PROCEEDINGS

CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN WORKSHOP

Sponsored By The Program for the Study of Crime and Delinquency, Division of Public Administration, The Ohio State University.

Conducted at the Center for Tomorrow, July 19-23, 1972.

Printed by the

Program for the Study of Crime and Delinquency

1314 Kinnear Road, Suite 214

Columbus, Ohio 43212

1972

This monograph was supported in part by grants 380-00-J-70 and 2860-00-J3-72 from the Law Enforcement Assistance Administration through the State of Ohio Department of Development. Such support by the funding agent does not necessarily indicate concurrence with the contents or recommendations within.

Table of Contents

ENVIRONMENTAL DESIGN AND THE PREVENTION OF BEHAVIORAL DISORDERS AND CRIMINALITY

C.R. Jeffery

Crime Control Strategies: Past, Present and Future

My interest in crime prevention, as contrasted to punishment and rehabilitation of offenders, began as a result of a realization that the present system is a failure at all levels. Any systems approach to a problem, using signal detection theory as a model, must include the detection of the problem, a formulation of alternative responses possible, and an effective solution or intervention to the problem. The criminal justice system as it now operates has none of these capabilities; it does not detect or convict more than a fraction of those committing crimes; it has not created alternative responses to the crime problem; and it has no effective solution to the problem. There are 2.7 million reported crimes annually, which represent less than 40 per cent of the total crime figure. From this figure only 727,000 arrests, 160,000 convictions, and 63,000 prison sentences occur.[1] If we had a defense system that operated at this level of efficiency we would be out of business in a short period of time. The two alternatives given for handling those who have been convicted are (1) deterrence and punishment, and/or (2) treatment and rehabilitation of individual offenders via therapy, job training, and re-education programs. Neither approach has worked[2] and yet the current policy of the Law Enforcement Assistance Administration is to do more of the same -- put more resources into the police, the courts, and the correctional system. The assumption is made that if the police arrest more criminals, the courts convict more criminals, and the prison systems receive more criminals, the crime rate will be reduced. This is the philosophy of "increase the arrest rate, conviction rate, and imprisonment rate, and thereby reduce the crime rate." The criminal justice system is unable to handle its present case load, and if the system starts with less than 40 per cent of the actual cases, and imprisons less than 2 per cent of this figure, we would need to increase the efficiency of our system (using the present model) by over 90 fold. In other words, the only way the present system can be made to operate is by increasing it in size by 90, or some other figure depending on whose statistics you are using. It is difficult to visualize how an ineffective, congested, and overburdened system can be improved by a "more of the same philosophy." The police - courts - corrections system must defend itself on the premise that it can deter or rehabilitate those who come into contact with it, otherwise, why bring offenders into the system. There are many criminologists today who would argue that diversion from the system and the avoidance of labeling is the most profitable action to be taken.[3] If the present

system is not workable, then the logic of the situation calls for an alternative model.

It was around such issues as these that I published Crime Prevention Through Environmental Design in 1971,[4] and that the Program for the Study of Crime and Delinquency at Ohio State University under the direction of Dr. Harry Allen, sponsored a week-long conference on the topic of crime prevention. The participants were as interdisciplinary as we were able to bring together, including psychiatrists using drugs to modify behavior, urban planners, a geneticist, an urban sociologist, a systems engineer, two lawyers, a psychologist, and three criminologists. The purpose of the conference was to create a setting for the interdisciplinary discussion of the feasibility of designing a new crime control model. We wanted a critical mass or "think tank" of experts who could explore new avenues to crime prevention. The conference was held at The Center for Tomorrow, a name symbolizing the tenor and purpose of the meeting, focused as it was on 1990 and 2020, not 1972 or 1973.

Because of its domination by sociology, clinical psychology, social case work, and criminal law, the field of criminology has ignored for the most part recent developments in biology, biochemistry, neurophysiology, psychopharmacology, urban planning, and systems analysis. On a recent CBS broadcast "The Twenty-First Century" Walter Cronkite referred to this as the "age of DNA and RNA", a reference to molecular biology, biochemistry, and memory molecules. The conference attempted to bring the new biology and psychology into play in the creation of prevention models for behavioral disorders.

