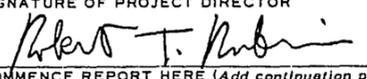


OMB APPROVAL NO. 43-R0825 MFL

 <b>U. S. DEPARTMENT OF JUSTICE</b> LAW ENFORCEMENT ASSISTANCE ADMINISTRATION		<b>CATEGORICAL GRANT</b> <b>PROGRESS REPORT</b>	
GRANTEE	LEAA GRANT NO.	DATE OF REPORT	REPORT NO.
Robert T. Rubin, M.D., Ph.D.	79-NI-AX-0076	31 Dec 80	5
IMPLEMENTING SUBGRANTEE	TYPE OF REPORT		
	<input type="checkbox"/> REGULAR <input type="checkbox"/> SPECIAL REQUEST <input checked="" type="checkbox"/> FINAL REPORT		
SHORT TITLE OF PROJECT	GRANT AMOUNT		
Conference Support: Fifth Annual Workshop	\$29,473.00		
REPORT IS SUBMITTED FOR THE PERIOD	THROUGH		
1 Oct 1980	31 Dec 1980		
SIGNATURE OF PROJECT DIRECTOR	TYPED NAME & TITLE OF PROJECT DIRECTOR		
	Robert T. Rubin, M.D., Ph.D. Professor of Psychiatry		
COMMENCE REPORT HERE (Add continuation pages as required.)		UCLA School of Medicine	
The appended pages constitute the final report for this grant. The final report summarizes the four workshops that were held previous to this one, which sets the stage for the detailed presentation of the topics discussed in this workshop. The report also includes lists of participants in each of the workshops and an extensive bibliography.			
<small>NOTE: No further monies or other benefits may be paid out under this program unless this report is completed and filed as required by existing law and regulations (FMC 74-7; Omnibus Crime Control Act of 1976).</small>			
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FINAL REPORT

Conference Support: Fifth Annual Workshop of the  
Interdisciplinary Group on Criminology

Grant #79-NI-AX-0076  
National Institute of Justice  
Law Enforcement Assistance Administration  
Washington, DC 20531

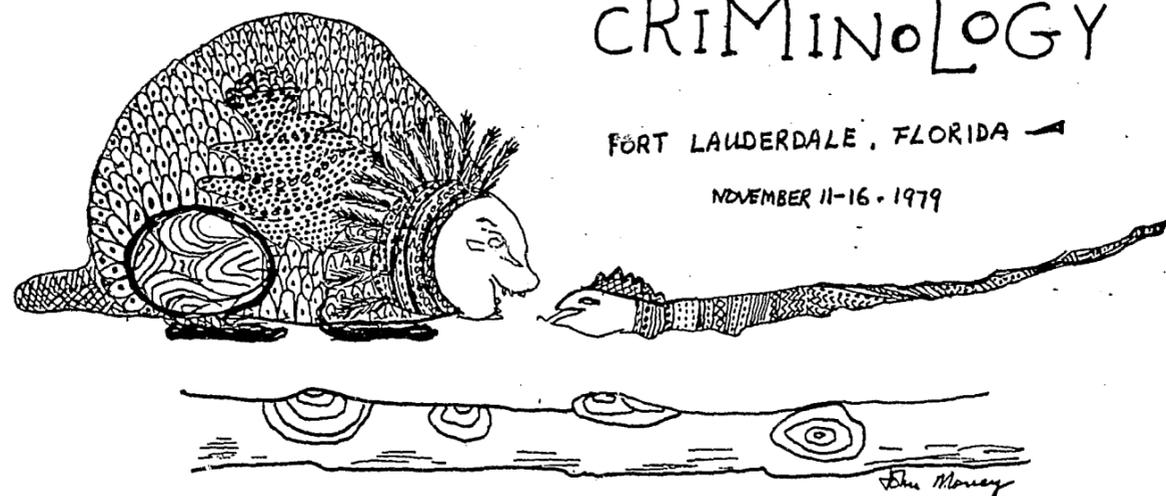
Dates of Grant: 1 September 1979-31 December 1980  
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TH  
WORKSHOP

# INTERDISCIPLINARY GROUP ON CRIMINOLOGY

FORT LAUDERDALE, FLORIDA →

NOVEMBER 11-16, 1979



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### Introduction and Background

The initial discussions and ideas that led to the formation of the international group that has come to be known as the Interdisciplinary Group on Criminology were formulated during the first International Symposium on Criminology held under the sponsorship of the International Center for Biological and Medico-Forensic Criminology, Sao Paulo, Brasil (8-12 August 1974). Several members of the present Interdisciplinary Group who participated in the Sao Paulo symposium had hoped that there would be an opportunity for small group discussion among the participants (35 invited consultants from 20 countries) from several disciplines in an effort to bridge the gap among differing disciplinary perspectives and approaches to the study and understanding of the phenomena of crime and delinquency. There was some sentiment among the core group which initiated informal discussions during the Sao Paulo symposium that efforts to remedy and balance the environmentally biased approaches to criminology would not be provided by developing a biological bias. Rather, the need was for a more broadly conceptualized interdisciplinary perspective that could allow consideration of relevant biological and environmental variables.

Since the basic purpose, organization and size of the Sao Paulo symposium (not to mention the four languages being used) did not permit the kind of small group discussion noted above, several participants sought to accomplish this particular interest through informal discussions during the evenings. These initial and informal conversations and discussions led to the formulation of several ideas and recommendations to the Director of the International Center for Biological and Medico-Forensic Criminology (Dr. Ayush Morad Amar). Among these was the suggestion that a smaller interdisciplinary group be convened to consider the development and formulation of more interdisciplinary and integrated frames of reference for studying the phenomena of crime and delinquency.

The participants in the informal discussions during the Sao Paulo symposium which led to the formation of the present Interdisciplinary group were: Drs. Wouter Buikhuisen (The Netherlands), Karl Otto Christiansen (Denmark), Frank Ervin (U.S.A.), Rafael Harrell (Mexico), Robert Rubin (U.S.A.), Saleem Shah (U.S.A.), and Shlomo Shoham (Israel). It was decided that the composition of this core group should be broadened in order to encompass a wider range of interdisciplinary, international and scholarly inputs.

### Mexico Workshop (11-14 March 1975)

In Sao Paulo, Dr. Rafael Ruiz Harrell offered to explore the possibility of Mexican sponsorship for the initial meeting of the fledging Interdisciplinary Group. Dr. Harrell's efforts led to the convening of the First Workshop of the group under the sponsorship of the Attorney General of Mexico. This first workshop was held in Queretaro, Mexico. (Appendix I lists the participants at this

meeting.)

The major purpose of the workshop was to develop a more integrated and interdisciplinary frame of reference in the field of criminology. The Mexico workshop was organized to begin with informal presentations and discussions of various biological and environmental perspectives in order to develop a common informational base, and to then proceed with discussions of ways in which particular disciplines and approaches view, conceptualize, and study topics of criminological concern. The first session of this three-day workshop involved presentations of various biological contributions and models: Dr. John Money discussed the field of psychobiology with special reference to the phenomena of dominance and submission (as related to aggression). The complex interactions of various genetic, hormonal, social and psychological variables at various stages in the development of the human organism were addressed. Dr. Robert Rubin discussed some basic developments in the field of endocrinology, with special reference to the role and functioning of the neurotransmitters in mediating certain types of behaviors. Dr. Frank Ervin discussed the complex interactions of testosterone levels with other variables at various stages of the development of the human organism (prenatal, prepubertal, post-pubertal, and post-climacteric) with respect to dominance and aggression. Each informal presentation was followed by discussion and interaction among the participants.

The next session of the workshop involved similar informal presentations and discussions pertaining to various social and environmental perspectives. Prof. Shlomo Shoham discussed the major contributions and implications of the 'labelling' perspective from the field of sociology. Prof. Karl Otto Christiansen discussed some research and related perspectives on culture conflict and crime. Prof. Wouter Buikhuisen discussed a number of studies of a social psychological nature on the distribution and characteristics of delinquency and youth crimes in the Netherlands. Prof. Marvin Wolfgang described his birth cohort study of delinquency; and Dr. Saleem Shah presented a social learning perspective for the understanding of the development of patterns of aggressive behavior.

The next phase of the Mexico workshop shifted to discussions of research which involved essentially 'mixed models', i.e., which sought to cut across disciplinary boundaries and attempted to combine contributions from two or more fields. During this phase Dr. Sarnoff Mednick discussed the work of his group in Copenhagen (Denmark) with respect to psychophysiological factors in delinquent and criminal behavior, as well as some of the research involving adoptees and the findings with regard to genetic factors in criminality. Prof. Christiansen discussed his landmark twin studies for analyzing possible genetic factors in criminality. Similarly, Dr. Ervin discussed some details of his work on the neurophysiology of aggression and Dr. Money presented some of his findings regarding persons with chromosomal aneuploidies and with sexual offenses.

The final part of this Workshop was devoted to a discussion of the ways in which the contributions of several disciplines might be integrated in an interdisciplinary conceptualization and be further

expressed in the design of a particular piece of research based upon such an interdisciplinary approach. The topic of violent behavior was selected for special attention. It was felt that the group should move from the more abstract and general discussions to the development and design of a specific research project focusing on violent behavior. Another topic that was discussed during the Mexico workshop was the possible preparation of a position monograph, consisting of chapters contributed by the participants, that could provide a state of the art summary of major developments and contributions from the several disciplines to the understanding of the phenomena of crime and delinquency. At the Mexico workshop Dr. Ayush Morad Amar indicated that his agency (subsequently renamed the Institute for Social Medicine and Criminology -- IMESC) would be pleased to sponsor the second meeting of the Interdisciplinary Group.

In the period between the first and second workshop there continued to be much correspondence and exchange between the participants, with coordination being provided by Dr. Saleem Shah. Such exchanges reiterated the major purpose of the group, viz., the development of more interdisciplinary perspectives in the field of criminology and the hope that such integrated efforts would help to cut across the limits, constraints, and the parochial concerns of particular disciplines and approaches. It was felt that the major purpose of the first workshop (to exchange information about the contributions and perspectives of various disciplines and to develop some common level of interdisciplinary discourse) had been achieved in large measure. It was also agreed that the further efforts of the group should focus on the design of one or more research projects addressing the topic of violent behavior. To facilitate planning toward the second workshop the coordinator, Dr. Shah, asked Dr. Mednick to serve as the chairman of a committee consisting of himself, Prof. Christiansen, Prof. Buikhuisen, and Dr. Eva Johanson (Sweden) -- who was invited to join the group around August 1975.

A tragic event which affected the Interdisciplinary Group was the death of Prof. Karl Otto Christiansen on 22 May 1976. This fatal heart attack occurred while Prof. Christiansen was serving as a visiting professor at the University of Minnesota and lecturing in criminology. This loss was felt very deeply not only by our group but also by the Scandinavian and the international criminological communities.

#### Brasil Workshop (15-20 November 1976)

In September 1976 Prof. Gösta Carlsson (Sweden) was invited to join the group and was expected to participate in the second workshop. However, some administrative problems in Brasil made it difficult for the necessary travel and related arrangements to be made for Prof. Carlsson's attendance. The second workshop was held in Guarujá, Brasil. (Appendix I lists the participants at this meeting). Dr. Saleem Shah served as chairman. For purposes of clarification and explication of common understanding by the group, it was agreed that the two basic aims of the group were 1) to develop an integrated, interdisciplinary conceptual framework to study (and thereby to try to

explain) the etiology of criminality, and 2) to develop, design, and to carry out a substantial research project which, at least in part, will test hypotheses drawn from the above conceptual framework. The research should not only enhance our understanding of the phenomena of criminal behavior, but should hopefully provide information of value with respect to the prevention and control of such behavior.

As per earlier discussions and correspondence exchange, it was agreed that we should focus our concerns on violent behavior. Much of the initial discussion during the second workshop focused on broader issues and questions. There were comments about the desirability of a more abstract conceptual discussion and clarification of research approach; there was also the view that such efforts might best develop from efforts to pin-point key variables believed, or empirically demonstrated, to be associated with criminal (especially violent) behavior, and to design a specific research project. Concerns about the homogeneous and/or heterogeneous nature of the subject population were also discussed. It was noted, for example, that even though the subject population may be limited to persons who have manifested violent behavior, there would be a wide range of persons and factors involved. And, given the international as well as the interdisciplinary nature of the group, it often was emphasized that we would need to be clear about the definition of key concepts, terms, and, variables -- since different disciplines may well tend to define, use, and measure the variables somewhat differently. Also, we may well be meaning or implying essentially the same thing even though using different words.

As a way of getting the discussion focused more specifically, Dr. Buikhuisen presented what he described as a probabilistic model in which could be incorporated three broad categories of variables: predisposing variables, facilitating variables, and inhibitory variables. Predisposing variables were defined as those which by their presence increase the likelihood that criminal behavior may occur, i.e., these variables indicate a kind of vulnerability and they are able, by themselves, to explain a significant portion of the variance pertaining to (criminal) behavior. Stated differently, predisposing variables may be viewed as having a necessary but not sufficient or compelling relationship with the phenomena being studied. Facilitating variables do not by themselves explain or cause the phenomenon in question but, in combination with the predisposing variables they increase the probability that the behavior will occur. Inhibitory variables are those which, in the presence of predisposing factors, tend to decrease the probability that the behavior in question will occur and they may even prevent the behavior from occurring at all.

Given the above conceptual scheme, the participants then contributed and listed variables that might be classified with respect to the scheme. The following will serve to illustrate the kinds of variables classified according to the scheme:

Predisposing variables: genetic, neurophysiological, psychological, social and culture variables. For example, chromosomal aneuploidies (47, XXY & 47, XYY), biochemical/hormonal, perinatal, psychophysiological (autonomic 'recovery' characteristics), regular

and activated EEGs, various development, personality, and social variables.

Facilitating and Situational variables: ingestion of drugs and alcohol, presence and availability of weapons, sex-related factors, menstrual cycle, nature of specific interaction with victims (viz., provocation), social context of events, etc.

Inhibitory variables: e.g., internalization of social-ethical norms (i.e., early socialization), anxiety as related to fear and guilt (autonomic nervous system characteristics), fear of punishment, non-violent and related values and ideologies, high intelligence and educational achievement, socialization and training in alternative and competing (as contrasted with antisocial and violent) activities and skills, etc.

The discussions at the Second Workshop also included various assessment and measurement procedures which might be used, and the feasibility, cost, and other factors associated with specific assessments. And, even though a very comprehensive (even exhaustive) list of variables was compiled, it was agreed that a major task to be undertaken prior to the next meeting of the group was to reduce the number of variables to more a manageable and realistic proportion. Thus, each participant was to focus on variables in his or her particular area and suggest those four or five which appeared to have the greatest relevance for the understanding of violent behavior.

Finally, the group discussed and offered a number of suggestions and recommendations to Dr. Amar for the program and activities of the Institute of Social Medicine and Criminology (IMESC). Prof. Buikhuisen indicated that he would explore the possibility that the Ministry of Justice of The Netherlands might sponsor the next meeting of the Interdisciplinary Group on Criminology. The dates for the third workshop were set for 14-19 November 1977, and the meeting was scheduled to be held in Geldrop, Holland.

#### Holland Workshop (14-19 November 1977)

The Third Workshop was held in Geldrop, Holland, under the sponsorship of the Netherlands Ministry of Justice. (Appendix I lists the participants at this meeting.) The opening session of the Third Workshop was convened primarily to discuss the schedule for the various sessions of the workshop and to get some initial reactions to the proposed substantive agenda that had been prepared by Drs. Mednick, Rubin and Ervin. It was noted that even though the group was both interdisciplinary as well as international in composition, it was not necessary that the initial research undertaken be both interdisciplinary and also international in nature. It would be a big step forward if a well integrated interdisciplinary research project could initially be undertaken even in a single location. However, once this had been done, it would certainly be preferred that replications and related research be undertaken at other locations to see if the findings hold up and have cross-national relevance.

As per previous discussions of the group, it was agreed that the focus of the research would be on violent behavior. It was also agreed that the concern with individual acts of violence would not include terrorist acts and violence associated with serious mental disorders (e.g., psychoses). Further distinctions and questions were left for later discussion, for example: 1) What types of violent behaviors were we talking about? 2) What kinds of index cases were to be selected for the proposed research? (e.g., repeated violent delinquents/offenders; persons with repeated criminal behavior including some crimes of violence; persons who engage in repeated violent behavior but who have not yet come to the attention of the criminal justice system; other types of violent behavior such as child battering and spouse battering)

It was also agreed that possible treatment and/or prevention implications certainly should be kept in mind, even though this was not the primary objective. To the extent that factors identified as contributing to the understanding of violence indicated or suggested possible treatment and/or prevention aspects, studies specifically designed to test such intervention possibilities then could be undertaken.

