.09	(2.38)	[A]	8.00	(2.61)	[A]	.96	
7	Bender-Gestalt (0-30)	7.72	(3.44)	[A]	7.48	(3.06)	[A]	8.32	(2.48)	[A]	8.61	(3.70)	[A]	9.00	(3.40)	[A]	8.76	(3.47)	[A]	1.22	.975 F(15,1322)= .81
	Bender-Gestalt Time (Seconds)	415.53	(186.46)	[A]	412.19	(206.49)	[A]	384.78	(169.49)	[A]	410.74	(169.59)	[A]	388.00	(143.94)	[A]	387.40	(138.52)	[A]	.27	
	Goodenough-Harris Draw-A-Man Test (49-151)	96.79	(13.78)	[A]	95.83	(12.31)	[A]	99.68	(17.56)	[A]	97.00	(11.69)	[A]	90.09	(10.67)	[A]	95.72	(12.39)	[A]	.87	
7	Spelling WRAT (0-55)	22.73	(4.75)	[AB]	23.70	(3.81)	[A]	24.14	(6.08)	[A]	22.39	(4.28)	[AB]	21.00	(4.71)	[B]	21.32	(3.57)	[B]	1.84	.936 F(15,1322)= 2.13[b]
	Reading WRAT (0-84)	31.73	(7.81)	[A]	31.84	(6.79)	[A]	30.25	(6.03)	[AB]	30.91	(7.98)	[AB]	30.18	(7.55)	[AB]	27.36	(6.32)	[B]	1.82	
	Arithmetic WRAT (0-49)	20.19	(3.54)	[A]	20.62	(2.90)	[A]	19.43	(3.12)	[A]	19.43	(3.79)	[A]	20.36	(1.80)	[A]	19.16	(3.39)	[A]	1.13	
14-15	Total Reading CAT	31.98	(25.05)	[A]	30.72	(23.21)	[A]	32.39	(27.15)	[A]	24.17	(23.05)	[AB]	20.82	(19.52)	[AB]	14.60	(12.69)	[B]	3.09[b]	.951 F(20,1586)= 1.20
	Total Math CAT	24.01	(22.29)	[A]	22.78	(20.76)	[A]	22.32	(24.79)	[A]	16.17	(18.08)	[A]	15.09	(15.81)	[A]	16.48	(18.45)	[A]	1.33	

TABLE B.2

	Total Language CAT	28.63 (24.24)	[A]	26.26 (21.37)	[AB]	27.07 (24.88)	[AB]	22.87 (20.71)	[AB]	20.09 (15.68)	[AB]	13.76 (16.48)	[B]	2.30[a]				
	Spelling CAT	28.69 (24.52)	[A]	26.50 (21.46)	[AB]	25.75 (23.34)	[AB]	19.74 (20.36)	[AB]	14.45 (15.29)	[B]	15.76 (20.65)	[B]	2.56[a]				
	Total Battery CAT	25.21 (23.17)	[A]	23.75 (20.99)	[AB]	24.39 (25.18)	[AB]	17.39 (18.94)	[AB]	14.18 (15.88)	[AB]	12.08 (15.40)	[B]	2.42[a]				
14-15	Vocabulary-CAT Reading	35.09 (27.34)	[A]	32.59 (24.38)	[A]	36.28 (27.04)	[A]	25.00 (22.21)	[AB]	23.45 (22.99)	[AB]	16.08 (13.01)	[B]	3.35[b]	.940 F(25,1773)= 1.19			
	Comprehension-CAT Reading	31.06 (24.08)	[A]	30.53 (23.73)	[A]	29.93 (27.50)	[AB]	25.13 (23.13)	[AB]	20.64 (16.57)	[AB]	16.04 (13.12)	[B]	2.40[a]				
	Mechanics-CAT Language	30.02 (24.98)	[A]	27.46 (22.79)	[AB]	27.93 (24.20)	[AB]	22.00 (20.37)	[AB]	19.54 (13.14)	[AB]	15.96 (17.98)	[B]	2.30[a]				
	Usage & Structure-CAT Lang.	30.68 (22.49)	[A]	30.53 (19.56)	[A]	30.46 (23.77)	[A]	33.04 (21.33)	[A]	27.18 (16.64)	[AB]	17.52 (13.86)	[B]	1.86				
	Spelling CAT	28.69 (24.52)	[A]	26.50 (21.46)	[AB]	25.75 (23.34)	[AB]	19.74 (20.36)	[AB]	14.45 (15.29)	[B]	15.76 (20.65)	[B]	2.56[a]				
	Computation-CAT Math	24.54 (22.38)	[A]	22.02 (20.29)	[A]	22.11 (24.12)	[A]	17.35 (18.39)	[A]	17.91 (15.49)	[A]	19.12 (19.06)	[A]	.94	.975 F(10,960)= 1.23			
	Concepts & Problems-CAT Math	25.98 (22.73)	[A]	26.20 (21.09)	[A]	25.03 (25.50)	[A]	18.35 (18.27)	[A]	14.82 (15.72)	[A]	16.88 (19.56)	[A]	1.70				

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan is significant at $p<.05$

N	NONOFFENDER	NONINDEX	THEFT	DAMAGE	MILDLY VIOLENT	VERY VIOLENT	TOTAL
4 years	282	54	23	16	10	20	405
7/14-15 years	336	64	28	23	11	25	487

TABLE B.3 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS BY FOUR OFFENDER CATEGORIES - MALES ONLY

AGE (YRS)	TESTS	NONOFFENDER MEAN	(SD)	[DN]	NONINDEX OFFENDER MEAN	(SD)	[DN]	NONINJURY OFFENDER MEAN	(SD)	[DN]	INJURY OFFENDER MEAN	(SD)	[DN]	F (3,401) (3,483)	WILKS' L
4	Stanford	89.91	(12.29)	[A]	91.39	(11.49)	[A]	91.59	(13.03)	[A]	87.90	(10.26)	[A]	.75	.993 F(6,800)=.48
	Graham	31.04	(8.93)	[A]	32.33	(8.05)	[A]	31.77	(7.77)	[A]	30.97	(8.24)	[A]	.76	
7	Verbal IQ	92.42	(11.35)	[AB]	94.70	(11.32)	[A]	93.09	(10.52)	[AB]	89.11	(8.97)	[B]	2.01	.976 F(6,964)=1.92
	Perf. IQ	94.27	(12.66)	[AB]	94.14	(12.83)	[AB]	97.84	(11.11)	[A]	91.03	(14.01)	[B]	2.14	
	Full Scale IQ	92.67	(11.22)	[AB]	93.89	(10.97)	[A]	94.86	(8.51)	[A]	89.03	(10.89)	[B]	2.27	
7	Information	9.14	(2.44)	[A]	9.55	(2.38)	[A]	9.09	(2.00)	[A]	9.03	(2.12)	[A]	.62	.970 F(12,1270)=1.22
	Comprehension	8.67	(2.41)	[A]	8.55	(2.75)	[A]	9.00	(2.49)	[A]	8.17	(2.25)	[A]	.86	
	Vocabulary	8.21	(2.49)	[A]	8.50	(2.28)	[A]	8.29	(2.00)	[A]	7.72	(1.95)	[A]	.83	
	Digit Span	9.10	(2.38)	[B]	9.97	(2.75)	[A]	9.12	(2.75)	[AB]	8.08	(2.79)	[B]	3.58[a]	
7	Block Design	9.12	(2.26)	[AB]	8.70	(2.28)	[B]	9.70	(2.12)	[A]	8.53	(2.41)	[B]	2.66[a]	.966 F(9,1170)=1.85
	Coding	9.49	(2.78)	[B]	9.73	(2.72)	[AB]	10.47	(2.95)	[A]	9.56	(3.16)	[AB]	1.81	
	Picture Arrangement	8.92	(2.81)	[A]	9.05	(2.67)	[A]	8.88	(2.41)	[A]	8.03	(2.51)	[A]	1.27	
7	Bender-Gestalt	7.72	(3.44)	[A]	7.48	(3.06)	[A]	8.45	(3.06)	[A]	8.83	(3.40)	[A]	2.00	.979 F(9,1170)=1.13
	B-G Time	415.53	(186.46)	[A]	412.19	(206.49)	[A]	396.49	(168.34)	[A]	387.58	(138.12)	[A]	.37	
	G-Harris	96.79	(13.78)	[A]	95.83	(12.31)	[A]	98.47	(15.12)	[A]	94.00	(12.03)	[A]	.85	