Environmental Contingencies and Behavior

From the beginning of the conference it was obvious that by "environment" we meant internal as well as external environmental influences on behavior. The human body can be viewed as a open input-output or response system. These three systems are coordinated through the brain and nervous system, usually referred to as the central nervous system (CNS). In this analysis behavior becomes a matter of biochemistry, neurophysiology, and endocrinology. The input system involves the afferent nervous system and the sensory system. The coordination function involving thought, language, judgment, and emotion is carried on in several interrelated parts of the brain and is a biochemical process, since chemical changes are involved in learning, memory, and motor responses. The response or output system involves the efferent nervous system and the muscular system, wherein the organism responds to stimulation and acts on or adapts to the environment. Such a system is often referred to in psychology as operant or instrumental behavior, since it operates on the environment.

The Internal Environment

Several of the papers reviewed at the conference dealt with the biochemical properties of the brain and the use of drugs to alter anti-social behavior. In recent years psychiatry has moved much more into the framework of biology and biochemistry in the analysis of behavior, as seen in Dr. Knopp's paper on psychological depression, wherein he notes that "the brain plays a major if not the most important part in the origin or mediation of the depressed mood."[5] He states that the input-brain -output relationship can be disturbed by (1) too much, too little, or inappropriate stimulation, or (2) faulty neural transmission of impulses within the brain or to other structures of the body. His studies indicate that the depressed person suffers from a problem with the neurotransmitters norepinephrine and serotonin, that is, the depressed state is possibly caused by a depletion of monoamines needed for neurotransmission, especially within the pleasure center of the visceral brain. Basic knowledge of physiological and biochemical mechanisms of the depressed state is essential in an understanding of depression.

Likewise the work of Dr. Corson[6] with hyperkinetic animals shows the value of biochemistry and pharmacology for the study of behavior. Hyperkinetic children have been given a stimulant amphetamine which improves the behavior of some, has no effect on others, and increases the hyperkinesis in still others. It became obvious that hyperkinesis is a label for several conditions. Dr. Corson's dogs responded differently to amphetamine: some became calm and manageable, some remained active and hostile, and others became more active and vicious. Corson also made clear the point that behavior modification and re-socialization of the dog must occur at the same time that drug therapy is used, as illustrated by the vicious dog Jackson who learned to accept the reward of human friendship and affection after amphetamine was administered. The implications of such studies for criminology are great since many hyperactive children are aggressive, are problems within a family or school setting, leading to rejection by parents and teachers, and eventually to social alienation, truancy, and delinquency. Similar results were recently reported by Dr. James Satterfield of the Hyperactive Children's Clinic in Los Angeles.[7]

The work of Dr. Goldman[8] is even more directly related to criminology since they had a subject population of sociopaths from the Ohio prison system. Their study was motivated by evidence that sociopathy has a biological base, namely, excessive monoaminergic neurons within and without the central nervous system related to a pattern of decreased excitability (lack of response to stimulation). This low state of arousal characterizes sociopaths, as does sensory deprivation. They are on the low end of the arousal continuum, and have an excessive need for stimulation. These behavioral symptoms might be due to a defect in the catecholamine-secreting neurons, and they suggest that at least one class of sociopaths ought to respond to sensory-arousing drugs as do hyperkinetic children, since in both cases it is a matter of sensory deprivation and understimulation which causes the stimulus-seeking behaviors.

However, Goldman suggests that resocialization and re-education must occur along with drug therapy, a point also made by Dr. Corson in his work with hyperkinetic dogs. Goldman concludes that "not the least of the benefits of this fresh orientation toward monoaminergic arousal mechanisms is the likelihood of attracting and stimulating a broad spectrum of neuroscientists to explore the relationship between mental disorders and specific neuronal pathologies, and, hopefully, the return of psychiatry to the mainstream of biological medicine."[9]

Dr. Perry London[10] in his paper on boredom again touched on the topic of under and overstimulation. He defined boredom as a high arousal state and irritability brought on by stimulus satiation. Boredom results in a loss of value of sensory input due to gratification or frustration. London hypothesizes that boredom can be relieved by new activities (seeking new sources of stimulation) which can result in sexual crimes, or senseless crime or violence, or by reducing stimulus needs, through alcoholism, drug addiction, or suicide.