Passing reference was also made to some questions that required further discussion with regard to the sampling procedures to be considered, e.g., cross-sectional or longitudinal studies, and, if longitudinal, whether retrospective or prospective.

In the course of wide-ranging general discussions the group sought to do two essential things: 1) to crystallize the population variables and sampling procedure to be used, and 2) to thresh out various methodological as well as practical problems associated with various proposed studies.

Five approaches to the study of violent behavior were proposed: 1) self-report studies, 2) information provided by various informed persons (e.g. teachers, parents, etc.), 3) registered offenders, 4) direct observations (e.g. time sampling studies), and 5) use of volunteers (e.g. child or spouse batterers).

The advantages and disadvantages of each of the above approaches were discussed. Several other salient points were made. A point that was raised on several occasions was that we should try to include in our study of violent behavior individuals showing aggressiveness as a behavioral trait. It was suggested that such studies also address factors associated with the cessation of violence by individuals with established records of violent behavior; further, that we should try to study persons living in high-crime neighbourhoods, but who do not display any criminal or violent behavior. The purpose of this would be to determine factors that help to prevent and to buffer individuals against expression of violent behaviors. It was noted on several occasions that it would be very important to study the setting- and situation-specific nature of violent behavior.

The following broad categories of study variables were suggested: 1) chromosome genetics, 2) endocrine and possible neurochemical variables, 3) prenatal and pubertal variables, 4) neural factors--periphery, brain, and sympathetic, 5) neonatal biography (e.g. parent-, child-, and pair-bonding), 6) special events--biography of childhood history and development, and 7) peer-bonding biography--childhood and adolescence with special attention to peer group tendency regarding violence. (Other categories of variables will be added later.)

Five possible studies were suggested: 1) study of prison population (Israeli study discussed by Shlomo Shoham), 2) proposed study of school population, viz. 5% of boys with the highest ratings for aggressiveness (suggested by Sarnoff Mednick), 3) community-cultural study (Franco Ferracuti), 4) study of idiopathic behavior using volunteers, e.g. cases of child battering and spouse battering (John Money), and 5) recidivistic offenders, with 5+ offences (Sarnoff Mednick).

Because it was considered unlikely that we could undertake the ideal study which would include most of the key and relevant variables of concern, it was noted that it might well be possible that three separate but interrelated studies could include sets of overlapping variables.

It was requested that each person should try to use the following format for describing the research: 1) rationale for the proposed study, 2) basic description of the population to be studied (size, nature, and characteristics of the population, etc.), 3) the degree of access to and control over the study population, viz., to what extent can the study population actually be obtained for purposes of the proposed research and the assessment procedures, 4) sample selection and sampling criteria to be used, 5) data already available, 6) the specific kinds of violent behavior to be studied, and 7) the advantages and disadvantages of the proposed study.

A point that was frequently made during the workshop was that one should not think only in terms of whether a person had or had not displayed violent behavior, but it also was important to examine the specific types of violence that had been displayed, and to study such behaviors within more specific contexts. Two specific proposed projects are outlined below:

#### Study of Violent Offenders in an Israeli Prison

This study was proposed and described by Dr. Shlomo Shoham. The following were the essential features of the proposed research:

- Prison population: N=2700 (Guards: N= about 400)
- Maximum security prison
  - Males, with age range of 21+ yrs.
  - Average sentence - 5+ yrs.
  - Multi-ethnic population

#### Study sample: N=1000

- Offenders with violence in prison (250)
- Offenders with pre-prison violence and violence in prison (250)
- Offenders with pre-prison violence only (250)
- Offenders with no pre-prison violence and no violence in prison (250)

#### Study data: -- Observational data

- Prison records, including information about violent behaviors
- Pre-prison records
- Cultural and ethnic descriptions readily available in country
- Necessary equipment and expertise for psychobiological assessments will be needed.)

Advantages: Study is already partially funded; multi-ethnic composition of study population; good records are available; proposed study is pretty much ready to get started, i.e., no big start-up delays.

Disadvantages: No psychiatric patients; no juveniles or females; study population would not likely include child and spouse batterers; confounding effects of incarceration.

#### Study of Juveniles with Repeated Contacts with the Criminal Justice System

Dr. Sarnoff Mednick described this study; he noted that repeated contacts with the criminal justice system could be defined in terms of 3+, 4+ or 5+ charges or arrests.

Rationale: The objective of the study would be to gain etiological understanding of violent behavior, and also to learn about the prevention of violent behavior. Hence, since prevention is one of the objectives of concern, we would need to focus on younger Ss in order to have an opportunity to achieve preventive objectives. It will be necessary to find ways of identifying the Ss before they become violent (or before they are repeatedly violent). In order to address the above objectives it will also be necessary to identify the Ss in context, i.e., in the community context and using police contacts in the settings in which the Ss are likely to display violent behavior. Having so identified the study group (viz., in terms of 3+, 4+ or 5+ official contacts with the police), the Ss should then be studied as thoroughly as possible.

Study Sample: Could study about 100 Ss.

Study Data: Access to information would be very good. In a setting like Denmark could get details of parental and family history, criminal and psychiatry history, social characteristics, etc. (All of this information would be available from records.)

Will need to define violent offenses; possibly also will need to use various sub-categories.

Advantages: Naturalistic study; easy to identify Ss; controls are built into the design; dealing with an unselected study group (except for criterion of initial definition); shorter time-frame for determination of further violent behavior, therefore, reduced costs.

Disadvantages: Would have to wait 2 years to reassess the Ss, bias of involvement with the criminal justice system, unable to measure Ss before arrest and other criminal justice system contact, social class bias--will have predominantly lower SES (socioeconomic status) subjects.

Dr. Marvin Wolfgang then sketched out the essential information derived from his Philadelphia birth cohort study. With regard to the index group (144 with 5+ registered offenses), information was already available on registered and self-reported offenses, social background, etc. Dr. Wolfgang inquired of the group whether it would be useful and informative to locate these 144 Ss in order to undertake detailed assessments. The group felt that it would certainly be interesting and useful to study this high-offending group, even though one would not expect to gain much etiological information from these 30 year old subjects as compared to a prospective longitudinal study of 12 year old Ss. However, one could try out the various assessment procedures on these 144 Ss and appropriate controls. Measures and tests used and refined on the basis of the above Ss could then be used in various longitudinal studies like that proposed by Dr. Mednick, and also in certain experimental studies.

The group then developed a listing of the main variables that should be considered for inclusion in any intensive evaluation with regard to individuals with repeated violence:

#### LIST OF MAIN VARIABLES

##### Genetics

- 47, XYY; length of Y chromosome (H-Y Antigen)

##### Central Nervous System

- history  
- neurological exam  
- (C.A.T. Scan)  
- Laterality  
- 'Dynamic' E.E.G. (+ alpha waves?)

##### Endocrine Status

- circulating testosterone (free and bound)  
- urine MHPG  
- Cortisol  
- Luteinizing hormone (L.H.), follicle stimulating hormone (F.S.H.), Prolactin

##### Autonomic Nervous System

- Skin conductance responsiveness and recovery.

- Latency and intensity of autonomous response

##### Medical

- Cornell Medical Index  
- Detailed medical-somatic history (pregnancy and neonatal history)

##### Psychiatric history

- Hospital stays, chronic pathology  
- drugs, drinking (drug 'challenge' tests)  
- drugs during pregnancy or childhood  
- psycho-sexual history and status

##### Family background

- Family configuration (step-children, etc.)  
- single parent (father absent)  
- disciplining methods (phys. punishment)  
- child abuse (severe beatings)  
- capricious violent father and warm mother  
- family involvement in crime  
- family traditions of conflict solution (use of violence e.g. spouse battering)  
- parental coldness/lack of parent-child bonding  
- quarrelsome home atmosphere  
- incest  
- parent's achievement orientation

##### Personality (development)

- physical strength  
- physical stigmata  
- verbal ability/social skills  
- object-relation (boredom (stimulus hunger)  
- lack of empathy (misperception)  
- sensitivity to status threats  
- coping capacity (level of functioning)  
- insufficient impulse control (acting out, incapacity to postpone gratification)  
- field dependence (Rod and Frame test)  
- reducer-augmenter (Petre test)  
- extrapunitive  
- anxiety level (extremes on both sides)  
- school achievement  
- early manifestation of violent behavior  
- temper tantrums during childhood

##### Sociological

- Socioeconomic status (SES)

#### Brasil Workshop (19-23 November 1978)

The Fourth Workshop of the Interdisciplinary Group on Criminology was sponsored by the Institute of Social Medicine and Criminology (IMESC) of Sao Paulo, Brazil. The workshop took place at Iguazu Falls, Brasil. (Appendix I lists the participants at this meeting.)

It was decided to start with the basic description and design of two projects--the Israeli Project entitled "Study of Violent Offenders in an Israeli Prison," and the study to be conducted in Philadelphia, Pennsylvania, by Marvin Wolfgang and his associates, entitled "Longitudinal Study of Biosocial Factors Related to Delinquency."

#### Study of Violent Offenders in an Israeli Prison

The Israeli Project, initially discussed at the meeting of the group in Geldrop, Holland, was launched consistent with an interdisciplinary design developed by Drs. Robert Rubin, Sarnoff Mednick and Frank Ervin, during their consultation visit with Prof. Shlomo Shoham in Israel. This visit had been sponsored as a travel grant from the German Marshall Fund of the United States.

The research was conceived as an interdisciplinary project having as its rationale the basic notion that the study of any form of human behavior cannot be carried out adequately on an unidisciplinary level and still do justice to the complexity of the behaviors involved. The conceptual background for the interdisciplinary project was provided by this Interdisciplinary Group.

For purposes of this study, violent behavior has been defined in terms of various crimes of violence. The research subjects (Ss) consist of: 1) Prisoners with a history of violence both outside and inside prison and who are being held at the Ramle maximum security prison in Israel, 2) A control group who are also prisoners at Ramle but who do not have a history of violence, and 3) A second control group of men who have no history of delinquency or crime, matched with the experimental group with respect to age, sex and socioeconomic status,

The violent prisoners have been classified into groups with similar behavioral patterns; a lengthy sociological and psychological questionnaire has been administered to the research Ss; and they have also undergone comprehensive medical, neurological, neuropsychological, and psychological examinations. Some neuroendocrine assessments are also scheduled.

The Guttman-Lingols Multidimensional Scalogram Analysis (MSA) was used to analyze the dependent variables (Guttman & Rahav, 1970). There are 22 variables from which it has been possible to describe the interrelationships between the criminal and the victim; the motivation for the criminal's act of violence; the social proximity between the criminal and the victim; whether the violent behavior was accidental, continuous, or professional; the results of the violent encounter; and other variables that describe the personality of both the criminal and the victim.

The initial scalogram analysis, the results of which were still tentative, revealed the following types of violent behavior:

1) A group of persons who for material or other considerations have undertaken to carry out the violent assault as a task given to them by their superiors in the underworld, as a way of solving disputes among prisoners, or as a means of intimidating others or getting back loans given to members of the public by organized criminal groups. These may even be a rather "non-violent" people, apart from their highly professional conceptions of criminal activity.

2) Men who have tended to get into fights, possibly as a function of their hunger for stimuli. These would be the so-called psychopathic type of prisoners whose violent behavior relates more to factors in their personalities than to their relationships with their environment. These are individuals who seem always to be looking for trouble.

3) A third group, numerically smaller than the first two, consisting of prisoners who have been quite docile and conforming in their behavior and who have rather consistently been abused either by other inmates or by people outside the prison. When this abuse reached a certain unbearable level, as perceived and defined by them, they exploded into a kind of chaotic violence towards people and objects in their vicinity at the moment. These are the situational and accidental criminals.

The above three groups were found to be unrelated by the MSA analysis. In addition, there was a much less distinct cluster of a few prisoners whose violent behavior was accidental and was related to inmate-guard tensions of a situational type or, outside the prison, to conflicts between them and people in authority or to domestic conflicts.

Prof. Shoham then gave a progress report on the neurophysiological and neuroendocrinological components of the study. These are progressing, and they will be the subject for much discussion at the Fifth Workshop next year.

#### Longitudinal Study of Biosocial Factors Related to Delinquency

Dr. Wolfgang then discussed the design and plan of the Philadelphia Perinatal Project that has recently been funded by the National Institute of Law Enforcement and Criminal Justice (Law Enforcement Assistance Administration, U.S. Department of Justice).

This research follows a longitudinal research design and examines a variety of possible correlates of delinquency and crime. The study utilizes a Philadelphia data base on seven consecutive birth cohorts created for medical research by the Collaborative Perinatal Project (CPP) of the National Institute of Neurological Diseases and Blindness, U.S. Public Health Service. The term "biosocial" refers to all physiological, psychological, psychiatric and sociological variables available in the CPP and relative to delinquency and crime. The rationale of the study is to use the enormously rich data base of the Collaborative Perinatal Study (pre-, peri- and postnatal data)

relative to the major dependent variable of delinquency, as determined by a police contact prior to age 18. Birth stress scales, brain damage and similar variables will be examined relative to delinquency.

The CPP data are unique with regard to research on biosocial correlates of delinquency and crime. For the most part, past biosocial research has, concentrated predominantly on the impact of biological factors on criminality, to the depreciation or near exclusion of various environmental factors. Such an approach has pitted one research bias against another, with neither examining thoroughly the etiological components of delinquency and crime. Reliance on limited data has contributed to this inefficiency. The CPP data, however, allow rigorous examination of the separate, combined and interacting effects of extensive biological and sociological information. Contrary to most biosocial research data, the CPP data contain comprehensive information pertaining to a variety of disciplines, thereby allowing a multidisciplinary perspective. The examination of cohorts over time provides an opportunity to determine the impact of social trends on delinquency, in addition to an evaluation of biosocial influences on families who have more than one child in the sample. Plans for follow-up interviewing and testing of cohort children will contribute a retrospective focus complementing a child's increasing dependence on the environment after age seven. Most importantly, the data describe cohorts selected independently of, and prior to, their involvement in the juvenile justice system. Thus, pre- and postsystem involvement behavior will be compared, in addition to delinquent and nondelinquent behavior between cohort members. It is this opportunity, utilizing a very unique data base, that the Philadelphia study is taking advantage of.

In 1954 the National Institute of Neurological Diseases and Blindness acquired funds to explore research possibilities concerning the relationship between perinatal environment and neurological disorders, particularly cerebral palsy and mental retardation. After several years of planning, the study was approved and eventually expanded to include an evaluation of the genetic, biological and environmental effects upon both pre- and postnatal development. Increasing interest in a longitudinal examination of pregnant women and their children resulted in the Neurological Institute's approval in 1957 of fifteen university-affiliated medical centers as participants in a collaborative study. The resulting project, CPP, was designed to examine infant and childhood mortality, physical and psychological development, and general reproductive functioning in addition to the earlier concerns of biological and environmental influences on pregnancy outcomes. During 1959 a pretest period initiated staff recruitment, patient selection and the development of data manuals. Formal data collection on pregnant women began on 2 January 1959; registration ceased on 13 December 1965. Altogether, 55,908 pregnancies were registered. Those cases "lost to study" for various reasons reduced the sample size to 49,434 (Niswander and Gordon, 1972). Examination of sample children from gestation through age seven continued until 1974, completing a total project with a cost in excess of 100 million dollars (McFalls, 1976).

Data collection for the CPP reflects a prospective design. Although sample selection varied among centers according to random or systematic methods, the primary consistent selection requirement was the patient's admittance to a participating hospital clinic. Sampling constraints excluded doubtful follow-up prospects; unwed mothers considering adoption for their children, transients, women planning to leave the area, and "walk-ins" - women who gave birth the same day as registration.

Upon selection, each woman was administered a battery of interviews and given a physical examination. Additional data were required at the time of delivery and during fourth-month, eighth-month, and fourth-year examinations (McFalls, 1976). Information on the child was collected at various developmental periods: a general pediatric examination at four months, a mental and motor development assessment at eight months, a neurological exam at one year and a psychological assessment at four years. A speech, hearing and language examination was applied at thirty months, and final assessment at seven years.