TABLE B.3

7	Spelling	22.73	(4.75)	[AB]	23.70	(3.81)	[A]	23.35	(5.37)	[A]	21.22	(3.88)	[B]	2.45	.956 F(9,1170)=2.42[a]
	Reading	31.73	(7.81)	[A]	31.84	(6.79)	[A]	30.55	(6.91)	[AB]	28.22	(6.74)	[B]	2.64[a]	
	Arithmetic	20.19	(3.54)	[A]	20.62	(2.90)	[A]	19.43	(3.40)	[A]	19.53	(3.02)	[A]	1.58	
14-15	Reading CAT	31.98	(25.05)	[A]	30.72	(23.21)	[A]	28.69	(25.47)	[A]	16.50	(15.09)	[B]	4.50[b]	.962 F(12,1270)=1.54
	Math CAT	24.01	(22.97)	[A]	22.78	(20.76)	[A]	19.55	(22.03)	[A]	16.05	(17.47)	[A]	1.88	
	Lang. CAT	28.63	(24.24)	[A]	26.26	(21.37)	[A]	25.18	(22.97)	[AB]	15.69	(16.29)	[B]	3.51[a]	
	Spelling CAT	28.69	(24.52)	[A]	26.50	(21.46)	[A]	23.04	(22.04)	[AB]	15.36	(18.96)	[B]	4.00[b]	
	Total Battery	25.21	(23.17)	[A]	23.75	(20.99)	[A]	21.23	(22.64)	[AB]	12.72	(15.35)	[B]	3.61[b]	
14-15	Vocabulary	35.09	(27.34)	[A]	32.59	(24.38)	[A]	31.19	(25.38)	[A]	18.33	(16.91)	[B]	4.58[b]	.958 F(15,1322)=1.37
	Comprehen.	31.06	(24.08)	[A]	30.53	(23.73)	[A]	27.76	(25.49)	[A]	17.44	(14.18)	[B]	3.74[a]	
	Mechanics	30.02	(24.98)	[A]	27.47	(22.79)	[AB]	25.25	(22.53)	[AB]	17.05	(16.55)	[B]	3.53[a]	
	Usage & Str.	30.68	(22.49)	[A]	30.53	(19.56)	[A]	31.63	(22.47)	[A]	20.47	(15.21)	[B]	2.54	
	Spelling	28.69	(24.52)	[A]	26.50	(21.46)	[A]	23.04	(22.04)	[AB]	15.36	(18.96)	[B]	4.00[b]	
14-15	Computation	24.54	(22.38)	[A]	22.01	(20.29)	[A]	19.96	(21.65)	[A]	18.75	(17.84)	[A]	1.36	.977 F(6,964)=1.85
	Concepts and Problems	25.98	(22.73)	[A]	26.20	(21.09)	[A]	22.02	(22.57)	[A]	16.25	(18.27)	[A]	2.44	

	N				
4 years	282	54	39	30	Total=405
7/14-15 years	336	64	51	36	Total=487

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan significant at $p<.05$

TABLE B.4 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS BY SIX OFFENDER CATEGORIES - FEMALES ONLY

AGE (YRS)	TESTS (TEST RANGE)	NONOFFENDER MEAN	(SD)	[DN]	NONINDEX OFFENDER MEAN	(SD)	[DN]	THEFT OFFENDER MEAN	(SD)	[DN]	DAMAGE OFFENDER MEAN	(SD)	[DN]	MILDLY VIOLENT OFFENDER MEAN	(SD)	[DN]	VERY VIOLENT OFFENDER MEAN	(SD)	[DN]	F (5,387) (5,494)	WILKS' L
4	Stanford-Binet Intelligence Scale (25-175)	92.12	(13.74)	[A]	89.46	(11.97)	[A]	91.50	(13.23)	[A]	86.00	-	[A]	87.00	-	[A]	97.00	(1.40)	[A]	.31	.991 F(10,772)= .33
	Graham-Ernhart Block Sort Test (0-45)	33.56	(8.08)	[A]	33.46	(7.34)	[A]	32.31	(10.66)	[A]	37.00	-	[A]	39.00	-	[A]	34.50	(.71)	[A]	.21	
7	Verbal IQ WISC (45-155)	91.48	(11.77)	[A]	90.00	(10.33)	[A]	91.00	(9.15)	[A]	94.00	(5.00)	[A]	77.50	(4.95)	[A]	86.83	(6.58)	[A]	.90	.971 F(10,986)= 1.45
	Performance IQ WISC (44-156)	94.92	(12.08)	[A]	89.73	(11.15)	[A]	91.71	(9.45)	[A]	99.67	(3.51)	[A]	93.50	(4.95)	[A]	86.50	(13.13)	[A]	2.10	
	Full Scale IQ WISC (25-154)	92.45	(11.32)	[A]	89.00	(10.01)	[A]	90.58	(7.93)	[A]	96.00	(2.64)	[A]	84.00	(5.66)	[A]	85.33	(9.33)	[A]	1.45	
7	Information-WISC Verbal (0-20)	9.14	(2.44)	[A]	8.92	(2.45)	[A]	9.00	(2.45)	[A]	8.67	(2.52)	[A]	6.50	(3.53)	[A]	8.50	(1.22)	[A]	.62	.974 F(20,1629)= .64
	Comprehension-WISC Verbal (0-20)	8.15	(2.33)	[A]	8.00	(2.45)	[A]	8.04	(2.25)	[A]	8.67	(3.21)	[A]	6.50	(.71)	[A]	8.33	(2.50)	[A]	.27	
	Vocabulary-WISC Verbal (0-20)	7.60	(2.36)	[A]	7.68	(1.51)	[A]	7.87	(2.23)	[A]	9.33	(2.31)	[A]	6.50	(.71)	[A]	6.50	(1.52)	[A]	.78	
	Digit Span-WISC Verbal (0-20)	9.60	(3.07)	[A]	9.00	(3.23)	[A]	9.29	(2.76)	[A]	9.33	(1.53)	[A]	6.00	-	[A]	8.17	(1.94)	[A]	1.06	

TABLE C.4

7	Block Design-WISC Performance (0-20)	8.78	(2.08)	[A]	8.50	(2.27)	[A]	8.67	(1.83)	[A]	9.67	(1.15)	[A]	7.50	(2.12)	[A]	6.50	(2.59)	[A]	1.77	.960 F(15,1358)= 1.34
	Coding-WISC Performance (0-20)	10.64	(2.83)	[A]	9.79	(2.66)	[A]	9.87	(2.40)	[A]	11.67	(1.53)	[A]	11.00	(1.41)	[A]	9.17	(2.64)	[A]	1.28	
	Picture Arrangement-WISC Performance (0-20)	8.39	(2.62)	[A]	7.32	(2.58)	[A]	7.91	(2.39)	[A]	8.33	(.58)	[A]	9.00	(1.41)	[A]	8.50	(1.87)	[A]	1.22	
7	Bender-Gestalt (0-30)	8.71	(3.60)	[AB]	9.21	(3.37)	[AB]	7.54	(3.32)	[B]	9.33	(.58)	[AB]	13.50	(.71)	[A]	8.33	(4.37)	[AB]	.22	.955 F(15,1358)= 1.53
	Bender-Gestalt Time (Seconds)	393.80	(158.86)	[A]	471.85	(339.92)	[A]	403.87	(147.54)	[A]	237.33	(23.46)	[A]	408.00	(56.57)	[A]	504.00	(124.24)	[A]	2.18	
	Goodenough-Harris Draw-A-Man Test (49-151)	92.45	(11.32)	[A]	89.00	(10.01)	[A]	90.58	(7.93)	[A]	96.00	(2.64)	[A]	84.00	(5.66)	[A]	85.33	(9.33)	[A]	1.45	
7	Spelling WRAT (0-55)	23.67	(4.69)	[A]	21.44	(4.29)	[A]	23.75	(4.68)	[A]	24.67	(3.51)	[A]	21.50	(.71)	[A]	21.67	(2.34)	[A]	1.78	.966 F(15,1358)= 1.13
	Reading WRAT (0-84)	32.90	(8.39)	[A]	29.26	(6.75)	[A]	33.92	(9.13)	[A]	33.33	(3.21)	[A]	31.00	(2.83)	[A]	31.67	(4.97)	[A]	1.36	
	Arithmetic WRAT (0-49)	20.48	(3.28)	[A]	19.56	(3.11)	[A]	21.00	(2.50)	[A]	20.33	(2.52)	[A]	16.50	(.71)	[A]	20.83	(1.94)	[A]	.29	
14-15	Total Reading CAT	34.99	(26.16)	[A]	19.97	(17.00)	[a]	30.92	(25.15)	[AB]	10.00	(6.24)	[B]	10.50	(3.53)	[B]	20.00	(17.83)	[AB]	3.44[b]	.946 F(20,1629)= 1.36
	Total Math CAT	28.37	(22.96)	[A]	17.97	(18.70)	[B]	22.04	(18.17)	[AB]	8.00	(4.36)	[B]	11.00	(7.07)	[B]	10.00	(6.78)	[B]	3.01[a]	

TABLE 6.4

	Total Language CAT	38.41	(25.97)	[A]	25.26	(17.25)	[B]	33.08	(24.79)	[AB]	23.00	(31.19)	[B]	23.50	(2.12)	[B]	13.00	(7.87)	[B]	3.22[b]	
	Spelling CAT	41.12	(28.22)	[A]	25.00	(22.82)	[B]	38.42	(27.92)	[AB]	17.00	(14.18)	[B]	28.50	(17.68)	[AB]	19.00	(16.54)	[B]	3.27[b]	
	Total Battery CAT	32.33	(25.25)	[A]	18.41	(17.52)	[B]	27.29	(22.70)	[AB]	10.00	(12.12)	[B]	12.50	(3.53)	[B]	10.33	(8.73)	[B]	3.66[b]	
14-15	Vocabulary-CAT Reading	37.87	(29.45)	[A]	19.71	(15.16)	[B]	32.87	(28.31)	[AB]	15.33	(11.15)	[B]	13.00	(1.41)	[B]	23.67	(28.11)	[AB]	3.44[b]	.939 F(25,1821)= 1.24
	Comprehension-CAT Reading	34.47	(24.51)	[A]	22.00	(18.90)	[B]	30.96	(21.23)	[AB]	7.67	(3.78)	[B]	12.50	(7.78)	[B]	19.17	(10.74)	[B]	3.18[b]	
	Mechanics-CAT Language	40.73	(27.16)	[A]	26.71	(17.75)	[B]	33.92	(25.59)	[AB]	24.67	(29.77)	[B]	21.50	(4.95)	[B]	15.50	(10.11)	[B]	3.32[b]	
	Usage & Structure-CAT Lang.	36.00	(23.48)	[A]	28.15	(17.62)	[A]	35.46	(22.77)	[A]	27.33	(30.29)	[A]	31.00	(9.89)	[A]	18.17	(10.61)	[A]	1.48	
	Spelling CAT	41.12	(28.22)	[A]	25.00	(22.82)	[B]	38.42	(27.92)	[AB]	17.00	(14.18)	[B]	28.50	(17.68)	[AB]	19.00	(16.54)	[B]	3.27[b]	
	Computation-CAT Math	29.82	(23.74)	[A]	19.12	(19.85)	[B]	23.75	(18.84)	[AB]	11.00	(7.55)	[B]	17.50	(13.43)	[B]	11.00	(8.12)	[B]	2.72[a]	
	Concepts & Problems-CAT Math	28.97	(22.36)	[A]	19.59	(19.16)	[B]	22.58	(18.14)	[AB]	8.00	(5.29)	[B]	9.00	(2.83)	[B]	11.50	(4.37)	[B]	2.94[a]	