The theme of under or overstimulation was one that was touched upon by all of the speakers, and one that needs more systematic exploration in relation to behavioral disturbances.

The genetic dimensions of behavioral disorders were spelled out in the paper by David Rosenthal [11] (not present at the Conference) wherein he noted the role of genetics in schizophrenia, homosexuality, manic-depression, alcoholism, criminality and neuroses. The National Institutes of Health recently established seven new Genetic Research Centers, coordinated out of the University of California at San Diego. Dr. Arnold Mandell of UCSD has reported a genetic factor in drug addiction in relation to the effects of drugs on brain chemistry and behavior.[12] Dr. Young pointed out at the conference that any phenotype can be expressed in the formula $P = G + GE + Ep + Et$, where P is phenotype, G is genotype, Ep is permanent environmental influences, Et is temporary environmental influences, and GE is the interaction of genotype and environment. Any discussion of the environmental control of behavioral disorders must take into account the genetic structure of organisms and the possible impact of different environmental conditions on genetic traits. For purposes of behavior control the most critical element is the interaction of genetics and environmental factors, since control of environmental factors is more feasible than is control of genetics variables.

The discussion so far indicates some developments in biology that are relevant for any discussion of behavior, and which should be made a part of criminology. The integration of biology and psychology is now well underway in the United States, as is reflected in many departments of psychology and psychiatry wherein clinical training in Freudian psychology is being replaced by training in biochemistry, neurophysiology and psychopharmacology. We can predict that in the next twenty years there will be a major revolution in criminology as the biological aspects of behavior come to be better understood by criminologists.

The External Environment

We next turned to the impact of the external environment on behavior, a subject of considerable interest to urban sociologists, urban planners, environmental psychologists, and learning psychologists. Those in attendance at the conference emphasized the need to view the environment-organism-environment complex as a total system with an integration of functions, an interaction of parts, and a feedback process wherein the control of behavior is possible. Planners noted that they had been involved in less than 5 percent of the man-made environment, and therefore this environment was not designed to prevent criminal behavior or behavioral disorders any more than it was designed to prevent pollution or waste of natural resources. Any good urban plan must include the behavioral aspects of the environment, the possible alternative action available, and the consequences of one decision or plan for other components of the system.

Attention was paid to the use of urban design to reduce the opportunities for crimes to be committed and to identify and deal with targets of criminals, not the criminals themselves. In my book I emphasized the need to deal with environmental opportunities rather than on the detection, prosecution, conviction, punishment, and treatment of individual offenders. At the time when I wrote the book, I knew that crime had a definite ecological distribution, since sociologists had established that fact in many ways. However, no hard data existed as to how urban areas produced high crime rates or how urban design might be used to reduce crime rates. Since the book was published several studies have been published which furnish us with hard data on urban design and crime rates. The Criminal Law Education Research Center of New York University, under the direction of G.O.W. Mueller, designed a project to test the impact of criminal sanctions as a deterrent to the use of slugs in parking meters in the City of New York.[13] After a pre-test of selected areas in order to get baseline data, the research team placed three different labels on three different groups of meters. One label read "Federal Offense--1 year in prison and $1000 fine." Another label read "State Offense--90 days in jail, $500 fine." The third label read "City Offense--$50 fine." The rate of slugging of the meters did not decline in the experimental areas, and in fact increased in the Federal Offense area, probably because the citizenry realized that the chances of prosecution and conviction for a serious Federal offense were much less than for a City offense. The New York University team also measured the impact of a new type of meter on the rate of slugging. This meter was designed (1) to reject slugs and thus not record time when a slug was used, and (2) to display in a visual box the last coin deposited in the meter. In areas where this new meter was installed the rate of meter abuse declined significantly. The conclusion reached by the project was that mechanical deterrence is effective whereas legal deterrance is not.