The longitudinal research is examining only the Philadelphia sample for several reasons. During 1973, a nonprofit research organization, the Institute for the Continuous Study of Man (ISCM), was created to regulate the research generated from the Philadelphia CPP data. In agreement with Children's Hospital of Philadelphia, ISCM assumed responsibility for maintaining the original CPP data and for collecting and unifying data resulting from a variety of individual CPP research efforts. Thus, ISCM allows interested researchers access to current data which are unobtainable in other locations. Also, because the Criminology Center of the University of Pennsylvania has established excellent relations with Philadelphia police and school officials in past research, reliable assistance can be secured for collecting official statistics and locating subjects for follow-up interviews.

THE FIFTH WORKSHOP OF THE INTERDISCIPLINARYGROUP ON CRIMINOLOGY

Galt Ocean Mile Hotel  
Fort Lauderdale, Florida

11-16 November 1979

The Fifth Workshop of the Interdisciplinary Group on Criminology was held in Fort Lauderdale, Florida under the sponsorship of the National Institute of Justice of the Law Enforcement Assistance Administration. (The participants are listed at the beginning of this report.) The content for this workshop was based upon the evolution of the contents of the four preceding workshops, as detailed above. This workshop was planned not so much to continue the theoretical discussions of an interdisciplinary focus that marked the beginning of the series of workshops, but rather it was planned to concentrate on the specific research projects currently being undertaken by members of the group. Specifically, these included the study of violent offenders in an Israeli prison, the Philadelphia collaborative perinatal project, and the longitudinal study of biosocial factors related to delinquency. The substantive presentations and discussions about each of these projects that occurred at the Fifth Workshop are detailed below.

## Study of Violent Offenders in an Israeli Prison

### Israel police coordination

The Interior Ministry's Police Branch Research and Development Division approved this unique interdisciplinary project in June 1977. The purpose of the research was to elucidate the various sociobiologic parameters of violent prisoners in order to better classify these prisoners and to enable the Prison Service to cope more effectively with problems related to custody and treatment. The parameters to be studied were to encompass three distinct disciplines: (1) sociopsychologic (2) neuroendocrinologic (3) neuropsychologic, neuropsychologic, and neurologic. Summary scores from each of these three disciplines were to be integrated for interdisciplinary data analysis.

### The history of the project and overview of its conduct

Upon approval of the project, the Israel Police examined the computer printout of all prisoners incarcerated in Ramle and Maasiyahu Prisons (situated within the same complex and centrally located 15 minutes from Tel Aviv) who were sentenced to medium and long term sentences for violent or non-violent offenses per last conviction. This population provided 210 violent prisoners and 280 non-violent prisoners. Of these 490 names, many were found invalid for the research population. For example, the offenses registered on the printout, when compared to police rap sheets, personal prison files, and court records were inconsistent. After months of tedious work, a target population of approximately 150 prisoners was identified.

In March 1978, under a travel grant from the German Marshall Fund of the United States, Profs. Rubin, Mednick and Ervin visited Israel to set up the interdisciplinary framework of the project. At this time contact was made with Levinstein Hospital who agreed to carry out the neurophysiologic and neurologic testing. Dr. Rubin supplied the necessary equipment and detailed instructions to carry out blood sampling. Contact was made with a medical student and with an endocrinologist at Tel Hashomer Hospital who agreed to take the blood samples at the prison. It was later decided that the blood sampling would be the last stage of testing so as to minimize dropouts from the target population, the assumption being that this phase would pose the most objections from prisoners.

During 1978 and 1979, a team of research assistants interviewed over 150 prisoners, of which 117 completed the two day battery of sociologic and psychologic testing. Enormous administrative coordination was required to carry out these tests. Ramle Prison - originally a British mandate fortress - had no available rooms to test the subjects. Manpower had to be found to escort prisoners to and from the interview and remain outside the room during the interview. In

short, the project was daily taxing an already overtaxed prison administration short of manpower and facilities.

Meanwhile a gamut of specialized equipment and test material was enroute to Levinstein Hospital. An 8 channel FM tape recorder, portable 1/2" video tape recorder, and even an airconditioned mobile van were rounded up for Levinstein Hospital, which equipped the van with the above equipment and also their own sensitive equipment, much of which was built specially for this project. (see following page).

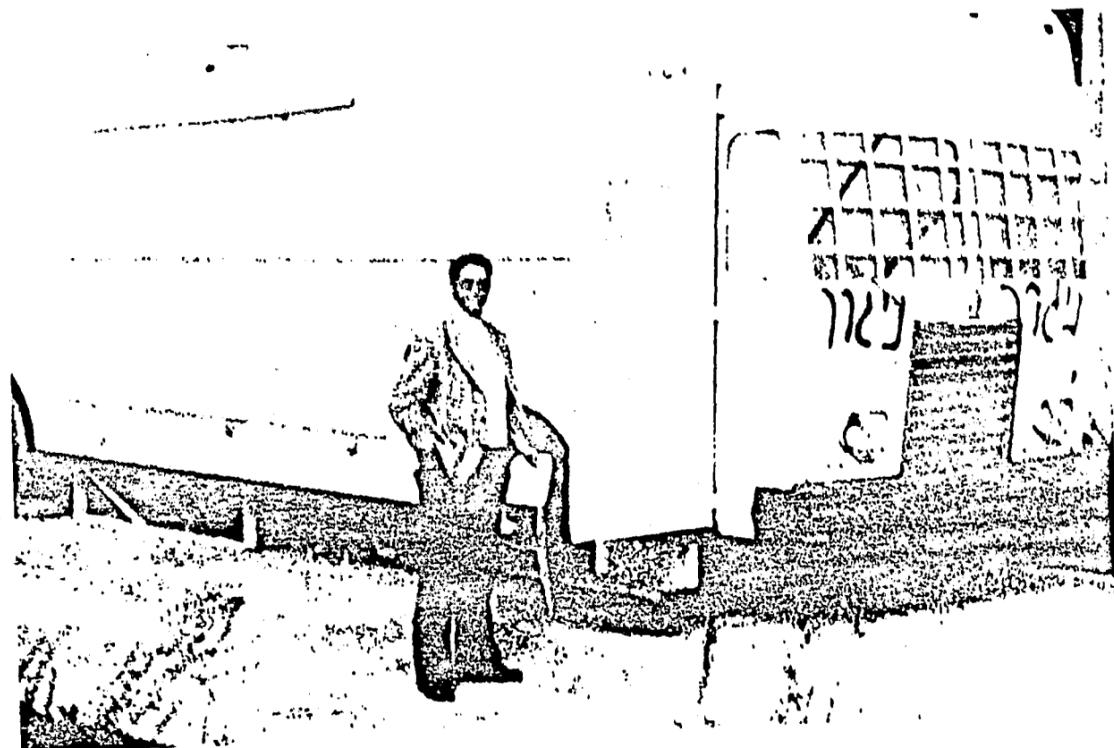
In January 1979 a major prison break of 8 'lifers' from Ramle maximum security prison delayed the start of the neurophysiologic testing until April. These tests were given in the van (see photo) in a secluded, quiet part of the prison yard. The van (received on loan from the Hadassah Medical School), the equipment, and the battery of tests were pre-tested at Levinstein Hospital and later transported to Ramle Prison. The neurophysiologic data gathering was completed in July 1979 on 99 subjects. Urine samples (to screen out possible narcotic effects) were taken from 91 subjects. This 15.4% drop out rate was extremely low for prisoners undergoing such potentially incriminating testing.

Immediately upon completion of neurophysiologic testing, blood samples were taken. A first batch of 40 samples was air-freighted to Los Angeles in October 1979. A second batch of 19 samples was later sent in April 1980. Altogether 59 blood samples were taken. This represented 50.4% of the total research population of 117.

At present the data from both the sociopsychologic and the neuroendocrinologic disciplines have been collected and initially analyzed. Summary scores have been given for each subject. These scores will be forwarded to the Israel Police, who are integrating the data. Master tapes will be supplied to each of the principal scientists after completion of summary scores. Due to the complexity of the neurophysiologic and neurologic testing, there has been some delay in analyzing that discipline's data.

### Behavioral clusters of violent prisoners

In order to construe a behavioral classification of offenders, we made a list of all the offenses carried out by our research population over the last ten years. The prisoners who were found to be violent both within the prison and outside it also were included in this analysis. Violent prisoners were defined as those who perpetrated offenses, the main component of which was a physical injury to another person. Only those offenses for which a conviction had been reached were included in the list of violent offenses committed outside the prison. Offenses for which inditement was filed or in which the defendant was found not guilty were excluded. The behavioral factors of the violent offenses were gleaned from the judgement of the court, and our aim was to achieve maximum reliability in trying to ascertain the facts - while assuming that the decision of the judge as to the acceptability of the various versions has a factual veracity. To this end we construed the following criteria by which each offense was



MOBILE VAN FOR NEUROPHYSIOLOGICAL TESTING

classified:

Sex of the victim  
 Was the victim chosen by sight, by certain criteria or accidentally  
 Type of link between criminal and victim  
 Was there any provocation on the part of the victim  
 Was there any conflict before the offense was committed  
 Was there any sexual background to the offense  
 Was the offense committed under the influence of drugs, alcohol  
 Was the motivation for the offense, sexual, lucrative, emotional  
 Was the offense planned  
 Was the offense committed by a group or individual  
 Was the offender a leader or follower  
 Was the offense completed or not  
 Was the offense committed in a professional or impulsive manner  
 Was the behavior of the offender at the time of the perpetration  
 of the offense calm, excited or disoriented  
 Amount of injury to property  
 Type of weapon

Concerning the offenses committed in prison, we encountered difficulties in gleaning the facts, due to the reluctance of the prisoners to divulge details of their conflicts with other prisoners. After examining all the possibilities of the situation for each offense, we decided to get the details of each violent act from the officer in charge of discipline and intelligence in prison. The prison log book, specifying the perpetration of the offense, was also utilized.

Our population consisted of two groups, those who were violent in and out of prison and those who were violent outside prison but not inside prison. There were no prisoners who were violent inside prison but not outside. Then, in order to find homogenous clusters of offenders based on type of offense, we utilized a cluster analysis program, which is a solution for finding homogenous classes of objects, given a matrix of some measure of distance (or similarity) between objects. Even though the number of offenders in our study was 60, the number of offenses committed by them amounted to 142, since some offenders committed more than one violent offense (maximum number of offenses for each offender was six). Thus the objects for the cluster analysis were offenses rather than offenders. The differentiation of offenders into homogenous clusters was based on the distribution of offenses committed by a single subject into different clusters.

If more than half of the offenses of a subject fell into a single cluster this subject was assigned to that cluster. The measure of distance between offenses was based on the characteristics of the offense across 18 behavioral traits, describing the offense and the circumstances under which the offense was committed. More specifically, the measure of distance between pairs of offenses was the Euclidian distance computed on the 18 standardized trait scores.

Cluster analysis yielded two main clusters of size 45 and 26 offenses and three subsidiary clusters of 10, 7 and 6 offenses. The remaining 48 offenses, not having been clustered, were considered as a

group of heterogeneous offenses. We considered this cluster analysis as a primary reiterative process of identifying meaningful homogenous clusters. As a second step we compared the different clusters across the 18 traits upon which the dissimilarity measure was constructed in addition to other criteria such as the legal description of the offense and the location of the crime, whether it was performed inside prison or outside of prison.

The largest cluster was characterized mainly by a high proportion of robbery offenses, even though some assault and murder offenses fell into this cluster. The second cluster consisted largely of assault offenses, and the third cluster was composed mainly of rape offenses.

The criteria for assigning an offender into one of the three clusters described previously were as follows: If the subject committed only one offense he was assigned to a cluster according to this offense. In the case of two or more offenses, the offender was assigned to a specific cluster depending in which cluster the majority of his offenses fell. An additional fourth group was constructed comprising subjects whose offenses were not classified into any cluster. This group could be called "individual offenders group".

The first important finding is that the distribution of offenses committed outside prison or inside it was not significantly related to the behavioral content of the offenses, as displayed by our criteria of classification. This in itself is a very significant finding validating our behavioral criteria as describing the intrinsic nature of the offense, beyond its place of perpetration and its modus operandi. The end product of our analysis was the five following clusters relating to the behavioral profile of offenders:

The first cluster consisted of 26 offenses and was characterized by the following parameters: these were predominantly cases of assault, the victim being both male and female; the victim was not chosen and was randomly assaulted; the link between assailant and victim was random and occasional; there was sometimes a previous skirmish between offender and victim; the motivation was passionate and emotional; the offense was not planned in advance, but was spontaneous; it was carried out by the offender alone without the aid of others; it was not professional or impulsive; and the assailant was very aroused at the time of the assault and the incidence of the use of arms was very low. We shall note this cluster as the "impulsives" because it signifies the impulsive outburst of violence without premeditation by people who apparently are unable to control themselves effectively. They are hungry for stimuli and excitement and they are 'looking for trouble,' not being very particular as to who the victim is.

The second cluster comprised 46 offenses: the victim was not sexually determined; the victim was carefully chosen by predetermined criteria; there was no previous proximity between assailant and victim; there was no previous skirmish or violent encounter; the motivation was calculated for gain or remuneration; the deed itself was planned; it was carried out with the help of others in a professional manner; the deed itself was not impulsive; the assailant was relatively composed while carrying out the deed; and there usually was use of arms. We

shall call the offenders within this cluster the "professionals" because they perpetrate their offenses in a cold blooded, calculated manner, motivated either by lucrative gain either for themselves directly or because they got a 'contract' from somebody else in the underworld to settle accounts with the victim. The relationship is typically of a professional assailant without any previous contact with the victim, and the sole purpose of the assault is a cold blooded, premeditated means to achieve a certain goal which is instrumental in the achievement of the lucrative aims of either the assailant or his organization.

The third cluster consisted of 7 cases of murder. Most of the victims were women--wives, relations or acquaintances of the offenders. The motivation of the offense was passionate and belongs to the type of offense which, although it may not include a legal provocation, is certainly provoked by the behavior of one of the couple followed by an emotional reaction by the other. This positive feedback cycle erupted into a situational outburst of violence which lead to the assault and murder. This cluster can be combined with the first cluster to form the impulsive group of violent offenses, the perpetration of which is less rational than the others.

Cluster four consisted of 6 professional murders presumably committed with a cold, calculated intent with a clear identification of the victim. This is the underworld type of cold blooded murder which certainly can be combined with the second cluster to form a combined group.

The fifth and final cluster related to 10 cases of sexual assault with a very marked sexual motivation. The cluster was characterized by the following criteria: the victim was female and prechosen by criteria; there was no previous link between the offender and victim or a random chance relationship; there was no previous skirmish or conflict, or passionate motivation; the act itself was planned and carried out solitarily; no professionalism was involved in this type of offense; the offender was very aroused during the act and seldom used weapons.

It should be pointed out that when the cluster analysis was carried out again using the behavioral criteria without the "legal tags," it reconstructed the behavioral profiles of the offenses and the offenders. This shows again that there is no need for the legal tag in order to define the behavioral content of the offense or the behavioral profile of the offender. We should also mention that some of the offenses, although having a legal tag, had no discernible behavioral characteristics which enabled us to classify them in a cluster. This means that the legal tag in itself was not sufficient for the construction of our behaviorally based dependent clusters.

It is important to mention that there were no correlations between the various criteria which characterized the offense, meaning that the characterization of each parameter is cumulative to the other, and one cannot describe one parameter by the other.

After having achieved the behavioral classification of the violent offenders, we now can proceed to relate the various psychological, somatic and endocrinological correlates as dependent variables which should be linked in turn to these independent clusters. Consequently, for the actual purposes of describing our clusters we may present three clusters, the first one consisting of clusters number 1 and 3 which we shall call the "impulsive emotional violent offenders", the second cluster consisting of clusters number 2 and 4 which we shall denote as the "accounts settling" type of violence perpetrated by professional offenders, and cluster 5 becomes the third cluster of sexual offenders. Our combining of the clusters 1 and 3 to form the new cluster number 1 and of 2 and 4 to form the new cluster 2 was justified by the fact that they were more similar in their parameters than different.

#### Scaling analysis of violent prisoners

The categorization inherent in cluster analysis helped to clarify some of the behavioral parameters of our population. But for the purposes of the actual linking of the continuous variables of our study, we decided that it would be more appropriate to construct scales of the relevant behavioral parameters of our research population. The reasons for this are that scales are more dynamic and less rigid than clusters, and the categorization into clusters artificially fit the subjects into categories to which they only partially belong. Finally, this method allows the possibility of scoring each subject separately along several scales.