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan is significant at $p<.05$

N	NONOFFENDER	NONINDEX	THEFT	DAMAGE	MILDLY VIOLENT	VERY VIOLENT	TOTAL
4 years	347	26	16	1	1	2	393
7/14-15 years	431	34	24	3	2	6	500

TABLE B.5 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS BY FOUR OFFENSE CATEGORIES - FEMALES ONLY

AGE (YRS)	TESTS	NONOFFENDER MEAN	(SD)	[DN]	NONINDEX OFFENDER MEAN	(SD)	[DN]	NONINJURY OFFENDER MEAN	(SD)	[DN]	INJURY OFFENDER MEAN	(SD)	[DN]	F (3,389) (3,496)	WILKS' L
4	Stanford	92.12	(13.74)	[A]	89.46	(11.97)	[A]	91.18	(12.88)	[A]	93.67	(5.86)	[A]	.34	.996
	Graham	33.56	(8.08)	[A]	33.46	(7.34)	[A]	32.59	(10.39)	[A]	36.00	(2.64)	[A]	.17	F(6,776)=.26
7	Verbal IQ	91.48	(11.77)	[A]	90.00	(10.33)	[A]	91.33	(8.77)	[A]	84.50	(7.29)	[A]	1.11	.979
	Perf. IQ	94.92	(12.08)	[A]	89.73	(11.15)	[B]	92.59	(9.30)	[AB]	88.25	(11.71)	[B]	2.93[a]	F(6,990)=1.74
	Full Scale IQ	92.45	(11.32)	[A]	89.00	(10.01)	[A]	91.18	(7.69)	[A]	85.00	(8.91)	[A]	2.20	
7	Information	9.14	(2.44)	[A]	8.91	(2.45)	[A]	8.96	(2.41)	[A]	8.00	(1.93)	[A]	.69	.983
	Comprehen-sion	8.15	(2.33)	[A]	8.00	(2.45)	[A]	8.11	(2.31)	[A]	7.87	(2.29)	[A]	.08	F(12,1304)=.69
	Vocabulary	7.60	(2.36)	[A]	7.68	(1.51)	[A]	8.04	(2.24)	[A]	6.50	(1.31)	[A]	.94	
	Digit Span	9.60	(3.07)	[A]	9.00	(3.23)	[A]	9.29	(2.63)	[A]	7.62	(1.92)	[A]	1.51	
7	Block Design	8.78	(2.08)	[A]	8.50	(2.27)	[A]	8.78	(1.78)	[A]	6.75	(2.37)	[B]	2.63[a]	.965
	Coding	10.64	(2.83)	[A]	9.79	(2.66)	[A]	10.07	(2.37)	[A]	9.62	(2.44)	[A]	1.55	F(9,1202)=1.97[a]
	Picture Arrangement	8.39	(2.62)	[A]	7.32	(2.58)	[A]	7.96	(2.26)	[A]	8.62	(1.68)	[A]	2.00	
7	Bender-Gestalt	8.71	(3.60)	[A]	9.20	(3.37)	[A]	7.74	(3.18)	[A]	9.62	(4.40)	[A]	1.05	.971
	B-G Time	393.80	(158.86)	[A]	471.85	(339.92)	[A]	385.37	(148.81)	[A]	480.00	(116.01)	[A]	2.69[a]	F(9,1202)=1.65
	G-Harris	93.85	(11.79)	[A]	89.73	(9.74)	[A]	95.78	(13.68)	[A]	95.00	(5.95)	[A]	1.64	

TABLE B.5

7	Spelling	23.67	(4.69)	[A]	21.44	(4.29)	[B]	23.85	(4.52)	[A]	21.62	(1.99) [A]	2.93[a]	.978 F(9,1202)=1.22
	Reading	32.90	(8.39)	[A]	29.26	(6.75)	[A]	33.85	(8.63)	[A]	31.50	(4.34) [A]	2.28	
	Arithmetic	20.48	(3.28)	[A]	19.56	(3.11)	[A]	20.92	(2.46)	[A]	19.75	(2.60) [A]	1.20	
14-15	Reading CAT	34.99	(26.16)	[A]	19.97	(17.00)	[B]	28.59	(24.64)	[AB]	17.62	(15.76) [B]	5.06[b]	.958 F(12,1304)=1.77[a]
	Math CAT	28.37	(22.96)	[A]	17.97	(18.70)	[B]	20.48	(17.71)	[AB]	10.25	(6.34) [B]	4.67[b]	
	Lang. CAT	38.41	(25.97)	[A]	25.26	(17.25)	[B]	31.96	(25.08)	[AB]	15.62	(8.28) [B]	5.15[b]	
	Spell. CAT	41.12	(28.22)	[A]	25.00	(22.82)	[B]	36.04	(27.42)	[AB]	21.37	(16.11) [B]	4.87[b]	
	Total Battery	32.33	(25.25)	[A]	18.41	(17.52)	[B]	25.37	(22.31)	[AB]	10.87	(7.57) [B]	5.66[c]	
14-15	Vocabulary	37.87	(29.45)	[A]	19.70	(15.16)	[B]	30.92	(27.39)	[AB]	21.00	(24.27) [AB]	5.33[b]	.953 F(15,1358)=1.58
	Comprehen.	34.47	(24.51)	[A]	22.00	(18.90)	[B]	28.37	(21.34)	[AB]	17.50	(10.03) [B]	4.42[b]	
	Mechanics	40.73	(27.16)	[A]	26.70	(17.75)	[B]	32.89	(25.62)	[AB]	17.00	(9.18) [B]	5.41[b]	
	Usage & Str.	36.00	(23.48)	[A]	28.15	(17.62)	[A]	34.55	(23.15)	[A]	21.37	(11.39) [A]	2.21	
	Spelling	41.12	(28.22)	[A]	25.00	(22.82)	[B]	36.04	(27.42)	[AB]	21.37	(16.11) [B]	4.87[b]	
14-15	Computation	29.82	(23.74)	[A]	19.12	(19.85)	[B]	22.33	(18.30)	[AB]	12.62	(9.05) [B]	4.24[b]	.971 F(6,990)=2.43[a]
	Concepts and Problems	28.97	(22.36)	[A]	19.59	(19.16)	[B]	20.96	(17.75)	[AB]	10.87	(4.01) [B]	4.51[b]	

	N				
4 years	347	26	17	3	Total=393
7/14-15 years	431	34	27	8	Total=500

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan significant at $p<.05$

TABLE B.6 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS FOR MULTIPLE OFFENDERS - MALES ONLY

AGE (YRS)	TESTS	NONOFFENDER MEAN	(SD)	[DN]	ONE TIME OFFENDER MEAN	(SD)	[DN]	>TWO TIME OFFENDER MEAN	(SD)	[DN]	F (3,481) (3,484)	WILKS' L
4	Stanford	89.91	(12.29)	[A]	91.62	(10.77)	[A]	89.69	(12.54)	[A]	.53	.996 F(4,802)=.39
	Graham	31.04	(8.93)	[A]	31.93	(8.13)	[A]	31.72	(7.87)	[A]	.35	
7	Verbal IQ	92.42	(11.35)	[AB]	95.10	(10.85)	[A]	90.91	(10.24)	[B]	2.73	.989 F(4,966)=1.37
	Perf. IQ	94.27	(12.66)	[A]	95.54	(11.67)	[A]	93.90	(13.64)	[A]	.36	
	Full Scale IQ	92.67	(11.21)	[A]	94.84	(9.74)	[A]	91.56	(10.71)	[A]	1.75	
7	Information	9.14	(2.44)	[A]	9.55	(2.31)	[A]	9.04	(2.08)	[A]	1.05	.987 F(8,962)=.78
	Comprehension	8.67	(2.41)	[A]	8.91	(2.40)	[A]	8.35	(2.66)	[A]	1.01	
	Vocabulary	8.21	(2.49)	[A]	8.56	(2.32)	[A]	7.97	(1.91)	[A]	1.16	
	Digit Span	9.10	(2.83)	[A]	9.74	(2.66)	[A]	8.80	(2.93)	[A]	2.16	
7	Block Design	9.12	(2.56)	[A]	8.99	(2.41)	[A]	9.04	(2.21)	[A]	.18	.984 F(6,964)=1.29
	Coding	9.49	(2.78)	[A]	9.96	(2.62)	[A]	9.93	(3.16)	[A]	1.30	
	Picture Arrangement	8.92	(2.81)	[A]	9.17	(2.55)	[A]	8.39	(2.54)	[A]	1.75	
7	Bender-Gestalt	7.72	(3.44)	[A]	7.67	(3.26)	[A]	8.52	(3.06)	[A]	2.01	.983 F(6,964)=1.37
	B-G Time	415.53	(186.46)	[A]	369.67	(122.32)	[A]	427.40	(212.10)	[A]	2.18	
	G-Harris	96.79	(13.78)	[A]	96.79	(15.06)	[A]	95.85	(11.67)	[A]	.16	