In comparative study of Toledo, Ohio and Rosario, Argentina, David and Scott[14] discovered that Toledo had a high offense rate for larceny,

auto theft, and burglary, whereas Rosario had a high rate for sex assaults and assaults. In Toledo shoplifting offenses were made easy by the physical design of the supermarkets, which was not true for Rosario. Residential burglary was high in Toledo because of the ecological isolation of the houses, which provided the physical opportunity for burglary, whereas in Rosario the design of residential districts, with a mixture of business and residential use, made for more eyes on the street and less burglary. Auto theft was common in Toledo because of the great availability of automobiles. Thefts in Rosario were chiefly by servants from the homes of employers. The opportunities for assault were related to the high amount of personal contact and physical crowding in Rosario.

H. Laurence Ross[15] has noted that traffic laws which attempt to handle traffic accidents and deaths by means of controls over the behavior of the drivers are ineffective, and he states that we should turn to technological control of traffic offenses via car design, seat belts, roll bars, door locks, and better highway engineering.

William Yancey[16] made an analysis of the Pruitt-Igoe housing development in St. Louis, a project which is now being razed after less than 20 years of existence. Pruitt-Igoe is a classic in the annals of public housing failures. It is now abandoned because of a high rate of assault, rape, robbery, burglary, and vandalism, and the physical design of the project created a major crime problem for St. Louis. Yancey relates the behavioral disorders to the lack of public space or defensible space wherein informal networks of social control could develop. The atomization of social interaction, the design of stairwells which represented uncontrollable space, the isolation of elevators, hallways, and lobbies, the lack of accountability of those entering the project--all are given as reasons for the behavioral breakdown which accompanied the architectural design of Pruitt-Igoe. This project should demonstrate for all times the impact of environment on behavior.

During the conference a film was shown by Mr. Barry Hirsch of the New York University Project for Security Design. This research operation has been analyzing the impact of apartment house design on crime rates.[17] So far they have found that certain streets, corridors, stairwells, elevators, and lobbies were dangerous because of design. Such areas were not public in the sense of being open to observation by others, but they were public in the sense of being accessible to strangers who could enter the buildings without accountability. Low-rise apartments (3 stories or less) had a low robbery rate but a high burglary rate because of the accessibility of apartments from the ground level. High-rise apartments had a high robbery rate but a low burglary rate. The greater the number of apartments to a floor, the higher the crime rate. Buildings which had a common public space, shared entrances, and other shared space had a greater feeling of neighborliness and a lower crime rate.

The urban environment is not only involved in providing opportunities

for criminal acts, but for creating serious behavioral disorders which may in one of several ways come to be regarded as crimes. Overcrowding has a high association with crime, mental illness, suicide, alcoholism, drug addiction, and other pathologies.[18] Aggression, frustration, withdrawal, and isolation have all been viewed as products of overcrowding. In terms of our earlier thesis of over and under stimulation, the urban environment can provide both an overload of obnoxious stimuli and an underload of pleasurable and varied stimuli. Crowding, noise, pollution, litter and confusion are all part of the urban scene, and the type of stimulation found in such an environment is anything but healthy. Even the disease and mortality rates of such areas are high.

Operant psychology places great emphasis on the reinforcement or punishment one receives from the environment as a contingency to a response. Operant psychology also places great emphasis on contingency management, environmental design, programmed educational and token economies. A wedding of urban design, environmental psychology, and operant psychology would be needed in the creation of a prevention system for behavioral disorders.

In this respect we should mention that the design of the physical facilities used for the management of behavioral disorders, our prisons and mental hospitals, runs counter to all we know about environmental management of behavior.[19] We place our inmates and mentally ill in settings designed to foster suicide, depression, withdrawal, aggression, isolation, and psychosis.

Interaction of External and Internal Environments

Not only is human behavior determined by the internal neurophysiology and biochemistry and the external environment to which the organism responds, but the interaction of organism and environment modifies or alters both. The modification of the external environment is well understood. Anthropologists and sociologists have discussed culture and society as major components of human adaptation, and such concepts refer to the man-made environment. In fact, culture and society have been given such prominence in sociology that adaptation to or rejection of cultural norms is regarded as the sole process by which criminal behavior occurs. The relationship between biological processes and cultural processes is not clearly understood at this time.