In the first stage we reevaluated all the criteria which have been used to characterize the behavioral parameters of the offenses for the purpose of the cluster analysis. We constructed a continuum, following this analysis which characterized all the offenses ranging from the planned, to the intermediate stage of planned and impulsive, to the impulsive, as shown in the following table:

#### The Criteria and Their Categorization

V13	Was the victim chosen:	1. by sight by certain criteria	- planned
		2. unknown	- planned + impulsive
		3. accidentally	- impulsive
V14	Type of link between criminal and victim		
	1. perpetration of act under orders of others, acquaintance, know through work		- planned
	2. accidental connection, close friend, members of family, marriage partners		- planned + impulsive
	3. no connection		- impulsive
V15	Previous connection between criminal and victim:		
		1. yes	- planned
		2. unknown*	- planned + impulsive
		3. no	- impulsive
V17	Was there any conflict before offense was committed:		
		1. no	- planned
		2. unknown,*yes	- planned + impulsive
V23	Was the motivation for the offense:		
		1. lucrative	- planned
		2. sexual or otherwise	- planned + impulsive
		3. emotional	- impulsive

\*Indicates that there was no information in the file of the perpetrator to answer the question.

## Table (cont.)

V28	The offense was committed:	1. in a professional manner - planned
		2. unknown* or otherwise - planned + impulsive
		3. in an impulsive manner - impulsive
V29	The criminal has self-destructive tendencies:	
		1. no - planned
		2. unknown* - planned + impulsive
		3. yes - impulsive
V30	The behavior of the offender at the time of perpetration of the crime:	
		1. calm - planned
		2. otherwise, unknown,* rape - planned + impulsive
		3. excited - impulsive
V33	Type of weapon:	
		1. killing instrument, firearms - planned
		2. weapon other than firearms - planned + impulsive
		3. assault or damage without weapon - impulsive

\*Indicates that there was no information in the file of the perpetrator to answer this question.

It should be pointed out that we have included in this table only the criteria which could be categorized according to the continuum of calculation - impulsiveness.

The following table describes the distribution of the subjects on each of the criteria:

Distribution of Subjects on each criterion (in percentages)

		1	2	3
		planned	planned + impulsive	impulsive
V13	Was the victim chosen	78.5	7.9	13.6
V14	Type of connection between victim and offender	14.7	50.0	35.3
V15	Previous connection between victim and offender	39.8	17.7	42.5
V17	Was there are conflict before the offense was committed	51.4	48.6	
V23	The motivation for the offense	45.4	15.8	38.8
V28	The offense was committed in which manner	51.9	3.3	44.8
V29	The offender had self destructive tendencies	39.4	40.0	20.6
V30	Behavior of offender at time offense was committed	44.8	17.5	37.7
V33	Type of weapon	42.0	27.2	30.8

For the second stage we calculated the intercorrelations among the criteria.

The following table presents the intercorrelation between the various criteria. This table reveals that the correlation between the criteria signifying the type of link between the criminal and the victim (item No. V14), and the criterion relating to the previous link between the victim and his assailant (item V15) is .95. We can also see that the magnitude of the link and its direction between these two criteria and the other criteria in the table are similar. We have concluded therefore, that these criteria are equivalent and measure the same phenomenon. We decided to use criterion V15 (i.e. the previous link between victim and assailant) for scaling purposes.

The Intercorrelation Coefficients Among the Criteria

	V13	V14	V15	V17	V23	V28	V29	V30	V33	
Was the victim chosen	V13	-	.43	.56	-.19	.01	.16	-.17	.04	-.02
Type of connection between victim and criminal	V14		-	.95	-.59	-.29	-.18	.30	-.06	-.18
Previous connection between victim and criminal	V15			-	-.64	-.24	-.10	.21	.01	-.02
Was there any conflict before the offense was committed	V17				-	.54	.52	-.28	.33	.32
Was the motivation for the offense, sexual, lucrative or emotional	V23					-	.69	.09	.42	.26
Was the offense committed in a professional or impulsive manner	V18						-	.27	.81	.64
Did the offender have self destructive tendencies	V19							-	.38	.17
Was the behavior at time of perpetration calm, excited or distorted	V30								-	.41
Type of weapon	V33									-

The final stage of our analysis was a factor analysis of the correlation matrix between the eight criteria included in our analysis. This factor analysis was meant to estimate the number of dimensions that explain the mutual links between the criteria.

The following table presents the two factors which emerged from our factor analysis. Consequently, the criteria V13 + V15 (was the victim chosen plus the previous connection between the victim and assailant) belong to the same content realm whereas the other criteria V17 + V23 + V30 + V33 (was there any conflict before the offense was committed plus was the motivation for the offense sexual, lucrative or emotional plus was the offense planned plus the behavior of the offender at the time of the perpetration of the offense plus type of weapon) belong to a second content realm.

Results of Factor Analysis

	Factor I	Factor II
V13 Was the victim chosen by sight, by certain criteria or accidentally	0.09831	0.80124
V15 Previous link between criminal and victim	-0.14951	0.79060
V17 Was there any conflict before the offense was committed	0.60022	-0.44922
V23 Was the motivation for the offense, sexual, lucrative or emotional	0.66570	-0.11990
V28 Was the offense committed in a professional or impulsive manner	1.01727	0.06565
V29 The offender has self destructive tendencies	0.20794	-0.01802*
V30 Was the behavior of the offender at time of perpetration of the offense calm, excited or disoriented	0.76647	0.02062
V33 Type of weapon	0.55535	-0.01866

\*This criterion was not considered since its loading was not significant.

These two independent scales point to dimensions which describe our population. The relevance of the two independent dimensions is that the first relates to the motivation of the prisoner, irrespective and independent of his interaction with his environment. This we shall denote as the "motivational" scale. The second dimension relates to his impulsiveness or his intentionality as related to the interaction with his environment. This scale we shall denote as the "interactional" scale. This could enable us to ascertain the violence proneness of a prisoner irrespective of the actual human or physiological environment he is in, whereas the second dimension might add the environmental and interactional parameters which are cumulative in effecting a violent outcome.

The great advantage of these two scales is that they serve us as dimensions depicting the impulsiveness-intentionality continuum in both the motivation and victim-offender interaction of the violent behavior of our research population. We now shall be able to relate our psychosocial and somatic variables to these scale variables.

#### The sociocultural component of the Israeli prisoner project

The questionnaire comprising the psychocultural group of independent variables of this study begins with a general part consisting of identification items, demographic items, medical history, socialization problems, relationships with parents, family cohesion, relationship with peers, and employment history. The second part of the questionnaire deals with the relationships between guards and inmates within the prison, and the prisoners' attitude towards prisons and the police and criminal justice system, as well as attitudes toward membership and reference groups.

The third set of psychocultural variables relate to the personality assessment of the prisoners with the Cattell Adult Questionnaire (C.A.Q.) Form A. This test is a shortened form of Cattell's 16 Personality Factors (PF) Inventory which has been used successfully to assess personality variables, attitudes and behavior of mentally healthy subjects. Form B of the C.A.Q. is meant to assess various structural defects of personality as well as some forms of psychopathology (Cattell et al., 1970).

The Motivational Distortion Test, which is also taken from Cattell's 16 PF Inventory, is designed to measure social desirability, as well as the presentation of the self. The underlying notion is that the greater the desire of an individual to be accepted by a group the less violent he will be towards it.

The Raven Progressive Matrices test for non-verbal intelligence was included in the test battery because of some general notions in the criminological literature linking certain types of violent behavior with low verbal intelligence and higher performance intelligence.

The Sensation-Seeking Scale (S.S.S.) is a very effective instrument for measuring a person's hunger for outside stimuli (Zuckerman et al., 1964). This test is thought to be crucial for the assessment of personality in relation to the need of some individuals for constant external stimulation. The underlying hypothesis is that the more one needs outside stimuli, the greater are the chances of the person being involved in violent incidents.

The Matching Familiar Figures (M.F.F.) test measures the impulsive versus the reflective tendency of a person (Kagan, 1965; Kagan et al., 1974; Kagan & Messer, 1975). An individual who is impulsive is more likely to be violent than one who is reflective.

Kohlberg's Moral Dilemmas (Kohlberg et al., 1974) elicit open-ended answers and are meant to assess internalized moral attitudes. It is assumed that such moral attitudes have some mediating effect on behavior, and thus also on violent and non-violent behavior.

A test that assesses "tolerance of ambiguity" is also included in the battery (Budner, 1962). The hypothesis is that if a person is intolerant of ambiguity he is more likely to need to have control of his environment and, therefore, to react violently to ambiguous stimuli.

Levenson's test (Levenson, 1973) is a modern version of the "locus of control" test. The underlying notion for inclusion of this test is that if a person is internally-controlled he will tend to be less violent than if he is externally-controlled, e.g., by fear of sanctions.

The Risk-Taking Questionnaire (Shoham et al., 1976) presents situational possibilities of risk as related to goals of gain versus loss. The underlying notion for use of this test is that high risk-takers are more likely to display violence.

The test for Machiavellianism (Christie & Geis, 1970) assesses the tendency to manipulate other people in order to gain something from them. The rationale for the use of this measure is that if one is able to gain things by manipulating others nonviolently, one will be less likely to use violence.

Witkin's Rod and Frame test (Witkin et al., 1954) measures field dependence and independence. If a subject is more field dependent, he hypothetically would tend to be more violent when confronted with ambiguous and frustrating situations.

The Thematic Apperception Test (T.A.T) is a projective psychological test that uses a series of pictures about which the subject makes up a story (Murray, 1938). Some of the pictures present scenes of possible violence, in order to assess the orientation of the subject toward violence.

The neuropsychological component of the Israeli prisoner project

In a recent study Spellacy (1978) has shown that neuropsychological variables can help discriminate between violent and non-violent incarcerated offenders. Significant differences were found with regard to cognitive, language, perceptual and psychomotor abilities. Similar results, although with other populations, have been obtained by Yeudall (1977, 1978) and by Berman and Siegal (1976). Finally, in the New York Times of 26 June 1979 (Adams, 1979), reference was made to a study of Lewis, Balla and Pincus in which violent and non-violent offenders were compared. Symptoms of CNS dysfunction were established significantly more among the violent offenders. The consistency of these findings justifies attempted replication of these studies in the Israeli prisoner project.

The above mentioned neuropsychological impairments point to dysfunctions located in the prefrontal regions of the brain. This part of the brain plays an important role in the planning and regulation of behavior. Impairments in this area mean that the subject loses the power to look critically at the results of his actions, to correct his mistakes and to check whether his actions are following the right course (Luria, 1968, 1973). According to Nauta (1971) because of this lack of cognitive control, the comparison in the final analysis is one between the affective responses evoked by each of the various alternatives (quoted from Yeudall, 1978).

Lack of insight in the consequences of their behavior certainly is another correlate of neuropsychological impairments observed in impulsive violent offenders. According to Yeudall (1978), anterior brain dysfunction is responsible for the violent individual's changed perception of the world and, what is even more important, his reduced adaptive ability to cope with events and frustrations. This is why children with such dysfunctions need greater support from their environment in order to prevent the genesis of maladaptive behavior. From a developmental point of view it is interesting to compare impulsive violent offenders with children characterized by the minimal brain dysfunction syndrome (MBD). Indeed there is reason to link this syndrome with some forms of adult psychopathology or delinquency (Wender, 1972; Weiss et al, 1978; Mendelson et al, 1971; Tarnopol, 1970).

According to Wender (1972) children manifesting the MBD syndrome are characterized by two primary deficits: 1) An abnormality in arousal. To support this hypothesis Wender presents the following evidence. In an EEG study of children with "behavioral disorders", Stevens et al (1968) found a positive correlation between hyperactivity and a slowing of frequencies in the occipital region. Wikler et al (1970) have reported that hyperactive patients showed excessive non-age-dependent slow EEG activity. Assuming that slow wave activity is a measure of decreased arousal, Wender states these data would seem to indicate that some MBD children are hypoaroused. Satterfield and Dawson (1971), employing the G.S.R., found that 50% of their sample of hypoactive children showed characteristics assumed to

indicate low arousal (e.g. greater skin resistance). 2) A diminished capacity for positive and negative affect with a related diminished responsiveness to both positive and negative reinforcement. The latter should explain why many of these children tend to be disobedient and refractory to socialization.

The above mentioned observations suggest that the following correlates can be distinguished within persons with a history of repeated (impulsive) violence: neuropsychological dysfunctioning, slow EEG activity, low ANS, high impulsivity, low socialization; inability to establish warm emotional relationships and lack of empathy. Added to this could be poor parent-child relationships, rejection by parents, low academic achievement and low self esteem.

The question, then, is by what theoretical formulation could these separate elements be brought together? Neuropsychological dysfunctioning could have been caused by pre- and perinatal complications prematurity, infections of the brain in early infancy (e.g., encephalitis), pertussis or head injuries. A genetic factor cannot be ruled out. (It has been observed that in families with MBD children, similar neuropsychological dysfunctioning has been found more frequently among the parents than in families without MBD children.)

Because of these CNS dysfunctions, it may be hypothesized that the child becomes irritable, restless, quarrelsome, disobedient, emotionally somewhat unstable, clumsy and difficult to discipline. For the parents, it is not easy to love these children. Such children do not live up to the expectations that parents usually have about their offspring. The lack of positive emotional response is usually quite frustrating to the parents, perhaps especially so to the mothers. Therefore, if the syndrome is not recognized it can easily lead to emotional deprivation, frequent use of corporal punishment, and finally rejection of the child. This could have a serious impact on the child's capacity to develop emotional relationships with other people and also feelings of empathy. (On the other hand, this lack of warmth in interpersonal relationships could be directly caused by the neuropsychological dysfunctioning.)

Besides, as these children are not amenable to discipline, the socialization process greatly will be complicated and is likely to fail. These CNS dysfunctions also will have serious consequences for the academic achievement of these children. In the elementary school they will suffer from their concentration difficulties, restlessness, short attention span, etc. Because of their restlessness and being refractory to discipline, teachers will tend to experience these children as troublesome. Thus, the above features, together with low academic achievement of these youngsters, can easily lead to rejection of these children. Being rejected by parents as well as by teachers (and after some time also being rejected by their peers), these children will develop low self esteem, will tend to become neurotic, and will have to rely for their company on peers who also are not able to meet the usual expectations and demands of society. This is a critical point. From here the children can - depending on their

particular opportunity structures - become socially deviant in various ways. Because of their impulsivity and lack of empathy on the one hand, their frustrations on the other hand, and a lack of alternatives to solve their problems in socially acceptable ways, it is not difficult to hypothesize and to understand that such youngsters will tend to become increasingly prone to criminal and violent behaviors.

Assessment of the presence of CNS dysfunction in the Israeli subjects is taking place in the following ways:

- 1) By carrying out a neurological examination;
- 2) By administering neurophysiological tests like EEG, alpha at rest, alpha drive, critical flicker fusion and visual evoked response;
- 3) By collecting G.S.R. data; and
- 4) By administering the following neurological tests: a Halstead's Tactual Performance Test; a Halstead's Trail Making Test; a Hebrew version of Reitan's Categorization Test; a Hebrew version of Luria's Test for Verbal Memory; Recall of Rey's Figures; Gibson's Spiral Maze; Digit Span; and Raven Progressive Matrices.

The data collected will be analyzed in various ways: 1) By comparing various categories of violent offenders with each other and with non-violent offenders and a reference group matched for age, S.E.S. and ethnicity. 2) By constructing a network of relationships around the expected neuropsychological impairments. Correlations will be calculated with the results of the neurological examination, the neurophysiological data, the G.S.R., parent-child relationships, academic achievement and the scores on psychological variables like S.S.S., M.F.F., Kohlberg's Moral Dilemmas, Stanley Baker Test, Rod and Frame Test, and the Risk Taking Test.

#### The psychophysiological component of the Israeli prisoner project

There are two bases for predicting relationships between psychophysiological variables and violence:

1. Research on offenders (in general) has yielded the clear finding that their skin conductance responsiveness is at a low level; they make few responses, habituate quickly, and recover slowly.
2. One study (with a small number of subjects) has specifically examined skin conductance behavior in violent offenders

(Hinton's unpublished research at Broadmoor in England). Hinton divided his violent offenders into two categories: (a) life criminals: those whose violence was embedded in a total life pattern of criminal behavior including violence against strangers; and (b) mentally ill persons: those whose violence was typically directed at someone they knew. This second category was heavily populated with violent offenders who were diagnosed at Broadmoor as "schizophrenic."