TABLE B.6

7	Spelling	22.73	(4.75)	[B]	23.96	(5.21)	[A]	22.18	(3.63)	[B]	2.89	.967 F(6,964)=2.69[a]
	Reading	31.73	(7.81)	[A]	31.88	(7.35)	[A]	29.41	(6.36)	[A]	3.31[a]	
	Arithmetic	20.19	(3.54)	[A]	20.42	(3.28)	[A]	19.57	(2.98)	[A]	1.40	
14-15	Reading CAT	31.98	(25.05)	[A]	32.77	(23.69)	[A]	21.49	(21.20)	[B]	6.57[b]	.967 F(8,962)=2.04[a]
	Math CAT	24.01	(22.29)	[A]	24.46	(21.77)	[A]	16.40	(18.74)	[B]	4.30[a]	
	Language CAT	28.63	(24.24)	[A]	29.22	(21.94)	[A]	18.46	(19.31)	[B]	6.71[b]	
	Spelling CAT	28.69	(24.52)	[A]	26.84	(22.19)	[A]	19.17	(19.92)	[B]	5.40[b]	
	Total Battery	25.21	(23.17)	[A]	25.71	(21.34)	[A]	15.69	(19.18)	[B]	6.33[b]	
14-15	Vocabulary	35.09	(27.34)	[A]	34.68	(24.78)	[A]	23.71	(21.81)	[B]	6.40[b]	.959 F(10,960)=2.10[a]
	Comprehension	31.06	(24.08)	[A]	32.65	(23.82)	[A]	21.28	(20.98)	[B]	6.34[b]	
	Mechanics	30.02	(24.98)	[A]	30.40	(23.54)	[A]	19.05	(18.52)	[B]	7.34[c]	
	Usage & Str.	30.68	(22.49)	[A]	32.58	(19.59)	[A]	25.07	(19.97)	[B]	2.77	
	Spelling	28.69	(24.51)	[A]	26.84	(22.49)	[A]	19.17	(19.92)	[B]	5.40[b]	
14-15	Computation	24.54	(22.38)	[A]	23.35	(21.26)	[AB]	18.18	(18.94)	[B]	2.83	.973 F(4,966)=3.28[a]
	Concepts and Problems	27.91	(22.73)	[A]	25.98	(22.39)	[A]	17.79	(19.09)	[B]	5.27[b]	

N			
4 years	282	58	65 Total=405
7/14-15 years	336	69	82 Total=487

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan significant at $p<.05$

TABLE B.7 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS FOR MULTIPLE AND CHRONIC OFFENDERS - MALES ONLY

AGE (YRS)	TESTS	NONOFFENDER MEAN	(SD)	[DN]	ONE TIME OFFENDER MEAN	(SD)	[DN]	TWO-FOUR TIME OFFENDER MEAN	(SD)	[DN]	>FIVE TIME OFFENDER MEAN	(SD)	[DN]	F (3,401) (3,483)	WILKS' L
4	Stanford	8.91	(12.29)	[A]	91.62	(10.77)	[A]	91.20	(13.05)	[A]	86.30	(10.87)	[A]	1.11	.987 F(6,800)=.85
	Graham	31.04	(8.93)	[A]	31.93	(8.13)	[A]	31.36	(7.71)	[A]	32.55	(8.36)	[A]	.32	
7	Verbal IQ	92.42	(11.35)	[AB]	95.10	(10.85)	[A]	92.58	(10.85)	[AB]	87.12	(7.62)	[B]	3.24[a]	.980 F(6,964)=1.63
	Perf. IQ	94.27	(12.66)	[A]	95.54	(11.67)	[A]	94.88	(13.75)	[A]	91.68	(13.40)	[A]	.60	
	Full Scale IQ	92.67	(11.22)	[AB]	94.84	(9.74)	[A]	93.05	(11.11)	[AB]	88.16	(9.03)	[B]	2.34	
7	Information	9.14	(2.44)	[A]	9.55	(2.31)	[A]	9.21	(2.18)	[A]	8.64	(1.82)	[A]	1.04	.973 F(12,1270)= 1.08
	Comprehension	8.67	(2.41)	[A]	8.91	(2.40)	[A]	8.47	(2.74)	[A]	8.08	(2.51)	[A]	.82	
	Vocabulary	8.21	(2.49)	[A]	8.56	(2.32)	[A]	8.35	(2.00)	[A]	7.12	(1.36)	[B]	2.34	
	Digit Span	9.10	(2.83)	[AB]	9.74	(2.66)	[A]	9.23	(2.87)	[AB]	7.84	(2.89)	[B]	2.86[a]	
7	Block Design	9.12	(2.26)	[A]	8.96	(2.41)	[A]	9.19	(2.25)	[A]	8.68	(2.13)	[A]	.41	.981 F(9,1170)= 1.01
	Coding	9.49	(2.78)	[A]	9.96	(2.62)	[A]	10.00	(3.18)	[A]	9.76	(3.16)	[A]	.91	
	Picture Arrangement	8.92	(2.81)	[A]	9.17	(2.55)	[A]	8.58	(2.47)	[A]	7.96	(2.70)	[A]	1.47	
7	Bender-Gestalt	7.72	(3.44)	[A]	7.67	(3.26)	[A]	8.54	(3.01)	[A]	8.48	(3.25)	[A]	1.34	.981 F(9,1170)= 1.02
	B-G Time	415.53	(186.46)	[A]	369.67	(122.32)	[A]	422.49	(227.29)	[A]	438.60	(176.37)	[A]	1.49	
	G-Harris	96.79	(13.78)	[A]	96.79	(15.06)	[A]	96.70	(11.28)	[A]	93.92	(12.52)	[A]	.35	

TABLE B.7

7	Spelling	22.73	(4.75)	[B]	23.96	(5.21)	[A]	22.59	(3.75)	[B]	21.24	(3.22)	[B]	2.42	.961
	Reading	31.73	(7.81)	[A]	31.88	(7.35)	[A]	30.02	(6.23)	[AB]	28.04	(6.59)	[B]	2.61	F(9,1170)= 2.16[a]
	Arithmetic	20.19	(3.54)	[A]	20.42	(3.28)	[A]	20.02	(2.88)	[AB]	18.56	(3.01)	[B]	2.00	
14-15	Reading CAT	31.98	(25.05)	[A]	32.77	(23.69)	[A]	23.81	(23.33)	[AB]	16.20	(14.33)	[B]	4.96[b]	.956
	Math CAT	24.01	(22.29)	[A]	24.46	(21.79)	[A]	16.58	(20.23)	[A]	16.00	(15.15)	[B]	2.86[a]	F(12,1270)= 1.80[a]
	Language CAT	28.63	(24.24)	[A]	29.22	(21.94)	[A]	20.82	(21.23)	[AB]	13.08	(12.77)	[B]	5.13[b]	
	Spelling CAT	28.69	(24.52)	[A]	26.84	(22.49)	[AB]	20.31	(19.59)	[B]	16.56	(20.81)	[B]	3.74[a]	
	Total Battery	25.21	(23.17)	[A]	25.71	(21.34)	[A]	17.29	(21.21)	[B]	12.04	(13.12)	[B]	4.54[b]	
14-15	Vocabulary	35.09	(27.34)	[A]	34.68	(24.78)	[A]	25.00	(22.84)	[B]	20.76	(19.39)	[B]	4.41[b]	.952
	Comprehension	31.06	(24.08)	[A]	32.65	(23.82)	[A]	23.77	(23.09)	[B]	15.60	(13.87)	[B]	4.93[b]	F(15,1322)= 1.59
	Mechanics	30.02	(24.98)	[A]	30.40	(23.54)	[A]	21.74	(20.41)	[AB]	12.92	(11.37)	[B]	5.70[c]	
	Usage & Str.	30.68	(22.49)	[A]	32.58	(19.59)	[A]	26.23	(21.75)	[A]	22.44	(15.23)	[A]	2.02	
	Spelling	28.69	(24.52)	[A]	26.84	(22.49)	[AB]	20.31	(19.59)	[B]	16.56	(20.81)	[B]	3.74[a]	
14-15	Computation	24.54	(22.38)	[A]	23.35	(21.26)	[AB]	17.33	(19.48)	[B]	20.12	(17.87)	[AB]	1.98	.964
	Concepts & Problems	25.98	(22.73)	[A]	27.91	(22.39)	[A]	19.14	(20.96)	[B]	14.72	(13.82)	[B]	3.74[a]	F(6,964)= 3.00[b]