On the other hand the modification of the biology of the organism by the environment is not completely understood either, though several major breakthroughs have occurred in recent years. It is now known that the weight of the brains of rats reared in an enriched environment differs from those of rats reared in a state of sensory deprivation. "Experience with the environment does cause growth and chemical changes in the brain, and these changes are related to behavior." Memory is at least in part a matter of chemical changes involving DNA and RNA and proteinsynthesis in the brain, and learning and memory are a matter of

biochemical changes occurring as a result of stimulation.[20] Such studies as these are critical to intervention programs in the lives of those living in poverty since if the brain of the six year old child reared in an environment of sensory deprivation has not developed in a normal fashion, then the ability of the child to respond to an enriched environment is severely limited regardless of what programs are instituted to retrain or re-educate the poor.

Another area of great concern is the area of malnutrition, learning, and behavior. Molecular biology has revealed that protein syntheses in the brain is critical to memory and learning. A person deficient in protein in his diet will suffer from a lack of brain development.[22] A child with a history of protein deficiency will not develop normally as concern biochemistry and brain physiology and will never be able to respond adequately to his environment.

A formula which expresses these relationships can be expressed as follows: B=Ee + Ei + Og + OE, where B is behavior, Ee is the external environment, Ei is the internal environment, Og is the genetic makeup of the organism, and OE is the interaction effect of organism and environment.

One area which needs greater investigation is the relationship between pleasure and pain centers of the brain and behavior. The pleasure-pain psychology of hedonism has been put forth since the time of Bentham, and in the 1930's and 1940's under the influence of B.F. Skinner, the behaviorists documented in the laboratory the relationship between environmental contingencies of reinforcement and punishment and response rates. However, these psychologists worked on an S-R (stimulus-response) model, with no Organism between the stimulus and the response. The Organism was a black box, as S→▱→R. Now, through brain stimulation studies and new knowledge of neurophysiology, the neurological centers for pain and pleasure have been located in the brain. The relationship of pleasure and pain centers to external stimulation, to other parts of the brain, and to behavior can be studied in detail. It has been stated that criminal behavior is a result of the probability of pleasure versus pain from any given criminal act.[22] The neurofunctioning of pleasure and pain centers in respect of criminal behavior must be pursued since the criminal justice system is based upon the use of punishment to alter behavior.

We are now approaching the point in history where we can locate criminal behavior in the biochemical and neurophysiological functions of the brain as they are related to pleasure and pain. The integration of sociological, psychological, and biological aspects of behavior into a total integrated theory of behavior has never been achieved in criminology, but given our present state of knowledge such integration may be forthcoming. Such a theory of behavior would be a total system in the sense that it would view behavior as a product of several separate systems--biological, chemical, physiological, social--working as an interdependent system. In many ways criminologists are reopening issues

raised by Lombroso, but these issues are based now on a scientific view of behavior not available when Lombroso was writing.

Future Needs

The conference attendees agreed that the legal and ethical implications of behavior control and environmental design must be explored in depth. The legal problems encountered in any social planning are tremendous, and the specter of Big Brother and 1984 are always the initial, simple knee-jerk responses to such proposals. The issues of drug therapy and brain surgery for prison inmates are already hot issues in the State of California. There was agreement that environmental engineering must focus on improving the quality of life and not on locks, alarm systems, and security devices. The conference viewed the problem of engineering as analoguous to any environmental problem--air pollution, water pollution, overpopulation, density, loss of natural resources. We do not hesitate to regulate the environment for purposes of clean air or clean water, and we have a major movement today to support abortions and birth control, so why should it be different for clean behavior. Mental illness, poverty, delinquency, and crime are as much a product of the environment we have created as are pollution and spoilage of environmental resources, and yet the people who are first in line to support a "Protect the Earth" movement are usually the first to oppose any movement to better the quality of human behavior.