In terms of skin conductance, the life criminal violent individuals resembled the hypo-responsive-slow-recovering criminals previously described in the literature. The mentally ill violent individuals were hyper-responsive-fast-recovering (as has been reported in the literature for schizophrenics) (Hinton et al., in press).

The Guttman MSA categorization of the Israeli prisoners yielded three types (plus one residual type); two of these seem to resemble Hinton's (in press) two types (viz., the aforementioned "professionals" and "impulsives"), and make up the majority of the cases.

These findings make possible empirically-based predictions regarding the skin conductance patterns of two of the violence-types which the MSA analysis has disclosed. (It is an interesting aside that the English psychiatrist Mayer-Gross (Mayer-Gross et al., 1954) classified psychopaths into two not-related types - the unstable drifter, who tends to be an impulsive stimulus seeker, and the cold and emotionally callous person who is inclined to be detached, schizoid, and with schizophrenic relatives.)

As mentioned above, there are several publications reporting relationships between neuropsychological dysfunctioning and crimes of violence (e.g., Spellacy, 1978; Yeudall, 1977; Berman & Segal, 1976). Thus, the neurophysiological assessments will be compared with some neuropsychological assessments in the Israeli project. In this regard, the research by Spellacy (1978) is particularly relevant since his work had also involved comparison of incarcerated violent offenders with a group of matched inmates without histories of violence.

In the case of the EEG work there is a weaker empirical basis for prediction. Clinical EEG reports with violent offenders have not all been equally excellent methodologically. There are scattered reports that violent criminals have abnormal EEGs of a variety of types. The occipito-temporal, 14-6 cycles-per-second spike pattern has been suggested as a correlate of impulsive and violent behavior, but again the control groups have not been totally adequate. It has also been noted that EEG patterns suggestive of psychomotor epilepsy are related to aggression, but again methodological problems make these studies of questionable value. The greatest methodological problems were that the EEG studies were carried out on individuals who had already experienced violent interactions, and there was the absence of control groups. However, some hypotheses may be garnered from neuropsychological studies of offenders; these studies have suggested

that psychopaths have left hemisphere dysfunction, especially in the frontal-temporal lobes.

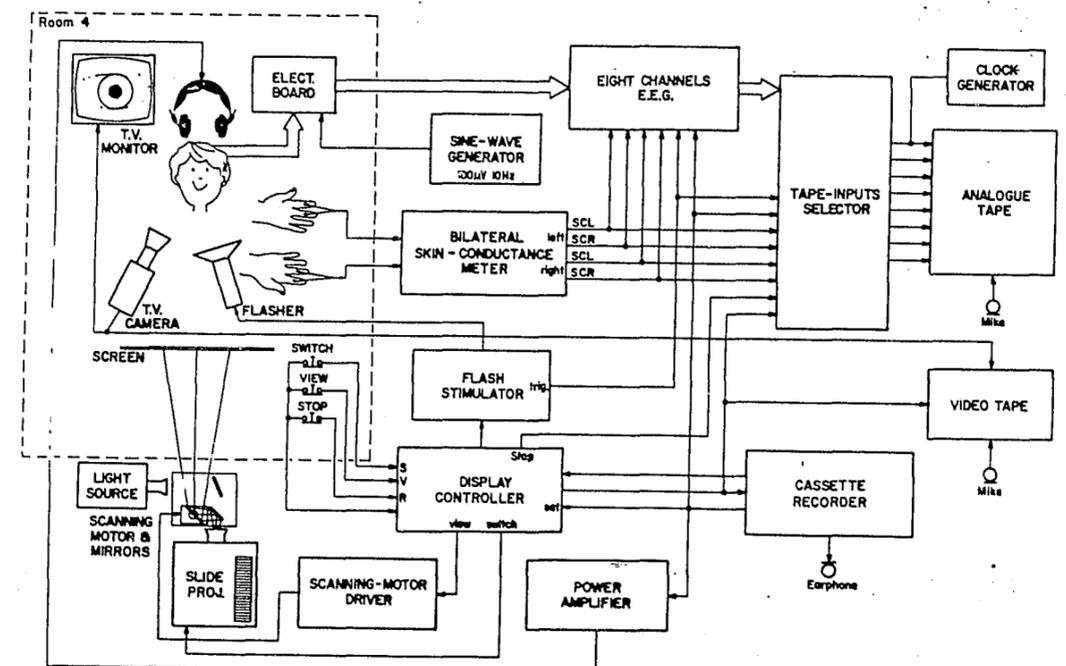
In addition to the classical tests of the autonomic system such as pupillometry and galvanic skin resistance, a new test of autonomic-motor interaction has been incorporated. This is based on the paradigm that motor action might lead to autonomic reinforcement and thus to possible aggression enhancement not detected by tests of the autonomic system only. The tests include the presentation of 2 sequences of 5 stories, each "told" by 5 slides. Motor interaction was introduced by permitting the subject to determine the number of times each slide will be presented. In addition, the subjects also control the rate of slide change.

Four additional tests also are being incorporated into this paradigm: Contingent Negative Variation, Visual Evoked Response, EEG and Critical Fusor Frequency (to determine alpha drive). Neurological examinations include physical examinations as well as psychological tests for possible detection of brain damage (both organic and non-organic) currently in use in Leinstein Hospital. From these data we hope that a model can be suggested based on criminological, social, endocrinological and neurophysiological aspects that will characterize the aggression behavior of the inmates.

1. The Pupillometer Test: The pupil size, measured with a video camera, will be stored on a video-recorder. The preliminary tests indicate that in the system used in this study, 30-40% pupil diameter changes can be obtained for different slide contents. The slides were divided into 4 sets, each set directed to the behavior of one of the group of subjects. The pupil diameter is being measured for each subject.
2. The Autonomic-Motor Interaction Test: In this test the possible reinforcement of motor reaction on the autonomic system is measured. The autonomic reaction is measured from pupillometer measurements, and possible motor reaction reinforcement is measured from the temporal sequence of slide changing. This relationship is being calculated for each subject.
3. The Galvanic Skin Resistance Test: This test is conducted according to Prof. Venables's and Prof. Mednick's algorithm; in this algorithm, time constants are correlated with aggressive behavior.
4. The Contingent Negative Variation Test: The motor reaction to a tone conditioning is being measured. The time course of the average EEG response to the pseudorandom pre-conditioning stimulus also will be quantified.
5. The Visual Evoked Response Test: Late components in VER, considered to be characteristic of "mental process," are being measured. The response latency in the P>300 range will be used.

6. The EEG Test: Classical EEG is being performed, and abnormal signs based on visual examination are reported. Accepted criteria of EEG analysis are employed. These results will be correlated with the neurological examination.
7. Physical Examination: The results of the physical examination are being coded and analyzed. The pathological distribution will be reported for the entire population and for each of the study groups.

The Data Acquisition System is illustrated in the following Figure and permits the presentation of the sequence of tests in a semi-automatic mode to decrease time spent between tests. It also permits, as illustrated, the accumulation of the data on both EEG paper and analog tape.



The tests, summarized in the table below, are given in continuous session of approximately ninety minutes:

Table 1. Psychophysiological Tests - Summary Table

Test Name	Variables Measured	Recording Durations (min)			Stimuli	Test Duration (min)
		Paper	Tape	Video		
Pupillometry P.	Pupil Diameter Bilateral Skin Conductance Eye Movements	4*	4	4	12 Slides	9
Autonomic- motor Interaction A.M.I.T.	Pupil Diameter Motor Reaction Skin Conductance Eye Movements	11*	11	11	2 Sequences of 5 Stories each "told" by 5 Slides	15
Electro- dermal Activity G.S.R.	Bilateral Skin Conductance EEG - 2 channels	15	15	-	Auditory Tones	15
Contingent- Negative- Variation C.N.V.	Motor Reaction EEG - 5 channels Eye Movements	31*	31	-	Auditory Tones followed by 15Hz Flashes	33
Visual Evoked Response V.E.R.	EEG - 6 channels Eye Movements	5*	5	-	Flashes	6
EEG and Critical Flicker Fusion EEG	EEG - 6 channels Eye Movements	11	11	-	Verbal Instructions and Flashes	15

\*Optional for calibration, data verification and special events.

An air conditioned van was placed in a quiet remote spot outside the main buildings in Ramla Prison for the psychophysiological test. The van is a four-roomed, serially arranged dentist's bus about fourteen meters long, as shown in the earlier Figure in the introduction. (from here on the rooms will be referred to by numbers given from the front of the van to the rear). Room No. 4 was selected for the tests, and it was sealed with acoustic matter in order that the subject would be seated in a partially darkened, silent environment. Acclimatization was so designed that the subject would rest at least half an hour in the van and an additional ten minutes in the test room prior to the testing session. Furthermore, the relative humidity and the shade temperature measurements outside and inside the van were taken and recorded three times a day.

On the testing days, urine samples were taken in the morning from a group of prospective subjects. Drug screen tests were performed on these samples. The exact procedure for the drug tests was chosen from the following two options, according to the results of a pre-test: Option 1) The urine samples were screened for drug usage every morning and negative answers were delivered on the same day, about three hours later. Thus, testing began only with drug-free subjects, or Option 2) In case the pre-test indicated a cardinal drug abuse in prison, presumably hash, the results of the drug tests were accepted post facto and the collected data will be analyzed accordingly.

The whole population passed a neurological questionnaire before the beginning of the psychophysiological tests. The questionnaire was taken and filled in by Prof. Najenson, head of Levinstein Hospital. The results thus obtained indicated for which subjects certain tests might be invalid and thus should be eliminated from the sample. In addition, a psychophysiological test considered to evaluate minimal brain damage was given to each subject.

A psychological attitude test was delivered at the end of the testing session for each subject by an independent person. The aim of this test was to try to get some measure of the subject's attitude towards the tests he had just experienced. The questions concerned the feelings of convenience and dislike during some or all of the test, fear from pain, subject's level of concentration, clarity of the instructions given and the subject's fatigue. The answers will be graded in six levels. Some subjects might be rejected later on the basis of these results.

In the block diagram of the foregoing figure the various specific test data flows are illustrated. The dashed lines indicate room No. 4 where the subject is seated. For some tests the subject stares at a screen in front of him where various texts are shown from slides for pupillometry and AMIT tests, during which time his right eye is video-photographed. Alternatively, for other tests the subject looks at a flash stimulator (EEG and VER tests). He is also able to hear the different audio stimuli to be given through headphones. EEG and eye movements are transferred to the instrumentation room No. 3, via an EEG electrode board. During pupillometry, AMIT, and the GSR tests,

skin conductance electrodes are connected to his fingers. Telegraph-keys, symbolized by a normally-closed push-button, are introduced in front of the subject in a convenient location and serve as controls to be operated by him in the AMIT and CNV test.

The display-controller provides the logic designed for the pupillometry, AMIT, and CNV tests and by controlling the flasher and the optical system, introduce the various stimuli. The 10 Hz sine wave generator supplies a calibration signal for the EEG channel, and the clock generator gives an accurate clock to facilitate better A/D conversion during play-back.

#### The neuroendocrine component of the Israeli prisoner project

Measures of testosterone secretion have been related to measures of aggressive behavior and social dominance in men. Persky et al (1971) studied 18 healthy young men and found that the production rate of testosterone was highly correlated with a measure of aggression derived from the Buss-Durkee Hostility Inventory. A multivariate regression equation was obtained between testosterone production rate and four psychologic measures of aggression and hostility, which accounted for 82% of the variance in the production rate of testosterone in these young men. Kreuz and Rose (1972) studied plasma testosterone levels and indices of fighting and verbal aggression in 21 young prisoners. While plasma testosterone levels did not differ between fighting and non-fighting individuals and did not correlate with psychological test scores, the ten prisoners with histories of more violent and aggressive crimes in adolescence had a significantly higher level of testosterone than the 11 prisoners without such a history. These investigators hypothesized that in a population predisposed by social factors to develop antisocial behavior, levels of testosterone may be an important additional factor in placing individuals at risk to commit more aggressive crimes in adolescent life.

Meyer-Balburg et al (1974) separated five low-aggression male undergraduate college students from six high-aggression students on the basis of the Buss-Durkee Hostility Inventory, and found that while the two groups were reasonably differentiated on several aggression scales, they did not show any significant differences in the production rate, plasma levels, or urinary levels of testosterone. Ehrenkranz et al (1974), on the other hand, determined plasma testosterone levels in 36 male prisoners--12 with chronic aggressive behavior, 12 socially dominant without physical aggressiveness, and 12 who were neither physically aggressive or socially dominant. These groups were separated on the basis of a battery of psychological testing; and there was a significantly higher level of plasma testosterone in the aggressive group as compared with the non-aggressive group or with the other two groups combined. The socially dominant group also had a significantly higher level of testosterone than the non-aggressive group. Doering et al (1975) performed a longitudinal study of the association between mood and

plasma testosterone by sampling 20 normal young men every second day for two months with a multiple affect adjective checklist and plasma testosterone concentrations. Inter-subject correlation coefficients between hostility, anxiety, depression, and plasma testosterone were all positive, but only the correlation between depression and testosterone was barely significant at the .10 level; between the other two affects and testosterone the correlations were not significant.

Rada et al (1976) classified 52 rapists and 12 child molesters, hospitalized in an institution for male mentally disordered offenders, according to the degree of violence expressed during the attack. One morning plasma testosterone level was measured on each subject. The most violent rapists had a higher mean plasma testosterone than normals, child molesters, or other rapists. Mean Buss-Durkee Hostility inventory scores for all the rapists were significantly higher than the mean for normals, but individual hostility scores did not correlate with plasma testosterone.

Monti et al (1977) studied 101 healthy young adult male volunteers by the administration of questionnaires for anxiety, hostility, social desirability, and sexual interest and practices, and two daily determinations of serum testosterone concentration. Individual testosterone levels on the two days correlated significantly ( $r=.69$ ,  $p<.001$ ), but with only 48% shared variance, indicating a poor correspondence between the two daily testosterone values. Testosterone levels correlated to a significant degree with some of the psychological measures, but only because of the large sample size--all correlations were quite low. Thus, in these normal subjects, no major relationship was found between the questionnaire items and testosterone levels.

Persky et al (1977) studied forty male alcoholics during one week of abstinence and one week of unlimited alcohol intake. Compared to plasma testosterone levels during the week of abstinence, plasma testosterone was reduced significantly during the week of alcohol intake. Only low, borderline significant correlations occurred between testosterone levels and hostility as measured by the Buss-Durkee Hostility Inventory and the Multiple Affect Adjective Check List.

The above cited studies, several of which have been cited in reviews by Shah and Roth (1974), Rose (1975), and Kling (1975), indicate that the relationship between testosterone levels and the psychological dimensions of aggression, social dominance, hostility, and depression, remain in some doubt. The studies are contradictory. One methodologic problem that may contribute to the confusion is that plasma testosterone levels are variable from hour to hour and from day to day within the same subject and are quite variable between subjects. Goldzieher et al (1976) pointed out that plasma levels of testosterone, as well as of the pituitary gonadotropins luteinizing hormone (LH) and follicle stimulating hormone (FSH), undergo rapid, large fluctuations. Therefore, in the case of testosterone, a single random blood sample is likely to yield a value within +20% of the true mean value only 68% of the time--even less often for LH (30% of

the time) and for FSH (54% of the time). In the case of plasma LH, the major hormonal influence on testosterone secretion, Santen and Bardin (1973) showed that sampling every 20 minutes for three hours and for six hours reduced the 95% confidence interval of the mean LH level to +18% and +12%, respectively (as contrasted to +25% for nine daily samples). Goldzieher et al (1976) concluded that for testosterone, three equally spaced blood samples, taken at 6 to 18 minute intervals, is the optimum practical sampling schedule to yield accurate estimates of integrated plasma hormone levels. This sampling schedule was followed in the prisoner study, as described below.

Each prisoner had three blood samples taken through a needle placed in an arm vein. The samples were taken at 20 minute intervals, after a one-hour rest period following the insertion of the needle. Each blood sample was about 10 ml so that in total a very small amount of blood was taken. The samples were taken from each prisoner at the same time of day in order to eliminate diurnal variability in hormone levels. Three samples were over an hour's time because, as mentioned above, hormones are secreted episodically into the bloodstream; thus single samples may show a wide variability in hormone concentration. The blood samples were immediately centrifuged and the serum taken off and frozen. The necessary equipment was set up in Ramle prison in a special area provided for this research. The serum samples were sent to Dr. Rubin's laboratory in Los Angeles for hormone analysis.