N				
4 years	282	58	45	20 Total=405
7/14-15 years	336	69	57	25 Total=487

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan significant at $p<.05$

TABLE B.8 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS FOR MULTIPLE OFFENDERS - FEMALES ONLY

AGE (YRS)	TESTS	NONOFFENDER MEAN	(SD)	[DN]	ONE TIME OFFENDER MEAN	(SD)	[DN]	>TWO TIME OFFENDER MEAN	(SD)	[DN]	F (3,289) (3,496)	WILKS' L
4	Stanford	92.12	(13.74)	[A]	91.28	(12.04)	[A]	87.45	(11.49)	[A]	.67	.996 F(4,778)=.35
	Graham	33.56	(8.08)	[A]	33.66	(7.75)	[A]	32.18	(10.29)	[A]	.16	
7	Verbal IQ	91.48	(11.77)	[A]	91.69	(10.19)	[A]	86.50	(7.21)	[A]	2.18	.978 F(4,992)=2.78[a]
	Perf. IQ	94.92	(12.08)	[A]	91.09	(10.01)	[B]	89.92	(11.52)	[B]	3.58[a]	
	Full Scale IQ	92.45	(11.31)	[A]	90.67	(8.74)	[AB]	87.00	(9.29)	[B]	3.15[a]	
7	Information	9.14	(2.44)	[A]	8.93	(2.72)	[A]	8.62	(1.55)	[A]	.63	.981 F(8,988)=1.21
	Comprehension	8.15	(2.33)	[A]	8.40	(2.30)	[A]	7.33	(2.31)	[A]	1.74	
	Vocabulary	7.60	(2.36)	[A]	7.95	(1.68)	[A]	7.17	(2.08)	[A]	.96	
	Digit Span	9.00	(3.07)	[A]	9.35	(3.02)	[AB]	8.21	(2.52)	[B]	2.45	
7	Block Design	8.78	(2.08)	[A]	8.60	(2.06)	[A]	8.04	(2.35)	[A]	1.51	.981 F(6,990)=1.55
	Coding	10.64	(2.83)	[A]	9.95	(2.28)	[A]	9.75	(2.89)	[A]	2.25	
	Picture Arrangement	8.39	(2.62)	[A]	7.64	(2.49)	[A]	7.87	(2.19)	[A]	2.05	
7	Bender-Gestalt	8.71	(3.60)	[A]	8.20	(3.53)	[A]	9.58	(3.20)	[A]	1.17	.985 F(6,990)=1.23
	B-G Time	393.80	(158.86)	[A]	428.29	(296.78)	[A]	458.95	(177.01)	[A]	2.19	
	G-Harris	93.85	(11.79)	[A]	93.60	(10.92)	[A]	91.04	(12.33)	[A]	.65	

TABLE B.8

7	Spelling	23.67	(4.69)	[A]	23.20	(4.28)	[AB]	20.92	(4.01)	[B]	4.14[a]	.976 F(6,990)=1.99
	Reading	32.90	(8.39)	[A]	31.80	(8.27)	[A]	30.42	(6.08)	[A]	1.30	
	Arithmetic	20.48	(3.28)	[A]	20.35	(3.08)	[A]	19.67	(2.35)	[A]	.74	
14-15	Reading CAT	34.99	(26.16)	[A]	25.44	(21.80)	[B]	18.62	(17.22)	[B]	7.08[c]	.966 F(8,988)=2.12[a]
	Math CAT	28.37	(22.96)	[A]	19.15	(18.73)	[B]	16.00	(14.79)	[B]	6.52[b]	
	Language CAT	38.41	(25.97)	[A]	29.22	(21.63)	[B]	22.17	(17.57)	[B]	6.91[b]	
	Spelling CAT	41.12	(28.22)	[A]	31.67	(25.89)	[B]	23.71	(21.29)	[B]	6.42[b]	
	Total Battery	32.22	(25.25)	[A]	22.67	(20.81)	[B]	15.75	(15.04)	[B]	7.84[c]	
14-15	Vocabulary	37.87	(29.45)	[A]	25.69	(22.98)	[B]	21.54	(20.53)	[B]	6.93[b]	.956 F(10,986)=2.22[b]
	Comprehension	34.47	(24.51)	[A]	26.76	(21.09)	[B]	18.75	(14.37)	[B]	6.65[b]	
	Mechanics	40.73	(27.16)	[A]	31.11	(22.28)	[B]	22.17	(16.97)	[B]	7.83[c]	
	Usage & Str.	36.00	(23.48)	[A]	30.04	(20.09)	[A]	29.54	(19.35)	[A]	2.12	
	Spelling	41.12	(28.22)	[A]	31.67	(25.89)	[B]	23.71	(21.29)	[B]	6.42[b]	
14-15	Computation	29.82	(23.74)	[A]	21.04	(20.00)	[B]	16.96	(14.63)	[B]	6.04[b]	.973 F(4,992)=3.40[b]
	Concepts and Problems	28.97	(22.36)	[A]	19.73	(17.75)	[B]	17.96	(17.61)	[B]	6.14[b]	

N				
4 years	347	35	11	Total=393
7/14-15 years	431	45	24	Total=500

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan significant at $p<.05$

TABLE B.9 ONE-WAY MANOVAS ON TEST SCORES AT 4, 7, AND 14-15 YEARS FOR MULTIPLE AND CHRONIC OFFENDERS - FEMALES ONLY

AGE (YRS)	TESTS	NONOFFENDER MEAN	(SD)	[DN]	ONE TIME OFFENDER MEAN	(SD)	[DN]	TWO-FOUR TIME OFFENDER MEAN	(SD)	[DN]	>FIVE TIME OFFENDER MEAN	(SD)	[DN]	F (3,389) (3,496)	WILKS' L
4	Stanford	92.12	(13.74)	[A]	91.28	(12.04)	[A]	87.78	(12.47)	[A]	86.00	(8.48)	[A]	.46	.995 F(6,776)=.32
	Graham	33.56	(8.08)	[A]	33.66	(7.75)	[A]	31.56	(10.85)	[A]	35.00	(9.89)	[A]	.20	
7	Verbal IQ	91.48	(11.77)	[A]	91.69	(10.19)	[A]	86.59	(7.66)	[A]	86.28	(6.52)	[A]	1.45	.973 F(6,990)=2.25[a]
	Perf. IQ	94.92	(12.08)	[A]	91.09	(10.01)	[AB]	92.06	(9.48)	[AB]	84.71	(14.98)	[B]	3.21[a]	
	Full Scale IQ	92.45	(11.32)	[A]	90.6[illegible]	(8.74)	[A]	88.18	(8.57)	[A]	8.14	(11.04)	[A]	2.32	
7	Information	9.14	(2.44)	[A]	8.93	(2.72)	[A]	8.41	(1.66)	[A]	9.14	(1.21)	[A]	.57	.978 F(12,1304)=.93
	Comprehension	8.15	(2.33)	[A]	8.40	(2.30)	[A]	7.35	(2.55)	[A]	7.28	(1.79)	[A]	1.16	
	Vocabulary	7.60	(2.36)	[A]	7.95	(1.68)	[A]	7.12	(2.34)	[A]	7.28	(1.38)	[A]	.65	
	Digit Span	9.60	(3.07)	[A]	9.35	(3.02)	[A]	8.47	(2.37)	[A]	7.57	(2.93)	[A]	1.78	
7	Block Design	8.78	(2.08)	[A]	8.60	(2.06)	[A]	8.41	(1.87)	[A]	7.14	(3.24)	[A]	1.62	.976 F(9,1202)=1.32
	Coding	10.64	(2.83)	[A]	9.95	(2.28)	[A]	10.12	(2.62)	[A]	8.86	(3.53)	[A]	1.84	
	Picture Arrangement	8.39	(2.62)	[A]	7.64	(2.49)	[A]	8.12	(2.45)	[A]	7.28	(1.38)	[A]	1.53	
7	Bender-Gestalt	8.71	(3.60)	[A]	8.20	(3.53)	[A]	9.29	(3.40)	[A]	10.28	(2.75)	[A]	.91	.979 F(9,1202)=1.18
	B-G Time	393.80	(158.86)	[A]	428.29	(296.78)	[A]	426.47	(167.83)	[A]	537.86	(186.38)	[A]	2.12	
	G-Harris	93.85	(11.79)	[A]	93.60	(10.92)	[A]	90.12	(12.00)	[A]	93.28	(13.78)	[A]	.55	

TABLE B.9

7	Spelling	23.67	(4.69)	[A]	23.20	(4.28)	[AB]	21.00	(3.81)	[B]	20.71	(4.78)	[B]	2.76[a]	.975
	Reading	32.90	(8.39)	[A]	31.80	(8.27)	[A]	30.47	(6.37)	[A]	30.28	(5.76)	[A]	.87	F(9,1202)=1.39
	Arithmetic	20.48	(3.28)	[A]	20.35	(3.08)	[A]	19.94	(2.41)	[A]	19.00	(2.24)	[A]	.63	
14-15	Reading CAT	34.99	(26.16)	[A]	25.44	(21.80)	[B]	20.41	(19.79)	[B]	14.28	(7.78)	[B]	4.81[b]	.963
	Math CAT	28.37	(22.96)	[A]	19.15	(18.73)	[B]	16.76	(15.77)	[B]	14.14	(13.02)	[B]	4.36[b]	F(12,1304)=1.57
	Language CAT	38.41	(25.97)	[A]	29.22	(21.63)	[B]	25.23	(18.97)	[B]	14.71	(11.47)	[B]	4.89[b]	
	Spelling CAT	41.12	(28.22)	[A]	31.67	(25.89)	[B]	27.53	(22.35)	[B]	14.43	(16.20)	[B]	4.65[b]	
	Total Battery	32.33	(25.25)	[A]	22.67	(20.81)	[B]	18.12	(16.66)	[B]	10.00	(8.46)	[B]	5.41[b]	
14-15	Vocabulary	37.87	(29.45)	[A]	25.69	(22.98)	[B]	23.82	(23.53)	[B]	16.00	(9.42)	[B]	4.73[b]	.953
	Comprehension	34.47	(24.51)	[A]	26.75	(21.09)	[B]	20.06	(16.46)	[B]	15.57	(7.28)	[B]	4.48[b]	F(15,1358)=1.58
	Mechanics	40.73	(27.16)	[A]	31.11	(22.28)	[B]	24.88	(18.83)	[B]	15.57	(9.32)	[B]	5.42[b]	
	Usage & Str.	36.00	(23.48)	[A]	30.04	(20.08)	[A]	32.12	(20.14)	[A]	23.28	(17.01)	[A]	1.65	
	Spelling	41.12	(28.22)	[A]	31.67	(25.89)	[B]	27.53	(22.35)	[B]	14.43	(16.20)	[B]	4.65[b]	
14-15	Computation	29.82	(23.74)	[A]	21.04	(20.06)	[B]	19.23	(16.42)	[B]	11.43	(7.16)	[B]	4.21[b]	.966
	Concepts & Problems	28.97	(22.36)	[A]	19.73	(17.75)	[B]	16.94	(16.07)	[B]	20.43	(22.16)	[AB]	4.13[b]	F(6,990)=2.88[b]