The need for major research of an interdisciplinary nature, involving behavioral genetics, neurophysiology, biochemistry, psychopharmacology, ecology, urban planning, systems analysis, criminology, and criminal law was made the first priority by those in attendance. Such research would seek a broad base of support and long-range funding without regard for immediate results. Such research would start as a planning and pure research operation, with action and demonstration projects added only if and when knowledge becomes available. The war on poverty program and the war on crime program were both established with no research or knowledge base and with no possible means for successful completion. The conference concluded that interdisciplinary research is a major way to break through the present crisis in crime, delinquency, and behavioral disorders. It was strongly suggested that future research focus on the study of many variables in a single subject, rather than upon the usual sociological approach of looking at a single variable in many cases, since interaction of genetic, biological, psychological, and sociological variables remains the most productive avenue for the study of behavior. It is anticipated that similar conferences will be held in the future to continue the work started if and when financial support is available.

Footnotes

1. The President's Commission on Law Enforcement and Administration of Justice, Science and Technology, U.S. Government Printing Office, 1967, Washington D.C.

2. C.R. Jeffery, Crime Prevention Through Environmental Design, Beverly Hills: Sage Publications, 1971.

3. Edwin M. Lemert, Instead of Court: Diversion in Juvenile Justice, Center for Studies of Crime and Delinquency, Washington D.C.: U.S. Government Printing Office, 1971; Diverting Youth from the Correctional System, Youth Development and Delinquency Prevention Administration, U.S. Department of Health, Education, and Welfare, 1971; Diversion from the Criminal Justice System, Center for Studies of Crime and Delinquency, Washington, D.C.: United States Government Printing Office, 1971; Community Based Correctional Programs, Center for Studies of Crime and Delinquency, Washington, D.C.: U.S. Government Printing Office, 1971.

4. Note 2 above.

5. Walter Knopp, "Pathophysiology of the Depressed State," in Depression in Medical Practice, Westpoint: Merck and Co., 1970, p. 2.

6. Samuel Corson, "Experimental Control of Hyperkinesis and Aggression," film presented at the conference.

7. Behavior Today, CRM Publications, Del Mar, California, July 3, 1972, p. 1.

8. Harold Goldman, "Sociopathy And Diseases of Arousal: Psychopharmacology, Treatment, and Prevention," unpublished paper presented at the conference.

9. Ibid., p. 15.

10. Perry London, "The Age of Ennui," unpublished paper presented at the conference.

11. David Rosenthal, "Genetic Factors in Behavioral Disorders," paper originally presented at the 1972 Annual Meeting of the National Academy of Sciences, April 25, 1972, Washington D.C.

12. Behavior Today, CRM Publications: DelMar California, July 10, 1972, p. 1.

13. John F. Decker, "Curbside Deterrence." Criminology: An Interdisciplinary Journal, August, 1972.

14. Pedro R. David and Joseph W. Scott, "A Cross Cultural Comparison of Juvenile Offenders, Offenses, Due Process, and Societies," to be published in Criminology An Interdisciplinary Journal.

15. H. Laurence Ross, "Folk Crime Revisited," to be published in Criminology: An Interdisciplinary Journal.

16. William L. Yancey, "Architecture, Interaction, and Social Control: The Case of a Large Scale Housing Project," in Environment and the Social Sciences: Perspectives and Applications, ed. by Joachim F. Wohlwill and Daniel H. Carson, Washington, D.C.: American Psychological Association, 1972, p. 126 ff.

17. A forthcoming book will describe the project in detail. Oscar Newman, Defensible Space, New York: Macmillan and Co., 1972.

18. Environment and the Social Sciences: Perspectives and Applications, op. cit., p. 3 ff; George W. Carey, "Density, Crowding, Stress and the Ghetto," American Behavioral Scientist, March-April, 1972, pp. 495-509.

19. Ibid., p. 87 ff.

20. Clifford T. Morgan and Richard A. King, Introduction to Psychology, New York: McGraw-Hill Co., 4th ed., p. 581.

21. David Kretch, Richard S. Crutchfield, and Norman Livson, Elements of Psychology, New York; Knopf Co., 1969, 2nd ed., pp. 469-471; Morgan and King, op. cit.

22. Malnutrition, Learning, and Behavior, ed. by Nevins S. Scrimshaw and John E. Gordon, Cambridge: MIT Press, 1968.

23.

24. The Freeworld Times, Minneapolis, January, 1972, p. 1.: February, 1972, p. 1.

Reading List

Environmental Design and Crime Control

C.R. Jeffery, Crime Prevention Through Environmental Design, Sage Publications, 1971.