Four hormones were measured in blood samples taken from the prisoner subjects. Luteinizing hormone is the major pituitary hormone regulating testosterone secretion, and prolactin also may play a role in this regard. Testosterone itself, the main androgenic hormone in men, also was measured. While there has been no clear relationship demonstrated between testosterone levels in blood and emotions of hostility and aggression in men, as mentioned above, there is some evidence published in the scientific literature that individuals with a long history of especially violent behavior, such as rape-murder, may have elevated circulating levels of testosterone (Kreuz, & Rose, 1972; Ehrenkranz et al., 1974; Rada et al., 1976). Finally, cortisol was measured in these samples. Cortisol is the adrenal cortical hormone most responsive to stress, so that there will be not only several measures of androgenic hormone secretion, but also a stress hormone measure to correlate with the measures of anxiety included in the social and psychological questionnaire.

Dr. Rubin recently spent a week in Israel relating the luteinizing hormone, prolactin, and testosterone data to the prisoners as grouped by history of violence and as scaled on the dimensions of motivation and interaction. On preliminary analysis there were no mean differences in any of the hormones between the groups of prisoners. More refined statistical analysis currently is being undertaken.

## The Philadelphia Collaborative Perinatal Project

### Introduction

The Philadelphia CPP sample constitutes the selection of all pregnant patients admitted to the Pennsylvania Hospital between January 1959 and December 1965. Unregistered emergency deliveries, patients who planned to deliver elsewhere, and mothers considering adoption for their children were excluded from the sample. The following table shows the annual breakdown of the total sample of 9,700 cohort members. The initial (1959-1960) and termination (1965-1966) cohorts indicate smaller sample sizes because of the lack of registration overlap from middle years.

During registration, women provided interviewers with medical and socioeconomic information about themselves, their husbands and their respective families. Data include mothers' laboratory test and physical examination results. At the time of delivery, the mother's physical status was again assessed and delivery conditions documented.

Whereas Pennsylvania Hospital was responsible for care of the mothers, Children's Hospital assumed responsibility for the children. (Both institutions are organizationally affiliated with the School of Medicine of the University of Pennsylvania.) Examinations for children were provided at four, eight, twelve and forty-eight months of age.

#### Annual Breakdown of Philadelphia CPP Cohort Members by Sample Size

1959 - 1960	N = 1275	First Cohort
1960 - 1961	N = 1300	Second Cohort
1961 - 1962	N = 1350	Third Cohort
1962 - 1963	N = 1450	Fourth Cohort
1963 - 1964	N = 1575	Fifth Cohort
1964 - 1965	N = 1500	Sixth Cohort
1965 - 1966	N = 1250	Seventh Cohort

Total: N = 9700

Final psychological and neurological examinations were administered to as many of the sample children as could be located. The home visit method contributed information updates at 18 months, and two, five and six years.

Generally, CPP data are described according to three subjects: the mother, the child and the family. In an examination of the total

population of CPP women, Myriantopoulos and French (1968) show that there is considerable variety among the demographic and socioeconomic characteristics, and that marked differences exist among samples of certain participating institutions. Although the total CPP population is skewed toward lower socioeconomic levels, the direction is not as extreme as could be expected considering most families were recruited from public hospital clinics. The Pennsylvania (Philadelphia) sample is about average for the CPP group, and slightly lower (by one decile) than the average socioeconomic level for the U.S. population. Ethnically, the Philadelphia sample is predominantly (87 percent) black, although the racial breakdown for the national CPP population is more evenly divided between blacks and whites (47 and 44 percent) respectively. In the Philadelphia sample nearly two-thirds of the patients were married at the time of registration. Consistent with the average in other institutions, two-thirds were between the ages of 20 and 34 and most of the remaining third occupied the 15 to 19 age group (McFalls, 1976).

The Philadelphia CPP sample thus reflects both a socioeconomic and a racial bias. Although this will limit the generalizability of the results to a certain extent, the design of the research focuses on internal comparisons to investigate the interactive effects of numerous factors on delinquency. Certain methods can also help to correct bias. For example, the Criminology Center is currently examining a 1958 Philadelphia birth cohort which provides a representative class and race distribution which may be used for estimating the extent of bias in the CPP sample. Accordingly, inclusion of the total percentage of CPP white youths through stratified random sampling, in addition to the weighting of subsamples, can permit more appropriate representation in the CPP for generalized comparison. Considering the independent nature of initial CPP sample selection, and the richness and detail of the data, internal comparisons between delinquent and nondelinquent groups are particularly worthwhile, regardless of the total sample representation.

The richness of the data warrants comment. The information provided about the kinds of data available indicates the extent and specificity of the information gathered and coded for the Philadelphia sample. Generally, physiological, biological, sociological and psychological data on the mother, the child and the family are grouped under various headings relating to a particular data category. For example:

OB: Obstetrical - includes the mother's reproductive, neurological, medical, psychiatric and gynecological history, in addition to a recent medical history. Detailed information is provided on prenatal observations, delivery room events and infant's physical condition.

PED: Pediatric - details delivery room observations and physical condition of the neonate, reports characteristics of fetal or infant death and the results of neonatal neurological tests. Included are interval medical histories reflecting periodic examinations of the

child to age seven, physical growth measurements and visual screening, in addition to other medical test outcomes.

PS: Psychological - contains considerable amounts of data on the behavior profile of the child (child's fearfulness, rapport with the examiner, cooperation, degree of dependency); the child's psychological test results (including the Bayley Scale for Mental and Motor Development, Stanford-Binet Intelligence scale, Bender Visual Motor Gestalt Test); maternal behavior while the child is tested (for example, the mother's expression of affection toward the child, her reaction to the child's needs, the child's appearance); intermittent speech, hearing and language examinations; and four- and seven-year psychological assessment examinations.

FHH: Family Health History - updates socioeconomic and genetic information on the child's family for comparison to information recorded during mother's registration (see SE). Includes data on possible hereditary mental and physical abnormalities in the child's siblings.

SE: Socioeconomic - provides a variety of socioeconomic indicators of the child's family, such as parents' income, occupation, education, number of dependents in the household and family residential fluctuations.

GEN: Genetic - presents, in addition to family health history, genetic data on the child's siblings, such as congenital malformations and fetal deaths.

In sum, therefore, the CPP data are unique with regard to research on the biosocial correlates of delinquency and crime. While past biosocial research has, for the most part, concentrated predominantly on the impact of biological factors on criminality to the near exclusion, or depreciation, of the impact of environmental factors, the CPP data allow rigorous examination of the separate, combined and interacting effects of both extensive biological and sociological information. Furthermore, the availability of seven consecutive cohorts provides an overview of the impact of social trends on delinquency because the sample extends over a seven-year period. A time series analysis is enhanced because the data base contains sibling members. Of the 1903 mothers in the Philadelphia CPP who had more than one child included in the sample, 1393 had two children included, 397 had three children, 133 had four or more children included. The CPP data base also contains 117 twin pairs. The inclusion of sibling members permits a sensitive examination of genetic and social effects within the family context, an opportunity which has not been available in most other research efforts.

Particularly advantageous is the potential for follow-up interviewing and research of cohort children who, at present, range in age from 12 to 19. Follow-ups enable a retrospective examination of events and physical development occurring since age seven in addition to participants' current attitudes and life styles. Differential data before and after age seven also contribute a change in focus

consistent with a mental and physiological transformation in the child's development.

#### Selection of CPP variables and other data

Three main data sources will be used for determining the biosocial correlates of delinquency and crime according to the probabilistic model: (1) the Philadelphia CPP data, (2) police and school (official) record data, (3) follow-up interviewing and psychophysiological testing of a select sample of CPP subjects.

#### The Philadelphia CPP data

The CPP data contain predominantly predisposing or inhibiting variables grouped according to the mother, the child, and the family. Variables may be more specifically classified according to the breakdown provided by the Interdisciplinary Group on Criminology (1978).

#### Police and school (official) data

Both police and school records will be collected for all 9700 members of the seven consecutive cohorts using data collection techniques similar to those in Delinquency in a Birth Cohort (1972) and the Criminology Center's current 1958 birth cohort project.

The CPP data are particularly advantageous because cohorts were selected independently of their involvement in the juvenile justice system. Thus, subjects' behavior can be examined before and after any possible official record; system contact need not be a confounding factor. According to the Center's past cohort study (1972), approximately 50 percent of black male offenders will have at least one official police contact (i.e., arrest record) before age 18. Because the CPP data are composed predominantly of black youths, we can expect a considerable percentage of the sample to have had some official contact. As a result, there will be a sufficiently large number of subjects for comparing delinquent and nondelinquent youths according to the range of variables used.

For all subjects, official delinquency data are being collected at age 18 and annually thereafter for those cohorts entering young adulthood. Because the present CPP sample ranges in age from 12 to 19, data collection will concentrate initially on the two cohorts that have left the juvenile justice system.

The arrest record codebook used for the Center's Philadelphia birth cohort study allows an intense examination of information on each arrest and court disposition. The 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 in addition to 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 complaint, any property which may have been stolen and its value, the complainant-offender relationship, the number of those injured and seriousness of injuries, use of and type of weapon present, and extent of verbal or physical intimidation. The arrest report details arrest relevant information such as the date, time, and place of arrest; the race, sex and number of those involved; offender's occupation; the crime classification; and the relation of the number of charges to the number of events. A seizure analysis report is included for cases involving seizure of drugs and alcohol. The report indicates the method of seizure, and the quantities and types of items seized. Data from the JAD report include the offender's adjudication and disposition outcomes.

In addition to the data just mentioned, all offenses are being coded for seriousness according to the scale used in the Criminology Center's current National Crime Severity Study. This seriousness scale allows a more precise representation of offense seriousness which is not reflected in the arrest code classification. Seriousness is determined by assigning weights to the amount of injury, theft and damage that occurs in the offense. For offenses not involving these three components, comparable scores, derived from the same scaling exercise, are available. Moreover, the National Crime Severity Scale indicates a continuum of current public sentiments on what is considered to be serious.

Both police and school records provide evidence of a youth's behavior in childhood and adolescence. Although police data will define the major dependent variable in this study, i.e., criminality, records will also include possible contributing, facilitating and situational variables. Whether or not drugs or alcohol were ingested, a weapon was available, etc., adds to the causal chain of factors and events leading to illegal behavior.

In turn, school data indicate both predisposing and inhibiting factors. Although access to school records can never be guaranteed, there is the belief that access to public school data can be secured for this project. Both the Criminology Center and the Institute for the Continuous Study of Man have enjoyed the cooperation of the Philadelphia School District in past and current research efforts.

School records contain a variety of retrospective information which is complementary to the CPP data collected during a child's first seven years. I.Q. test results, academic record, learning disabilities, parents' occupations, behavioral disorders, some medical data and so forth contribute considerable background data over time. Data which may bear an association to early childhood disorders and later criminality are also available. For example, evidence of communication problems during early childhood (which can have a biological base, such as brain dysfunction) and school failure in

adolescence may be a consistent pattern among delinquent youth.

#### Interviewing and psychophysiological testing

Examination of the CPP medical data, and particularly follow-up psychophysiological testing, necessitates acquiring an interdisciplinary research team. The primary hypothesis of this study is that a number of interrelated biosocial factors contribute over time to varying patterns of law-violating behavior. Although the focus is directed toward that behavior which is particularly aggressive and violent, other forms of criminality will also be included. Detection of the factors involved, and their sequence of influence from childhood to adulthood, are being emphasized.

#### Initial data analysis

Preliminary findings were based on the first two of the seven cohorts of youths whose mothers participated in the project at Pennsylvania Hospital between 1959 and 1966. Analyses incorporated selected prenatal, perinatal and postnatal variables acquired on both the mother and the child at varying time intervals during the study, ranging from the time of the mother's pregnancy to age seven of the child.

Upon selection, each mother was administered a battery of interviews and physical examinations. Additional data were acquired at the time of delivery and during the fourth- and eighth-month and four-year examinations. Information on the child was collected at various developmental periods: a general pediatric examination at four months, a mental and motor developmental assessment at eight months, a neurological examination at one year and a psychological assessment at four years. A speech, hearing and language examination was applied at thirty months and assessed finally at seven years. Cohorts were more than half (52%) female and predominantly (87%) black.

Preliminary analyses in the project concerned two major areas possibly related to the occurrence of officially defined delinquent behavior: 1) the association between variations of individual and summated birth stress events (fetal-neonatal brain damage) and subsequent evidence of cerebral dysfunction and behavioral disorder, and 2) the association between different indicators of laterality (eye, hand and foot) and tests of mental functioning.

Associations between fetal-neonatal brain damage and consequent cerebral dysfunction found in past research indicate that early brain damage, particularly due to hypoxia, potentiates later neuropsychiatric disabilities which vary according to the degree and the location of the injury (Knobloch and Pasamanick, 1959; Towbin, 1978). Kawi and Pasamanick (1958) hypothesize a "continuum of

reproductive casualty" ranging from fetal deaths "through a descending gradient of brain damage manifested in cerebral palsy, epilepsy, mental deficiency, and behavioral disorders in childhood". Further empirical evidence tends to support this association with other frequently related disturbances such as schizophrenia (Mednick, 1970; Mednick et al., 1971; Campion and Tucker, 1973; Handford, 1975), minimal brain dysfunction (Wender, 1971; Benton, 1973; Kalverboer et al., 1973; Reitan and Boll, 1973; Vandenberg, 1973; Bernstein et al., 1974; Mednick, 1977), problems associated with cerebral dominance (Vandenberg, 1973; Bernstein et al., 1974; Gur et al., 1979), reading failure (Kawi and Pasamanick, 1958; Denhoff et al., 1972), delinquency (Rosenberg, 1978) and general behavior disorder (McNeil, 1970; Cott, 1978). Other studies report no correlations or weak links between pregnancy complications and later neuropsychiatric or behavior disorders (Werner, 1968; Colligan, 1974) and delinquency (Pasamanick and Knobloch, 1966; Litt, 1974; Shah and Roth, 1974; Schulsinger, 1977; Lewis et al., 1979). These discrepancies in results may be attributed to differences in sampling, statistical techniques, selected behavioral indicators and differential subgrouping of studied behaviors.

There is also little evidence of attempts to categorize, or more precisely define, indicators of prenatal, perinatal or postnatal damage in relation to subsequent behavioral disorder. However, available studies of their separate and accumulated impact, detectable in autopsies, suggest that such a distinction may be important, particularly in terms of the timing and location of brain damage. To determine such differential impact, three summary variables of prenatal, perinatal, postnatal CNS damage to the infant were used, in addition to a fourth total measure of all three variables to indicate accumulated injury. Each of the four variables was examined in association with tests of mental and motor performance, neurological abnormality, behavior disorder and laterality.

The major hypothesis was that individuals who have experienced greater prenatal, perinatal or postnatal injury are more deficient on selected indicators of psychological, neurological and behavioral disorder. Further, in accordance with Towbin's findings, the types of deficiencies vary in the timing and severity of the four selected variables. Thus, it is expected that prenatal injury, representing the mother's poor obstetrical history or present condition, is more significantly related to gross neurological and motor performance indicators because its onset occurs during early brain development, and its effects usually persist throughout the perinatal period. Accordingly, "allstress", which comprises prenatal, perinatal and postnatal factors, will show associations with deficiencies in gross motor development. The exclusion of aggravating prenatal factors and Apgar in the "birthstress" variable should result in a better predicting value with mental rather than motor impairment because such injury is most likely to occur after cortical development.

The preliminary tests of the major hypotheses gave encouraging results. The total neonatal stress measure ("allstress") was found to affect both intellectual and particularly sensory-motor functioning. A

scrutiny of the three components of neonatal stress (prenatal, perinatal and postnatal) suggested further that each affects different spheres of CNS functioning. Prenatal stress affects primarily sensory-motor functioning, perinatal stress affects primarily intellectual functioning, and postnatal stress is associated with gross neurological impairment and behavior. These findings are congruent with Towbin's (1978) hypotheses of the relation between timing of stress and the type of neurological damage associated with it. Further, results suggest that such measures of neonatal stress could be used to predict behavioral consequences of CNS dysfunction and have the potential of revealing reliable associations with delinquent behavior, if such associations exists.