N				
4 years	347	35	9	2	Total=393
7/14-15 years	431	45	17	7	Total=500

[a] $p<.05$
[b] $p<.01$
[c] $p<.001$

Duncan significant at $p<.05$

APPENDIX C

TABLE C.1

PLACEMENT OF OFFENDERS AND NONOFFENDERS IN PROGRAMS FOR THE MENTALLY RETARDED, MALES AND FEMALES SEPARATELY

A. MALES

	NONOFFENDER	OFFENDER	TOTAL
NOT PLACED	319 (94.94%)	144 (95.36%)	463 (95.07%)
PLACED	17 (5.06%)	7 (4.64%)	24 (4.93%)
TOTAL	336 (100%)	151 (100%)	487 (100%)

B. FEMALES

	NONOFFENDER	OFFENDER	TOTAL
NOT PLACED	422 (97.91%)	67 (97.10%)	489 (97.80%)
PLACED	9 (2.09%)	2 (2.90%)	11 (2.20%)
TOTAL	431 (100%)	69 (100%)	500 (100%)

TABLE C.2

PLACEMENT OF MULTIPLE OFFENDERS IN PROGRAMS FOR THE MENTALLY RETARDED, MALES AND FEMALES SEPARATELY

A. MALES

	NONOFFENDER	ONE TIME OFFENDER	≥TWO TIME OFFENDER	TOTAL
NOT PLACED	319 (94.94%)	64 (92.75%)	80 (97.56%)	463 (95.07%)
PLACED	17 (5.06%)	5 (7.25%)	2 (2.44%)	24 (4.93%)
TOTAL	336 (100%)	69 (100%)	82 (100%)	487 (100%)

B. FEMALES

	NONOFFENDER	ONE TIME OFFENDER	≥TWO TIME OFFENDER	TOTAL
NOT PLACED	422 (97.91%)	44 (97.78%)	23 (95.83%)	489 (97.80%)
PLACED	9 (2.09%)	1 (2.22%)	1 (4.17%)	11 (2.20%)
TOTAL	431 (100%)	45 (100%)	24 (100%)	500 (100%)

TABLE C.3

NUMBER OF PLACEMENTS IN PROGRAMS FOR THE MENTALLY RETARDED FOR OFFENDERS AND NONOFFENDERS, MALES AND FEMALES SEPARATELY

	NUMBER OF PLACEMENTS			
	MALES		FEMALES	
	MEAN	(SD)	MEAN	(SD)
NONOFFENDER	.20	(1.23)	.06	(.56)
OFFENDER	.18	(1.04)	.20	(1.57)

TABLE C.4

NUMBER OF PLACEMENTS IN PROGRAMS FOR THE MENTALLY RETARDED FOR MULTIPLE OFFENDERS, MALES AND FEMALES SEPARATELY

	NUMBER OF PLACEMENTS					
	MALES			FEMALES		
	MEAN	(SD)	[DN]	MEAN	(SD)	[DN]
NONOFFENDER	.20	(1.23)	[A]	.06	(.56)	[A]
ONE TIME OFFENDER	.22	(.90)	[A]	.29	(1.94)	[A]
≥TWO TIME OFFENDERS	.16	(1.15)	[A]	.04	(.20)	[A]

TABLE C.5

NUMBER OF PLACEMENTS IN PROGRAMS FOR THE MENTALLY RETARDED FOR SIX OFFENDER CATEGORIES, MALES AND FEMALES SEPARATELY

	NUMBER OF PLACEMENTS					
	MALES			FEMALES		
	MEAN	(SD)	[DN]	MEAN	(SD)	[DN]
NONOFFENDER	.20	(1.23)	[A]	.06	(.56)	[B]
NONINDEX OFFENDER	.14	(.79)	[A]	.38	(2.23)	[A]
THEFT OFFENDER	.00	-	[A]	.00	-	[B]
DAMAGE OFFENDER	.39	(1.03)	[A]	.00	-	[B]
MILDLY VIOLENT OFFENDER	.00	-	[A]	.00	-	[B]
VERY VIOLENT OFFENDER	.40	(2.00)	[A]	.17	(.41)	[AB]

TABLE C.6

PLACEMENT OF OFFENDERS AND NONOFFENDERS IN PROGRAMS FOR THE REMEDIAL DISCIPLINED, MALES AND FEMALES SEPARATELY

A. MALES

	NONOFFENDER	OFFENDER	TOTAL
NOT PLACED	329 (97.92%)	134 (88.74%)	463 (95.07%)
PLACED	7 (2.08%)	17 (11.26%)	24 (4.93%)
TOTAL	336 (100%)	151 (100%)	487 (100%)

B. FEMALES

	NONOFFENDER	OFFENDER	TOTAL
NOT PLACED	430 (99.77%)	65 (94.20%)	495 (99.00%)
PLACED	1 (.23%)	4 (5.80%)	5 (1.00%)
TOTAL	431 (100%)	69 (100%)	500 (100%)

TABLE C.7

PLACEMENT OF MULTIPLE OFFENDERS IN PROGRAMS
FOR THE REMEDIAL DISCIPLINED, MALES AND FEMALES SEPARATELY

A. MALES

	NONOFFENDER	ONE TIME OFFENDER	≥TWO TIME OFFENDER	TOTAL
NOT PLACED	329 (97.92%)	67 (97.10%)	67 (81.71%)	463 (95.07%)
PLACED	7 (2.08%)	2 (2.90%)	15 (18.29%)	24 (4.93%)
TOTAL	336 (100%)	69 (100%)	82 (100%)	487 (100%)

B. FEMALES

	NONOFFENDER	ONE TIME OFFENDER	≥TWO TIME OFFENDER	TOTAL
NOT PLACED	430 (99.77%)	43 (95.56%)	22 (91.67%)	495 (99.00%)
PLACED	1 (.23%)	2 (4.44%)	2 (8.33%)	5 (1.00%)
TOTAL	431 (100%)	45 (100%)	24 (100%)	500 (100%)

TABLE C.8

NUMBER OF PLACEMENTS IN PROGRAMS FOR THE
REMEDIAL DISCIPLINED FOR OFFENDERS AND NONOFFENDERS,
MALES AND FEMALES SEPARATELY

	NUMBER OF PLACEMENTS			
	MALES		FEMALES	
	MEAN	(SD)	MEAN	(SD)
NONOFFENDERS	.06	(.45)	.002	(.05)
OFFENDERS	.40	(1.41)	.07	(.31)

TABLE C.9

NUMBER OF PLACEMENTS IN PROGRAMS FOR THE REMEDIAL DISCIPLINED FOR MULTIPLE OFFENDERS, MALES AND FEMALES SEPARATELY

	NUMBER OF PLACEMENTS					
	MALES			FEMALES		
	MEAN	(SD)	[DN]	MEAN	(SD)	[DN]
NONOFFENDER	.06	(.45)	[B]	.002	(.05)	[C]
ONE TIME OFFENDER	.07	(.49)	[B]	.04	(.21)	[B]
≥TWO TIME OFFENDER	.68	(1.81)	[A]	.12	(.45)	[A]

TABLE C.10

NUMBER OF PLACEMENTS IN PROGRAMS FOR THE REMEDIAL DISCIPLINED FOR SIX OFFENDER CATEGORIES, MALES AND FEMALES SEPARATELY

	NUMBER OF PLACEMENTS					
	MALES			FEMALES		
	MEAN	(SD)	[DN]	MEAN	(SD)	[DN]
NONOFFENDER	.06	(.45)	[B]	.002	(.05)	[B]
NONINDEX OFFENDER	.14	(.71)	[B]	.12	(.41)	[A]
THEFT OFFENDER	.68	(1.44)	[A]	.04	(.20)	[B]
DAMAGE OFFENDER	.65	(1.89)	[A]	.00	-	[B]
MILDLY VIOLENT OFFENDER	.09	(.30)	[B]	.00	-	[B]
VERY VIOLENT OFFENDER	.68	(2.23)	[A]	.00	-	[B]

APPENDIX D

TABLE D.1 MAXIMUM LIKELIHOOD ESTIMATES FOR THE FINAL UNSTANDARDIZED MEASUREMENT MODEL: ENDOGENOUS AND EXOGENOUS CONSTRUCTS - MALES AND FEMALES COMBINED