Oscar Newman, Defensible Space: Crime Prevention Through Environmental Design, MacMillan, 1972, (not published yet).

Joachim Wohlwill, ed., Environment and the Social Sciences, American Psychological Association, 1972, (articles by Yancey and Glasser especially).

John Decker, "Curbside Deterrence", Criminology, August, 1972.

Pedro David, "A Cross cultural comparison of Juvenile Offenders," Criminology (to be published).

Proskansky, H., Environmental Psychology, Holt, Rhinehart and Winston, 1970.

Kenneth Craik, New Directions in Psychology, Holt, Rhinehart, and Winston, 1970.

Biology and Brain Physiology

Jose Delagado, Physical Control of the Mind, Harper and Row, 1969.

Perry London, Behavior Control, Harper and Row, 1969.

Vernon Mark, Violence and the Brain, Harper and Row, 1970.

David Rosenthal, Genetic Theory and Abnormal Behavior, McGraw Hill, 1970.

Phillip Handler, ed., Biology and the Future of Man, New York: Oxford University Press, 1970.

Legal and Ethical Issues in Behavior Control

Nicholas Kittrie, The Right to Be Different, Baltimore: Johns Hopkins, 1971.

SOCIOPATHY AND DISEASES OF AROUSAL: PSYCHOPHARMACOLOGY, TREATMENT AND PREVENTION

Harold Goldman

As an outgrowth of persistent and intensive efforts to explain the chronic antisocial behavior of so-called sociopathic prisoners, we have come to the conclusion that a) sociopathy is indeed a distinct disorder and b) that it has a biological basis. The study of biological substrates of sociopathy has led to the development of a model which has had predictive utility. This model, however, when extended appears to have additional utility in integrating a much broader spectrum of behavioral syndromes heretofore viewed as discrete and often unrelated to one another. The model can become- we believe, the basis of a new productive nosology of behavioral diseases.

The organizing principle of this new paradigm is that these diverse (behavioral) syndromes: a) can be arranged along a continuum of states of hypo- to hyperarousal (1), and b) that problems of arousal derive from excessive operations of monoaminergic neurons -- within and without the central nervous system, and c) that different constellations of behavioral symptoms are likely to arise as a function of different, specific monoaminergic neurons.

The Biology of Sociopathy

Antisocial personality is a clinical disorder whose course, mechanisms, and etiology remain unknown. Genetic, physiologic, interactional and sociocultural etiologies have been advanced to explain this intractable behavioral disorder.

Even a cursory review of the literature reveals that the specific symptoms and behavioral manifestations of this disorder have been the subject of considerable debate through the years. At one time or another, sociopathy was referred to as "moral insanity," "moral imbecility," manie sans delire, "moral alienation," and still more recently, constitutional inferiority (atavism) and psychopathy (2). It was Partridge who first used the term sociopathy, describing it as a pathology involving the inability to conform to normative standards, rather than as a syndrome of intrapsychic symptoms. Generally speaking, and despite these disagreements, however, the following sixteen characteristic symptoms (3) embrace most of the previous and contemporary descriptions. Sociopathy involves:

(1) superficial charm and "good" intelligence;

(2) absence of delusions and other signs of irrational behavior;
(3) absence of "nervousness" or psychoneurotic manifestations;
(4) unreliability;
(5) untruthfullness and insincerity;
(6) lack of remorse or shame;
(7) inadequately motivated antisocial behavior;
(8) poor judgment and failure to learn by experience;
(9) pathological egocentricity and incapacity for love;
(10) general poverty in major affective reactions;
(11) specific loss of insight;
(12) unresponsiveness in general interpersonal relations;
(13) fantastic and uninviting behavior with and sometimes without drink;
(14) suicide rarely carried out;
(15) sex life impersonal, trivial, and poorly integrated;
(16) failure to follow any life plan.

Despite the long-standing interest, particularly by European investigators, in the biological substrates of criminal behavior, few modern American behavioral scientists have considered it relevant to examine these aspects of criminal conduct.