Preliminary tests of association between different indicators of laterality (eye, hand and foot) and tests of mental functioning also gave encouraging results. Previous research has engendered a debate regarding the impact of left-handedness, in particular, on intellectual capacities (Flick, 1966; Silverman, Adevai and McGough, 1966; Levy, 1969; Miller, 1971; Nebes, 1971; Bakan, Dibb and Reed, 1973; Hardyck and Petrinovich, 1977), including the areas of academic achievement (Sabatino and Becker, 1971; Gilbert, 1973), reading (Balo, 1963; Balow and Balow, 1964; Coleman and Deutsch, 1964; Belmont and Birch, 1965), learning (Allison, 1966), intelligence (Miller, 1971; Keller, Croake and Riesenman, 1973; Newcombe and Ratcliff, 1973; Fagan-Dubin, 1974; Hardyck, Petrinovich and Goldman, 1976), emotional instability (Orme, 1970), and visual-spatial capacities (Flick, 1966; Silverman, Adevai and McGough, 1966; Levy, 1969; Miller, 1971; Nebes, 1971; Kutas, McCarthy and Donchin, 1975). The lack of consensus in research conclusions suggests that it may be necessary to discriminate among groups of left-handers on at least two dimensions: the positive or negative family history of left-handedness (Zurif and Bryden, 1969; Hecaen and Sauget, 1971; Bryden, 1973; McKeever, Vandeventer and Suberi, 1973) and the extent of exclusiveness of the person's left-handedness (Hecaen and Sauget, 1971).

The idea that there may be a hemisphere specific disadvantage in left-handers, rather than a "minor degree of hemispheric specialization" (Hecaen and Sauget, 1971), was first suggested by Levy (1969) and since confirmed by others (Flick, 1966; Silverman et al., 1966; Miller, 1971; Nebes, 1971). The majority of these studies were only investigating differences in verbal intelligence in the context of differences between right- and left-handers; however, there appears to be no consensus regarding differences in visual-spatial performance, although the tests used for discrimination may not have been appropriate.

Aside from one report (Gur, 1974), footedness has only been studied within the context of congruent or incongruent lateral dominance (hand, eye, foot) among schizophrenics, where an increased incidence of left-footedness was reported and a temporal-limbic dysfunction of the left hemisphere in schizophrenics was suggested.

Examination of the impact of handedness, footedness and eyedness on selected psychological tests in a three-way MANOVA in this project

showed that the findings with handedness confirmed earlier reports. However, the results with footedness are an unprecedented finding. The most notable feature of the results is that handedness and footedness appear to be independent of each other as is indicated by their exclusive impact on two areas of mental functioning. Handedness is exclusively significantly related to the variables (performance IQ) which are classically accepted as indices of the nonverbal, visual-spatial capacities of the right hemisphere, and there seems to be no relation whatsoever between handedness and verbal-analytic abilities. Footedness, however, solely significantly related to those variables which are indicators of verbal-analytic (left hemisphere) capacities. Eyedness does not seem to follow any particular pattern, unlike the other two. It is difficult to interpret these findings, considering how little is known about the hemispheric lateralization of motor acts.

Research on both birth stress and laterality was conducted in the absence of delinquency data. However, these preliminary findings enable us to develop links of association between particular biological variables which, we hypothesize, will also be associated with delinquency in certain types of delinquents.

#### Discussion of CPP

Following the presentation by Dr. Wolfgang there was extensive discussion by the group concerning: the nature of the data, the more specific variables that have been listed and coded from the several assessment instruments, the kinds of data analytic approaches that might be taken, and also whether it might be possible to undertake any new assessments on some of the study subjects of special interest, e.g., youngsters who have become involved in serious delinquencies and appropriately matched controls. Since the present study is funded for only two years, it was not possible for Dr. Wolfgang to say much at all about the possibilities for further data collection and assessment of the subjects. However, given the unique nature of these data, it seemed possible that additional funding might become available following this two-year study.

Various analytic strategies were suggested and discussed. For example, one might begin with the variables in some sequential fashion--starting with the genetic and prenatal, and then working up to the birth and postnatal assessments, up to and then past the age 7 period. However, another strategy suggested was to begin with antecedent variables around the time when youngsters' behavior had clearly begun to manifest certain behavior problems of relevance to subsequent delinquency patterns. Then one could work backwards (viz., from around age 7 to earlier ages, to age 4 years, age one year, etc.). Of course, hopefully, it might also be possible to relate the above data to subsequent family, school, and juvenile justice data. And, once the initial analyses had been done, it would be desirable to use path analysis and related techniques for trying to determine etiological factors and relationships.

A more detailed review of Dr. Wolfgang's material concerning the Collaborative Perinatal Project was suggested, since it might add some interesting behavioral information in terms of the neurological and cognitive assessment, the speech and motor assessment, impulsivity measures at age 4, then at ages 5, and 6, and some school data. Such behavioral information and assessments might be directly relevant to the issue of criminality, and also to early manifestations of childhood aggression, and related conduct and behavior problems.

Two topics which might be worth considering were raised. One pertained to the possible impacts and relevance of the functioning of the Autonomic Nervous System (ANS) for behavior in general: 1) Which factors seem to be responsible for the reactivity of the ANS? and 2) What kind of variables seem to be associated with low ANS functioning? Literature reviews suggest relationships between low reactivity, on one hand, and psychopathic characteristics such as inability to feel guilt, lack of empathy, absence of emotional relationship with others, and a lack of capacity to profit from experiences, on the other hand. Thus, if something is said about the functioning of the ANS in a subject, and if people wonder whether this may have a relevant influence on the subject's behavior, this would show that attention is actually being given not only to the ANS functioning, but also to other factors even indirectly related to the ANS activity which "seem" to go together. In this sense, it was important to see what factors are correlated with low reactivity of the ANS.

As an example, the Wadsworth study (1976) was mentioned. This study started with children at the age of 6 years, and several measures were taken. Some interesting relationships were found. First, that one of the indicators of ANS functioning in subjects (i.e. pulse rate) was related to crimes they committed after a period of 10 years. The second finding was that emotional disturbances in childhood were also related to later criminality. Within the limits of such an analysis, it can be predicted that if both factors in the Wadsworth study relate to crime, they may also be significantly correlated with each other.

In the discussion that followed, it was questioned whether these findings had ever been replicated. It was indicated that they fit into the general pattern of findings relating low ANS arousal to antisocial behavior. In any case, for purposes of the Interdisciplinary Group's studies, it was felt to be not important whether the Wadsworth findings were valid or not, nor whether the data could be relied on. Rather, this study served to illustrate the other important approaches that could be taken in seeking an interdisciplinary understanding of the phenomena of concern. For example, even though not very much was clearly explained, there was some support for the often-noted correlation between childhood emotional disorders and the parent-child relationship. If attention is given to the ANS as a possible relevant indicator for criminal and related behavior, researchers will be faced with a problem as to what are the relevant processes that are actually involved here.

There are various possibilities for answering this question. One possibility would be to start with emotional deprivation as influencing ANS activity, thus establishing one sequence for the suggested linkage. Another may be that emotional deprivation leads to all kinds of changes in the personality of the subject concerned. For instance, taking the syndrome which is found in psychopaths (low reactivity of ANS, lack of fear and guilt feelings, lack of empathy, little or no insight, and reduced capacity for meaningful interpersonal relationships), it could also be assumed that these factors possibly relate to emotional deprivation; in addition, these factors may be viewed as predisposing factors directly related to crime.

The following discussion noted that the ANS was also correlated with the kinds of other factors both known and unknown. It could be that the kind of process observed above starts with emotional deprivation influencing early development of children and acting on the ANS functioning too. It may be quite important to determine whether these personality variables are directly related to ANS or if there is a relationship with emotional deprivation. If they are related to emotional deprivation, it might be thought that some effective psychotherapy would make it possible to remove these negative features.

On the contrary, if low reactivity of the ANS is the indicator (i.e., precursor) of possible difficulties in socialization among some of the subjects, then psychotherapy may be quite insufficient in dealing with these emotional problems. The intriguing question is whether a man has an impaired capacity to have guilt feelings because, to a certain extent, low ANS seems related to having been unable to have appropriate emotions (e.g., anxiety and fear). Moreover, if there is a direct link between ANS and certain personality variables, then it may be that people with low reactivity also display some other psychopathological characteristics. It was also questioned whether there might indeed be a kind of a syndrome related to low ANS and consisting of various manifestations such as lack of guilt feelings, lack of empathy, inability to profit from negative experiences, etc., as there was surely also an explanatory environmental factor. Hence, one could wonder whether this environmental factor might be responsible not only for the ANS, but also for the other factors noted above and correlated with the ANS.

The general discussion went on to suggest that this process might have other dynamics. For example, the process might start with emotional deprivation influencing the child and also causing low ANS response. The child's low ANS response could affect his ability to react properly to his environment, thus leading to interpersonal difficulties, isolation, and also vulnerability to behavioral problems. There may even exist a more anterior variable in this process influencing both emotional deprivation and ANS to cause a number of predisposing factors which may in turn lead to criminal and related behaviors, for instance, a genetic relationship between father's and child's criminality.

There are some animal experiments which shown that the amount of environmental stimulation that is given to newborn rats affects the actual morphology of the brain, viz., the density of the dendritic branches of the neurons in the brain. This is an environmental effect directly on the growth of the developing brain in the rat. Of course, whether results of such animal experiments can be applied to human beings was an open question. In any case, there was the possibility that early environmental stimulation, even in utero, may be a factor that relates to the reactivity of the ANS, for when a pregnant woman is stressed certain stress hormones are secreted and the fetus may thus be conditioned to a number of external stimuli in terms of certain reflexive behaviors.

A contrasting situation would be to take a child who has been really deprived for several years to a point where several abnormalities of central nervous system (CNS) functioning can be found, with no growth hormone secretion, disturbed sleep patterns and primitive behavior patterns, and severe impairment of language development. When such a child is put in a hospital where he encounters different environmental stimulation, there ensues an amazingly rapid catch-up growth. In any event, the question here was that we do not know how such children will function as adults. Nobody knows the results of long-term catch-up growth in terms of behavioral maturation.

There may not be sufficient and strong enough correlations to explain a major part of the variance. It could be, for instance, that emotional deprivation correlates with criminality  $+0.5$ , which is highly significant. Low autonomic reactivity could correlate  $+0.5$ ; but these two factors could be explaining completely different parts of the variance. This led to the comment that statistical methods such as path analysis could be used to determine various hypothesized causal links.

When talking about the ANS it should be remembered that neuroendocrinological, psychological, sociological and anthropological relationships must be taken into account as moving in a kind of cycle, and always in a given context. For example, an individual may be cognizant of certain behavioral and psychological characteristics associated with his low ANS reactivity, and he may have learned how to manage and to cope with such characteristics. Thus, his low ANS reactivity may not mean very much nor be associated with criminal or other behavioral problems. In other words, the above data concerning ANS characteristics should be viewed within a broader context of the complex interactions between many sets of variables.

At this point there was discussion focusing on the necessity of having clear and proper use of the expression "emotional deprivation." The way the concept was being used suggested a rather loose and vague notion. It was generally agreed, however, that it was essential to express ideas and concepts in an operational manner. Also, a difference should be made between the kind of brain-storming discussions we have during these workshops and the more specific task of working out a research design to test some theory or notion that we

have developed. In the latter case it would be most essential to give precise definitions of the concepts used; while in the former situation too rigid demands in this regard could possibly interfere with the creative process of the free discussion.

Since there were frequent references to the use of path analysis for determining and testing causal relationships among variables, it was suggested that Dr. Mednick provide some explanation and discussion of such analytic techniques. Sarnoff Mednick presented an explication of the application of causal modelling techniques. He used the Israeli project for illustrative purposes. Causal modelling is an advanced statistical procedure especially useful in longitudinal research (Joreskog, 1979; Joreskog and Sorbom, 1976a; 1976b; 1977).

Cross-National Comparison of Delinquency in Copenhagen  
and Philadelphia Birth Cohorts

Introduction

Several studies have indicated that differences in rates of criminality for specific offenses exist between the United States and Europe (Cavan and Cavan, 1968). For example, the rates for two well defined crimes such as murder and robbery vary greatly between countries in Western Europe and the United States, with Americans almost twice as likely to be involved in a homicide as either Germans or French citizens. On the other hand, several countries have higher rates for robbery than are found in this country. Often differences in legal, judicial or enforcement philosophies account for much of such variation cross-nationally. However, if the problems of equating for differences in reporting standards are temporarily disregarded, it is logical to enquire into the nature of the differences. Are high rates of murder and other violent crimes in some way related to the American society? If they are not integral to society in the United States, are there cultural or economic aspects in other nations which could be profitably studied to help understand criminal patterns here? It is possible that detailed information on the nature of cross-national differences can have a direct bearing on efforts at crime prevention in this country. If crime in the U.S. can be shown to be related to unique characteristics of American society, efforts at prevention might be directed at modifying these special conditions. Thus, the comparative study of cross-national criminal patterns might be useful in suggesting means for understanding the development of crime in the U.S., and in fact could suggest programs of intervention which would not otherwise be developed from investigations confined to one country alone.

At the present time, the notion that greater rates of certain offenses predominate in the United States is based upon international reports of criminal statistics. While these reports are useful, they do not generally yield the kind of data which promote understanding of how such differences may be arisen. Along with simple incidence rates, one would also seek information regarding the backgrounds of the offenders, data on social class, family rearing conditions, educational attainment, etc. At the same time, sound research procedures require that information on non-criminal control subjects also be available, in order to provide a basis for comparison with the delinquent population.

Data of the kind under discussion are optimally obtained by consideration of criminal behavior within a birth cohort. This method of investigation is capable of controlling for many interfering variables by comparing criminal individuals with non-offenders who were born in the same period, and who are assumed to be equivalent on several factors (Schaie, 1965). Since cohort studies are longitudinal, it is possible to gather information on the effects of early life events on later criminality, and to be assured that such data are as complete and unbiased as possible. Perhaps most important, serial or

repeat offenders can be routinely studied as part of the ongoing process of gathering data. Simple reports of incidence rates are very unsatisfactory in this regard. The great wealth of information available from cohort studies, plus the advantage of having directly comparable non-offender controls eventuate in enormous methodological benefits.

The Philadelphia cohort

An excellent example of the cohort method in criminology has been presented by Wolfgang, Figlio and Sellin (1972). They describe a cohort which consisted of all the males born in 1945 who resided in the city of Philadelphia from their 10th to 18th birthdays (n=9,945). Background measures included, inter alia, descriptive data on the homes, IQ and achievement test scores from schools, as well as complete police records.

These data permitted several clear conclusions to be made. For example, it was concluded that a single discrete action which could achieve maximum delinquency reduction would consist of preventing the "group of nonwhite lower SES boys from continuing delinquency after their first offense". The variable of age of first offense was examined using a sophisticated quantitative procedure for time series analysis known as the Markov process. This technique showed that the likelihood of committing an offense is essentially a constant probability over time, regardless of the number of previous punishments for the behavior. In general the authors state, "incarcerations or probation fail to curb future offenses, and in fact trigger higher probabilities of committing subsequent serious offenses".

Findings such as these seem especially important in the context of international differences in criminal behavior, for it appears that recidivism is quite common in the U.S. However, even when American juvenile delinquency is pictured as a "training ground for careers in adult criminality", the cross-national perspective may alter expectations in this regard (Gibbons, 1970). Examinations of a European birth cohort would be helpful in highlighting not only cross-national differences in crime rates, but also in exposing national differences in the backgrounds of the criminal individual. Separating the unique aspects of criminal behavior in the United States from common patterns found in other countries may be highly informative in furthering preventive efforts.

Using a birth cohort from the city of Copenhagen in Denmark, the present research is attempting to replicate the principle findings from the Philadelphia cohort project, but further seeks to identify those aspects of each population which may be unique. Especially valuable in terms of the current study have been the following: (1) the data already had been collected, and are available on magnetic tape as part of a longitudinal project; (2) the sample size is nearly three times as large as that available to Wolfgang, et. al.; (3) the

police reports, as well as much descriptive data, are very complete, due in large measure to the extensive system of Danish registers. Thus it appears that an investigation into the background of criminal behavior using this source of information offers a promising opportunity to replicate and extend the important findings presented by Wolfgang, et. al.

#### Description of the Danish cohort

The population in the proposed study consists of all male offspring born between 1 January 1944 and 31 December 1947, the mothers of whom were residents of Copenhagen, Denmark. The children were located using parish records, while the Folkeregister (the Danish national register) provided current addresses and other information. Copenhagen has a large metropolitan population which is very stable. Thus the 31,436 subjects who were originally identified were likely to remain in the area. However, the national registers provided complete information even for those subjects who later moved away from the city. When this study began, 28,884 of the original sample were still available. Of the 2552 cases which were not available, 1791 were dead, 58 could not be located in the Folkeregister (probably for reasons such as name change, death at birth, etc.), and 703 had emigrated. It should be noted that this group comprises a true birth cohort, and is furthermore a pure "population" - that is, all the criterion subjects were included. The cohort was defined in the course of a study of Danish men with sex chromosome anomalies (Witkin et al., 1976).