PARAMETER	λ_y	MALES ESTIMATE	MALES (S.E.)	FIXED ESTIMATE	FIXED (S.E.)	FEMALES ESTIMATE	FEMALES (S.E.)
WISC Information	(1,1)			3.652	(.224)		
Comprehension	(2,1)			2.368	(.238)		
Vocabulary	(3,1)			3.784	(.230)		
Digit Span	(4,1)			4.972	(.274)		
WRAT Spelling	(5,1)			1.000	-		
Reading	(6,1)			1.358	(.048)		
Arithmetic	(10,1)	.903	(.052)			.772	(.040)
WISC Block Design	(7,2)			.060	(.051)		
Coding	(8,2)			.493	(.062)		
Picture Arrangement	(9,2)			1.000	-		
Bender-Gestalt	(11,2)			1.223	(.086)		
Goodenough-Harris Drawing	(12,2)			3.273	(.292)		
CAT Vocabulary	(13,3)			1.110	(.036)		
Comprehension	(14,3)			1.046	(.030)		
Mechanics	(15,3)			1.131	(.033)		
Usage and Structure	(16,3)			.816	(.032)		
Spelling	(17,3)			1.074	(.036)		
Computation	(18,3)	.838	(.029)			.984	(.032)
Concepts and Problems	(19,3)			1.000	-		
Age at First Arrest	(20,4)	2.310	(.079)			3.047	(.127)
Age at First Offense	(21,4)	3.513	(.219)			4.106	(.249)
Total Number of Arrests	(22,4)			1.000	-		
Damage Offender	(23,4)	.339	(.023)			.164	(.016)
Injury Offender	(24,4)	.241	(.017)			.160	(.015)

SEX COMPARISON MODEL $\underline{X}^2(1104) = 1127.94$; $p = .3015$

TABLE D.1

PARAMETER	λ_x	MALES ESTIMATE	(S.E.)	FIXED ESTIMATE	(S.E.)	FEMALES ESTIMATE	(S.E.)
Mother's Age	(1,1)			1.000	-		
Birth Weight	(2,2)			1.000	-		
Income at Registration	(3,3)			1.000	-		
Blood Pressure, Systolic	(4,4)			.396	(.040)		
Blood Pressure, Diastolic	(5,4)			.224	(.030)		
Weight	(6,4)			1.000	-		
Height	(7,4)			.004	(.0003)		
Hand Preference	(8,5)			1.000	-		
Foot Preference	(9,5)			1.000	-		
Husband in Household	(10,6)			.036	(.004)		
Income at 7 Years	(11,6)			.041	(.005)		
Occupation	(12,6)			1.000	-		

TABLE D.1

PARAMETER		MALES ESTIMATE	(S.E.)	FIXED ESTIMATE	(S.E.)	FEMALES ESTIMATE	(S.E.)
θ_ε	(1,1)			3.976	(.195)		
	(2,1)			.548	(.154)		
	(3,1)			.702	(.136)		
	(6,1)	0	-			.054	(.037)
	(18,1)	.159	(.117)			0	-
	(19,1)	0	-			.252	(.091)
	(20,1)	.111	(.074)			0	-
	(2,2)			4.968	(.233)		
	(3,2)	1.127	(.210)			.650	(.186)
	(5,2)			-.074	(.025)		
	(6,2)			-.114	(.035)		
	(13,2)	.300	(.140)			0	-
	(15,2)	-.195	(.127)			0	-
	(18,2)	.262	(.130)			0	-
	(20,2)	-.091	(.082)			0	-
	(21,2)	.176	(.195)			0	-
	(23,2)	.048	(.021)			0	-
	(3,3)	4.027	(.270)			3.021	(.220)
	(5,3)			-.091	(.018)		
	(10,3)	0	-			-.056	(.020)
	(11,3)	-.903	(.257)			0	-
	(13,3)			.453	(.089)		
	(14,3)	0	-			.238	(.090)
	(15,3)	-.287	(.112)			0	-
	(16,3)	0	-			.379	(.116)
	(18,3)	0	-			-.217	(.092)
	(19,3)	.152	(.098)			0	-
	(20,3)	.128	(.076)			-.092	(.039)
	(21,3)	.296	(.172)			0	-
	(4,4)			5.352	(.271)		
	(10,4)	.092	(.032)			0	-
	(5,5)	.129	(.009)			.077	(.007)
	(6,5)	.102	(.009)			.070	(.008)
	(8,5)			.123	(.024)		
	(11,5)			.114	(.028)		
	(17,5)			.094	(.016)		
	(18,5)	-.062	(.020)			0	-
	(19,5)	-.058	(.018)			0	-
	(21,5)	.041	(.026)			0	-
	(22,5)	0	-			-.001	(.002)
	(23,5)	-.006	(.003)			0	-
	(6,6)			.259	(.014)		
	(10,6)			.019	(.004)		
	(12,6)	0	-			.514	(.193)
	(13,6)			.132	(.024)		
	(14,6)			.096	(.020)		
	(15,6)			.099	(.020)		

TABLE D.1

(16,6)	0	-			.073	(.029)
(17,6)			.264	(.028)		
(19,6)			.064	(.017)		
(20,6)	-.023	(.015)			0	-
(22,6)	0				.002	(.003)
(7,7)			3.735	(.184)		
(12,7)			2.993	(.757)		
(15,7)	.219	(.108)			0	-
(8,8)			7.223	(.335)		
(19,8)	-.285	(.134)			0	-
(9,9)			4.266	(.245)		
(14,9)	0	-			.429	(.116)
(10,10)	.068	(.006)			.049	(.004)
(11,10)			.071	(.025)		
(14,10)			-.020	(.010)		
(18,10)	.067	(.017)			.030	(.013)
(20,10)	-.028	(.015)			0	-
(22,10)	-.002	(.006)			0	-
(23,10)	-.006	(.003)			0	-
(24,10)	.004	(.003)			0	-
(11,11)			7.796	(.429)		
(12,11)	0	-			4.784	(1.418)
(15,11)	.228	(.161)			0	-
(12,12)	150.492	(10.032)			109.335	(7.431)
(13,13)			2.010	(.109)		
(14,13)	.347	(.091)			0	-
(17,13)			.255	(.074)		
(14,14)	1.461	(.122)			.954	(.088)
(15,14)	0	-			-.189	(.066)
(19,14)	.100	(.069)			0	-
(15,15)			1.218	(.080)		
(17,15)	0	-			.244	(.082)
(18,15)	.415	(.082)			.179	(.068)
(21,15)	-.142	(.110)			0	-
(22,15)			-.014	(.008)		
(16,16)			2.027	(.098)		
(18,16)	.304	(.088)			0	-
(20,16)	.127	(.053)			0	-
(17,17)			2.000	(.110)		
(19,17)	-.121	(.076)			0	-
(21,17)	-.268	(.130)			0	-
(22,17)	.024	(.019)			0	-
(18,18)	2.334	(.140)			1.879	(.117)
(19,18)			.771	(.066)		
(20,18)	0	-			.004	(.039)
(21,18)	-.229	(.115)			0	-
(22,18)			.005	(.010)		
(24,18)	.008	(.011)			0	-
(19,19)			1.282	(.073)		

TABLE D.1

	(20,19)	0	-			.036	(.028)
	(21,19)	0	-			-.093	(.070)
	(20,20)	.658	(.108)			.165	(.026)
	(22,20)	.094	(.039)			0	-
	(23,20)			-.021	(.002)		
	(24,20)	.062	(.015)			0	-
	(21,21)	3.005	(.266)			1.986	(.132)
	(22,22)	.092	(.017)			.017	(.003)
	(24,22)	.034	(.006)			.003	(.001)
	(23,23)	.039	(.003)			.008	(.000)
	(24,23)	0	-			.002	(.000)
	(24,24)	.044	(.003)			.008	(.000)
θ_δ	(10,1)	-.007	(.005)			0	-
	(12,1)			-.632	(.198)		
	(4,2)	-.943	(.420)			0	-
	(7,2)			.003	(.001)		
	(6,3)	0	-			.475	(.232)
	(4,4)			80.353	(3.727)		
	(5,4)			27.855	(2.352)		
	(5,5)			55.280	(2.513)		
	(12,5)	0	-			-15.520	(7.376)
	(6,6)			7.358	(5.321)		
	(9,6)	-.216	(.089)			0	-
	(7,7)			.001	(.0001)		
	(8,8)			.066	(.004)		
	(9,9)	.054	(.005)			.071	(.006)
	(10,10)			.123	(.011)		
	(11,11)			.112	(.013)		
	(12,12)			579.594	(27.788)		
β	(3,1)	3.539	(.767)			1.218	(.473)
	(3,2)	0.014	(.159)			.469	(.116)
	(4,3)	-0.062	(.016)			-.013	(.008)
γ	(1,1)	.136	(.058)			0	-
	(2,1)			.611	(.225)		
	(3,1)			.400	(.186)		
	(1,2)			.004	(.011)		
	(2,2)			.165	(.059)		
	(1,3)			.025	(.015)		
	(3,3)			.093	(.068)		
	(4,3)	.109	(.055)			0	-
	(1,4)	0	-			.008	(.002)
	(2,4)	.017	(.009)			.017	(.010)
	(4,4)			.002	(.101)		
	(1,5)	.097	(.089)			.133	(.137)
	(4,5)			.125	(.105)		
	(1,6)	.004	(.002)			.009	(.002)