The sources of data on criminal behavior for the population are police arrest records and court certificates. Police arrest records contain information on every contract with all citizens in the county made by the police, giving the paragraph of the law violated, data of infraction, etc. These records are very complete, even giving information on such non-criminal police contacts as investigations into property loss or witness reports. However, arrest records do not contain perfectly reliable results from subsequent legal proceedings and court-imposed sanctions. To complete the offense record, court certificates are also on file. These certificates are actually coded extracts of trials, and cover all violations of the penal code and "special laws" (e.g., traffic and tax violations) that resulted in convictions. Offenses in the Danish penal code include such acts of these, among others: forgery, intentional arson, sexual offenses, premeditated homicide, attempted homicide, manslaughter, assault and battery, housebreaking, larceny, receiving stolen goods, and damage to property belonging to others. These two sources of criminal behavior put a large amount of highly reliable data at our disposal.

Another unique feature of this information is a classification made for this cohort by the Danish criminologist Karl O. Christiansen on violent versus nonviolent offenders. These data were generated in order to investigate possible relations between social background and violence. It is available as a part of the data already collected. The original study on violence was not completed because of Prof.

Christiansen's death. It would be completed as part of this proposed project.

Parental socioeconomic status (SES) was classified primarily according to father's occupation at the time of the subject's birth. In a small number of cases the father or his occupation was not known; in some of these instances mother's occupation was known and was used instead. A seven-point SES classification was used, adapted from a nine-point system devised by Svalastoga (1959).

Other background variables were also available for each of the members of the cohort. Included among these are: IQ, professional or trade education, number of years in school (independent of trade education), and subject's occupation. Some descriptive items give details on the location of the subject's home, his church affiliation, and information pertaining to spouse and offspring.

The following table presents a comparison of the Philadelphia and Copenhagen cohorts; the two samples have much in common.

Characteristics of the Philadelphia  
and Copenhagen cohorts

<u>Characteristics</u>	<u>Available for</u>	
	<u>Copenhagen</u>	<u>Philadelphia</u>
<u>Criminal Behavior</u>		
Police arrest records		
Date of offense	Yes	Yes
Paragraph of law violated	Yes	Yes
Records of sanctions		
Police records	Yes	Yes
Court records	Yes	Yes
<u>Individual social data</u>		
Estimated intelligence	Yes	Yes
SES	Yes	Yes
Educational level achieved	Yes	Yes
<u>Descriptive statistics</u>		
Sample size	28,884	9,945
City population	924,000	1,949,000
Years of birth	1944-1947	1945

It is conceivable that one may explain differences between patterns of criminality for two countries in terms of social characteristics or organizations, especially if they differ dramatically on a large number of factors. For example, to make a

comparison of criminality rates between an underdeveloped African nation and an industrialized Western country would obviously produce differences, almost entirely due to gross inequality on many dimensions. This problem is germane in the present instance because, to a certain degree, comparison of any two countries may be susceptible to influences from extraneous variables. Consequently, a brief study of Danish and American national statistics was undertaken to assess the degree of divergence between the two nations. It is difficult to judge comparability without a frame of reference, and for this reason statistics from Canada were also included whenever possible. Our study has shown that, although differences do exist, many features of the United States and Denmark are surprisingly similar, with Denmark about as closely related to the United States as is Canada.

Denmark is a small nation of five million inhabitants in an area the size of Massachusetts and Vermont. With Canada as a frame of reference, it can be seen from the following table that all three countries are comparable on most of the statistics cited. The figure for suicides is quite high for Denmark. This has been partially explained by the willingness of the Danes to label a death as suicide. By contrast, "clear" suicides in the United States are frequently classified as accidental death in order to protect the family from the presumed negative labelling effects associated with the act.

Comparison of national statistics for Denmark,  
United States and Canada

	U.S.	Canada	Denmark
1973 Crude birth rate*	15.0	15.7	14.3
1973 Infant mortality* (under one year)	17.6	16.8	13.5
1973 Population increase*	5.6	8.3	4.2
1973 Life expectancy at birth (in years)			
male	67.4	68.8	70.7
female	75.1	75.2	75.9
1969 Suicide rate*	11.1	10.9	20.8
1960 Marriages*	8.5	7.8	7.5
1960 Divorces*	2.2	1.5	1.9
1971 Percent of national income spent on education	6.7	8.5	7.6

\*Rate per 1,000 population

Source: Statistical Abstracts of the United States,  
1975; U.S. Report of Commerce

The following table contains the distribution of income levels in Denmark and in the United States for blacks and whites. The United States in 1973 had the world's highest level of personal income; this is reflected in the comparative figures given in the table. A curiosity is the striking similarity in the 1973 income distributions for American blacks and Danes. In most instances they differ by only one or two percent of the population.

Distribution of income in U.S. and Denmark, 1973

Income Levels	The United States			Denmark
	% Total	% White	% Black	%
Under \$4,000	17.5	15.9	32.0	32.6
\$4,000 - \$6,999	15.4	14.7	21.2	20.4
\$7,000 - \$9,999	14.6	14.4	16.3	18.0
\$10,000 - \$14,999	22.6	23.3	17.2	17.0
\$15,000 and over	29.9	31.7	13.3	12.0

Source: Statistisk Arbog, Denmark, 1975 (Table 398)  
Statistical Abstract, U.S., 1975 (Table 649)

The Danes devote a proportion of the national income to education which is comparable to that of the United States. Mass higher education, however, is only now beginning in Denmark. In 1974 only 24% of Danish youth completed 12 years or more of schooling, while for the same period, 74.3% of American youth completed at least grade 12. Although 13% of the Danes obtained a higher education, 29% of U.S. students aged 23 completed college. These differences are very marked. It should also be noted, however, that the Danish "gymnasium" education (age equivalent to high school in the United States) is of very high quality. The "gymnasium" student in Denmark experiences a course of study at least comparable, and in many ways better than, the experience of those in honor programs in the best U.S. high schools.

Comparison of the social welfare systems of Denmark and the United States is extremely difficult, but that they are different is certain. The Danish system is more all-embracing, including support for rental payments (when needed), a national system for pensions for invalids of all sorts, liberal unemployment benefits, free medical and hospital care for all residents of Denmark, and a variety of other social services. It is clear that these social programs could influence the probability of criminal behavior, especially in certain SES groups, i.e., underprivileged classes. However, whether these benefits serve to suppress all kinds of crimes for all levels of society is not known. Within the city of Copenhagen where the birth

cohort originates, there are pockets of poverty. Many of the individuals living in these areas do not make use of the social welfare system to the extent that they might. The crime rates are extremely high in such districts, as are the rates of mental illness and general social dissolution. These areas are not as large as corresponding ghettos in Philadelphia. However, the physical and social circumstances have much in common with these ghetto areas.

In summary, these statistics show that many aspects of the two populations under consideration are not grossly different, and that both countries are relatively prosperous Western nations. While it is true that differences do exist, they appear to be not so large as to invalidate results from the proposed study. On the other hand, many measures are quite similar. It has frequently been found that comparisons between sections within a country may in fact be more dissimilar than between nations. Although it is important not to minimize the potential confusions which can arise from this problem, care in reporting procedures and conclusions may serve to offset whatever disadvantages exist. On the other hand, it might be mentioned that with proper precautions, existing differences between Copenhagen and Philadelphia can be the source of hypotheses to help explain cross-national differences in criminal behavior.

#### Primary data analyses

For all 28,884 men, the information described above resides on tape at the University of Southern California. With these data we are attempting to replicate almost all major findings reported for the Philadelphia cohort. A broad goal will be to assess the comparability of criminal behavior in the two cohorts as directly as possible. In the event that discrepancies do exist, an attempt will be made to evaluate differences between the cities of Philadelphia and Copenhagen which could be cited as possible explanations for the findings.

Attention is being given to the interaction of such variables as neighborhood, SES, and education, and their role in the occurrence of criminal behavior. We are especially interested, in light of conclusions by Wolfgang, et. al., to study the relations between social class, race and crime in the Copenhagen and Philadelphia cohorts.

A special analysis is being devoted to violent-nonviolent crime, particularly as it relates to social class. It is anticipated that this classification will be extremely useful in extending the findings of the Philadelphia cohort on the recidivism problem. Specifically, we are investigating serial instances of violent crime, employing the Markov procedures for time series analyses. Hybrid clustering procedures recently developed by Skinner (1977) are being applied to the problem of determining modal profiles of background data within offense categories. This approach seeks to determine a few distinct patterns of variables which describe most members of a subsample.

#### Discussion of cross-national study

Much discussion at the workshop centered around the usefulness of such research to criminology. Specifically, it was noted that society devotes large amounts of energy and funds to the maintenance of the apprehended offender and to attempts at his rehabilitation--considerable ingenuity is lavished on research on relatively esoteric and technically sophisticated treatments. New therapies from psychology, psychiatry and sociology are transplanted and tested on delinquent and criminal populations. All of these methods have in common that they wait for the appearance of criminality before acting.

Researchers at the workshop felt that if we are to reduce human suffering from criminal activity as well as its increasing financial burden to the community, some appropriate proportion of society's resources should be devoted to finding ways to prevent the initial onset of the antisocial behavior. To achieve this goal, research is needed which focuses on early identification of those in whom some interaction of biology, psychology and social conditions produces a predisposition to later antisocial behavior. Those identified as being pre-delinquent become candidates for exploratory prevention efforts. It was agreed that longitudinal prospective research such as the CPP and the cross-national study can address both of the preliminary steps necessary for future development of programs aimed at preventing onset of antisocial behavior, namely 1) the development of methods for early detection of those at risk, and 2) the creation and evaluation of interventive approaches.

The need for elucidating the predictors of future delinquent behavior was considered to be of great importance, because interventive procedures are likely to be psychologically and temporally intrusive. Crime prevention will probably not involve societal manipulation or forms of blanket population treatment such as water fluoridation; the interventions will have to be restricted to individuals at high risk for evidencing antisocial behavior. As a consequence, a first step in the development of primary prevention methods must be to devise assessment procedures which will effectively select the future delinquent. (It was also pointed out that if such early distinguishing characteristics of the future delinquent can be identified, these may help suggest intervention procedures.)

Prospective longitudinal research was deemed especially suitable for this process of devising pre-delinquency assessment procedures because the research subject who is already criminal is so changed by his criminal life style--the drugs and alcohol, his contact with the criminal justice system, the brain damage he may have suffered in violent episodes--that some portion of the differences between him and controls may simply reflect the consequences of his criminal life rather than antecedents. Therefore, workshop attendees advised intensive assessment of the criminal before he becomes exposed to

these criminal-life variables. This means examining a non-criminal population intensively and following this population until one can register who among them have become criminal or recidivistic. Then one can go back to the original intensive assessment to see what early-life characteristics distinguished the criminal from his law-abiding co-subjects.

Several other advantages of the prospective longitudinal method were brought up during the workshop discussions. The advantages mentioned are listed below.

1. Reduced Bias. The researchers, relatives, and the subject himself do not know if he will become a criminal; consequently, their reports and assessments are not influenced by the knowledge that the subject has been arrested. This relieves the data of a certain part of the burden of bias.
2. Current Data. The longitudinal method also offers the advantage that the information gathered is current, not retrospective. The part of the investigation which is retrospective is less so than it would be if the subjects were adults. Collecting data which is current insures greater accuracy than is attainable from retrospective reports, especially in the case of retrospective reports from parents about the early behaviors of their children.
3. Uniform Data. Another advantage of prospective data collection in longitudinal research is that the data are uniformly and systematically obtained. This is in contrast to retrospective studies which make use of childhood and school records concerning adults who are criminals.

With specific reference to the cross-national study, the areas of discussion included self-report vs. official statistics and possible reasons for differences between the countries such as educational levels, alcohol consumption, family stability and racial composition.

The issue of self-report vs. official registration of crime was debated. A minority of workshop participants maintained that the official registration was too heavily biased by police practice variables. Others pointed out that self-report of crimes, on the other hand, also contained a considerable source of bias. Most self-report methods involved questionnaires administered to school populations in the form of group examinations. Biases exist in differential rates of school dropouts--truancy and literacy. Some suggestions were made regarding the possibility of contacting comparable sub-samples of both populations in order to get self-report indices of criminal involvement. However, these were relegated to future research.

It is already clear from the outset of this project that differences in the rate of violence between the two cities might engender important hypotheses. Differences between Denmark and the United States in level of education were considered. While a greater proportion of the United States population receives a secondary and

college education, it was pointed out that Danes have more intellectual interests than Americans. Only about 25% of Americans read at least one book a year; 75% of Danes read at least one book. Thus, while formal education may be more prevalent in the United States, this does not tell the whole story.

The relationship between crime and alcohol was mentioned. Alcohol consumption in the two countries differs. Danes tend to drink much beer and wine relative to Americans, but Americans consume almost twice as much hard liquor. Patterns as well as rates of drinking also were considered important. It was argued that data such as these be obtained in many areas so as to permit broad hypotheses to be generated.

An important consideration in interpreting any differences between the two cohorts was family stability. Rates of divorce in the two countries are about the same. About one in 2 1/2 marriages end in divorce in both cities. However, the rates of both marriage and divorce are much lower for Denmark. This might mean that the rate of broken families is higher for the United States. It was argued that rates be obtained for the specific cities (Copenhagen and Philadelphia).

The question of race was a difficult one. Early data analyses in the project suggest that rates of police contact are about the same for the lowest class in Philadelphia (mainly blacks) and the lowest class in Copenhagen. In both cases the lower classes are responsible for more crime. These data suggest the idea that the greater frequency of crime among blacks in the United States may be due to their low SES position and associated factors. A suggestion regarding a significant factor referred back to family stability and structure. Black populations in the United States tend to have relatively unstable family conditions; many black children are born to unwed teenage mothers; and black fathers tend to abandon families at a rate exceeding that for whites. It was argued that this variable be given consideration as a potential explanatory factor in any differences found between the two cohorts.

Epilogue

As can be discerned from the above presentation of the Fifth Workshop, the content of the workshop evolved from the discussions at the four previous workshops. The roots of the three projects which the Interdisciplinary Group on Criminology considered at the Fifth Workshop exist in the discussions of the earlier workshops: The study of violent offenders in an Israeli prison, the Philadelphia collaborative perinatal project, and the cross-national comparison of delinquency in Copenhagen and Philadelphia birth cohorts all were presented in earlier workshops as potential projects for the interest of the group. The Fifth Workshop focused primarily on methodologic issues in these specific projects, which represented a considerable evolution from the philosophical and theoretical discussions concerning an interdisciplinary approach to crime and violence that characterized the discussions of the first two or three workshops. Without belaboring the point, we consider this to be a unique phenomenon in the history of research approaches in criminology. Whether or not the specific projects work out as planned, and the degree of enhancement of these projects by their discussion at the Fifth Workshop (and, we hope, future workshops), remain to be determined. Nevertheless, we believe that in the five years of our continuing discussions we have built a strong base for the conduct of actual interdisciplinary research in criminology.

The compilation of this report was done by Dr. Robert Rubin, but the contents of the report are indeed a collaborative effort of all the individuals involved in the Fifth Workshop. The innovative characteristics of the several projects should be credited to the group, whereas the compiler of this report assumes sole responsibility for any apparent deficiencies.

We obviously have achieved no closure by this report. Our projects are progressing and our interrelationships are evolving. This document then represents, as it were, a "snapshot" of a certain point in time in the life of the Interdisciplinary Group on Criminology. We have changed, and we will continue to change. Our hope is that by our research efforts we can make a useful contribution toward advancing the knowledge in the field of criminology.

Finally, we wish to point out that all of the studies on human subjects have been carried out with meticulous attention to the protection of the rights of the subjects involved--with reference both to their voluntary participation and to the confidentiality of the information obtained. All the projects were approved in advance by the relevant human subjects experimentation committees of the participating institutions. It also had been ascertained prior to the conduct of these projects that the risk-to-benefit ratio to the subjects was extremely small; i.e., the procedures voluntarily agreed to by the subjects represented a small risk to them compared to the potential benefits to society at large from developing the integrated data that is the focus of our interest and analysis.

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## APPENDIX I

Mexico Workshop

11-14 March 1975

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## Brasil Workshop

15-20 November 1976

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## Holland Workshop

14-19 November 1977

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Brasil Workshop  
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