TABLE D.1

	(2,6)			.026	(.009)		
	(4,6)			.005	(.002)		
ψ	(1,1)	.114	(.010)			.129	(.011)
	(2,1)			.484	(.037)		
	(2,2)			2.650	(.281)		
	(3,3)			1.618	(.118)		
	(4,4)	.304	(.029)			.076	(.006)
ϕ	(1,1)			.066	(.003)		
	(2,1)			.045	(.009)		
	(3,1)			.025	(.005)		
	(4,1)	0	-			.359	(.105)
	(6,1)			.246	(.096)		
	(2,2)	1.423	(.087)			1.246	(.075)
	(4,2)			2.779	(.356)		
	(5,2)	.018	(.014)			-.020	(.011)
	(6,2)	0	-			1.431	(.558)
	(3,3)	.250	(.016)			.660	(.040)
	(6,3)			1.627	(.268)		
	(4,4)			84.132	(6.720)		
	(5,4)	.382	(.121)			0	-
	(6,4)	10.830	(4.566)			9.545	(4.770)
	(5,5)	.039	(.005)			.024	(.004)
	(6,5)	.166	(.128)			0	-
	(6,6)			89.736	(17.787)		

TABLE D.2

MAXIMUM LIKELIHOOD ESTIMATES FOR THE FINAL STANDARDIZED (COMPARISON) MEASUREMENT MODEL: ENDOGENOUS CONSTRUCTS - MALES ONLY

PARAMETERS	LOADINGS			
WISC Information	.55	0	0	0
Comprehension	.36	0	0	0
Vocabulary	.58	0	0	0
Digit Span	.62	0	0	0
WRAT Spelling	.75	0	0	0
Reading	.69	0	0	0
WISC Block Design	0	.46	0	0
Coding	0	.29	0	0
Picture Arrangement	0	.63	0	0
WRAT Arithmetic	.85	0	0	0
Bender-Gestalt	0	.59	0	0
Goodenough-Harris Drawing	0	.43	0	0
CAT Vocabulary	0	0	.81	0
Comprehension	0	0	.86	0
Mechanics	0	0	.87	0
Usage and Structure	0	0	.71	0
Spelling	0	0	.80	0
Computation	0	0	.68	0
Concepts & Problems	0	0	.84	0
Age at First Arrest	0	0	0	.81
Age at First Offense	0	0	0	.70
Total Number of Arrests	0	0	0	.88
Damage Offender	0	0	0	.75
Injury Offender	0	0	0	.58

TABLE D.3

MAXIMUM LIKELIHOOD ESTIMATES FOR THE FINAL STANDARDIZED (COMPARISON) MEASUREMENT MODEL: ENDOGENOUS CONSTRUCTS - FEMALES ONLY

PARAMETERS	LOADINGS			
WISC Information	.55	0	0	0
Comprehension	.36	0	0	0
Vocabulary	.58	0	0	0
Digit Span	.62	0	0	0
WRAT Spelling	.75	0	0	0
Reading	.69	0	0	0
WISC Block Design	0	.46	0	0
Coding	0	.29	0	0
Picture Arrangement	0	.63	0	0
WRAT Arithmetic	.72	0	0	0
Bender-Gestalt	0	.59	0	0
Goodenough-Harris Drawing	0	.43	0	0
CAT Vocabulary	0	0	.81	0
Comprehension	0	0	.86	0
Mechanics	0	0	.87	0
Usage and Structure	0	0	.71	0
Spelling	0	0	.80	0
Computation	0	0	.80	0
Concepts & Problems	0	0	.84	0
Age at First Arrest	0	0	0	1.07
Age at First Offense	0	0	0	.81
Total Number of Arrests	0	0	0	.88
Damage Offender	0	0	0	.35
Injury Offender	0	0	0	.37

TABLE D.4 MAXIMUM LIKELIHOOD ESTIMATES FOR THE FINAL STANDARDIZED (COMPARISON) MEASUREMENT MODEL: EXOGENOUS CONSTRUCTS - MALES ONLY

PARAMETERS	LOADINGS					
Mother's Age	1.08	0	0	0	0	0
Birth Weight	0	1.00	0	0	0	0
Income at Registration	0	0	1.00	0	0	0
Blood Pressure, Systolic	0	0	0	.38	0	0
Blood Pressure, Diastolic	0	0	0	.27	0	0
Weight	0	0	0	.96	0	0
Height	0	0	0	.75	0	0
Hand Preference	0	0	0	0	.58	0
Foot Preference	0	0	0	0	.58	0
Husband in Household	0	0	0	0	0	-.69
Income at 7 Years	0	0	0	0	0	.76
Occupation	0	0	0	0	0	.36

TABLE D.5 MAXIMUM LIKELIHOOD ESTIMATES FOR THE FINAL STANDARDIZED (COMPARISON) MEASUREMENT MODEL: EXOGENOUS CONSTRUCTS - FEMALES ONLY

PARAMETERS	LOADINGS					
Mother's Age	1.08	0	0	0	0	0
Birth Weight	0	1.00	0	0	0	0
Income at Registration	0	0	1.00	0	0	0
Blood Pressure, Systolic	0	0	0	.38	0	0
Blood Pressure, Diastolic	0	0	0	.27	0	0
Weight	0	0	0	.96	0	0
Height	0	0	0	.75	0	0
Hand Preference	0	0	0	0	.58	0
Foot Preference	0	0	0	0	.58	0
Husband in Household	0	0	0	0	0	-.69
Income at 7 Years	0	0	0	0	0	.76
Occupation	0	0	0	0	0	.36

TABLE D.6 FINAL STRUCTURAL EQUATION (COMPARISON) MODEL (MATRIX FORM): STANDARDIZED SOLUTION - MALES ONLY*

1. $\underline{B}$ =

	η_1	η_2	η_3	η_4
EQ1	1.00	0.00	0.00	0.00
EQ2	0.00	1.00	0.00	0.00
EQ3	.73	.01	1.00	0.00
EQ4	0.00	0.00	-.24	1.00

2. $\underline{\Gamma}$ =

	ξ_1	ξ_2	ξ_3	ξ_4	ξ_5	ξ_6
EQ1	.10	.01	.05	0.00	-.05	.10
EQ2	.09	.11	0.00	-.09	0.00	.15
EQ3	-.06	0.00	.04	0.00	0.00	0.00
EQ4	0.00	0.00	-.16	-.03	-.05	-.11

3. $\underline{\Phi}^{**}$ =

	ξ_1	ξ_2	ξ_3	ξ_4	ξ_5	ξ_6
ξ_1	1.00					
ξ_2	.15	1.07				
ξ_3	.14	0.00	.55			
ξ_4	0.00	.26	0.00	1.00		
ξ_5	0.00	.09	0.00	.23	1.24	
ξ_6	.10	0.00	.25	-.12	-.10	1.00

4. $\underline{\Psi}^{***}$ = (Ψ_{21} free)

	EQ_1	EQ_2	EQ_3	EQ_4
EQ1	.97			
EQ2	.96	.94		
EQ3	0.00	0.00	.52	
EQ4	0.00	0.00	0.00	.93

TABLE D.6

5. $\underline{C}^{****}$ =

	η_1	η_2	η_3	η_4
η_1	.89			
η_2	.82	.99		
η_3	.66	.61	1.01	
η_4	-.18	-.17	-.26	1.62

*Correlations shown as "0.00" are fixed to zero to specify no direct relationship

**Standardized variance/covariance matrix of ξ

***Standardized variance/covariance matrix of ζ

****Standardized variance/covariance matrix of η

TABLE D.7 FINAL STRUCTURAL EQUATION (COMPARISON) MODEL (MATRIX FORM): STANDARDIZED SOLUTION - FEMALES ONLY*

1. $\underline{B}$ =

	η_1	η_2	η_3	η_4
EQ1	1.00	0.00	0.00	0.00
EQ2	0.00	1.00	0.00	0.00
EQ3	.25	.45	1.00	0.00
EQ4	0.00	0.00	-.05	1.00

2. $\underline{\Gamma}$ =

	ξ_1	ξ_2	ξ_3	ξ_4	ξ_5	ξ_6
EQ1	0.00	.01	.05	.20	.06	.24
EQ2	.09	.11	0.00	.09	0.00	.15
EQ3	-.06	0.00	.04	0.00	0.00	0.00
EQ4	0.00	0.00	0.00	-.03	-.05	-.11

3. $\underline{\Phi}^{**}$ =

	ξ_1	ξ_2	ξ_3	ξ_4	ξ_5	ξ_6
ξ_1	1.00					
ξ_2	.15	.93				
ξ_3	.14	0.00	1.44			
ξ_4	.15	.26	0.00	1.00		
ξ_5	0.00	-.10	0.00	0.00	.76	
ξ_6	.10	.13	.25	.11	0.00	1.00

4. $\underline{\Psi}^{***}$ = (Ψ_{21} free)

	EQ_1	EQ_2	EQ_3	EQ_4
EQ1	.89			
EQ2	.91	.93		
EQ3	0.00	0.00	.52	
EQ4	0.00	0.00	0.00	.95

TABLE D.7

5. $\underline{C}^{****} =$

	η_1	η_2	η_3	η_4
η_1	1.10			
η_2	.87	1.01		
η_3	.67	.66	.99	
η_4	-.07	-.06	-.07	.40

*Correlations shown as "0.00" are fixed to zero to specify no direct relationship

**Standardized variance/covariance matrix of ξ

***Standardized variance/covariance matrix of ζ

****Standardized variance/covariance matrix of η

APPENDIX V

BIOLOGICAL, PSYCHOLOGICAL, AND ENVIRONMENTAL FACTORS IN DELINQUENCY AND MENTAL DISORDER: AN INTERDISCIPLINARY BIBLIOGRAPHY

(under separate cover)