It was not until 1949 that Funkenstein et al.(4) parenthetically mentioned the cardiovascular lability of chronically antisocial individuals. Funkenstein (a psychiatrist) and his colleagues reported on 15 sociopaths (13 men and 2 women) selected from a group of court referrals to the Boston Psychopathic Hospital. They characterized these subjects ranging in age from 21 to 39 (mean = 25) as hostile recidivists. All had committed crimes of violence and exhibited no clinical signs of anxiety although they often claimed to be "nervous". Even though none of these volunteered any complaint of subjective discomfort, after an injection of 50 ug of epinephrine, 13 of the 15 sustained a systolic blood pressure rise of 75 mm Hg as compared to only 19 of the 85 psychotic and neurotic patients and 5 of the 15 controls.

In 1955, a psychologist Lykken (5) reported on the performance of 19 "primary" sociopath felons (12 of whom were men) on 8 assorted psychologic tests. On the 2 tests measuring autonomic function, the "primary" sociopaths produced a diminshed galvanic skin response (GSR) to lying and a diminished conditionability of the GSR as compared to the non-institutionalized controls. The first difference, the GSR to lying, approached the .05 level of significance. These differences were statistically different when the "primary" sociopaths were compared with a group of 19 incarcerated "neurotic" sociopaths (ie, the inmates who were labeled sociopathic by the prison staff but who did not meet Cleckley's clinical criteria).

In 1964, the social psychologists Schacter and Latané (6) reported that 15 imprisoned male sociopaths showed greater increases in pulse rate following an epinephrine injection than did 15 inmate control sub-

jects. (Whether the controls of Schacter and Latané more closely related to Lykken's "neurotic" sociopaths or to his controls is a moot point).

In 1965, the psychologist Lippert (7) compared 21 "sociopathic" delinquents with 21 nonsociopathic delinquents, and found that their patterns of spontaneous GSR frequency were characterized by a) lower resting levels, b) lesser increases during experimental manipulation, c) decreases to below resting levels following experimental manipulation, and d) increased adaptation to repeated stimuli.

Hare (8) in 1968, like Lippert, found that, at rest, 21 primary psychopaths had higher skin resistance and less variability than 12 non-psychopathic controls. Furthermore, the psychopaths' GSR, cardiovascular and orienting responses to mild stimuli, such as the solution of arithmethic problems, were less than in the controls.

Recently, Hakerem (oral communication, September 1968) observed an exaggerated pupillary response in a group of patients who were later identified as "psychopaths". This parenthetical observation was neither pursued nor published.

In the most recent and elegant assessment of the status of research in sociopathy, Hare underscores the assumption,now rather widely held, of a physiologic basis for this disorder. Substantial emphasis has been placed on some prominent biologic correlates of sociopathy, specifically:

a. That the EEG patterns of some sociopaths resemble those of children. This has led some investigators to the hypothesis of delayed maturation of some cortical neuronal mechanism (9, 10, 11). These abnormal EEG's,often found in their parents as well, are characterized by a predominantly slow wave pattern, a pattern found in states of hypoarousal.

b. In some sociopaths, limbic system disfunction, as evidenced in an abnormal slow wave EEG, seems to be involved (12).

c. From this evidence, one may conclude that psychopathy may depend on a decreased state of cortical excitability and on an attenuation of sensory input (13, 14).

d. Further, some sociopaths display not only these symptoms of hypoaraousal but of sensory deprivation, as well. For example, consistently observed is the paradoxical increase in aggressivity and other emotionality in certain sociopaths treated with drugs, such as barbiturates, neuroleptics and ethanol - substances which usually aggrevate states of sensory deprivation and promote passivity (3).

e. Certain sociopaths demonstrate a pathologic need for stimulation (16, 17, 18) and appear to be at a low end of

an arousal continuum. One would expect from these observations, that some sociopaths would avoid the use of depressants. Robbins indeed found this to be the case. On the other hand, Hill found depressants to improve the behavior of aggressive sociopaths.

f. Some sociopaths exhibit stereotyped behavior (19). In view of poor space-time integration and the stereotypical behavior, there is a likelihood that basal ganglia dysfunction may be involved.

g. Definite sexual differences in the median age of the onset of sociopathic symptoms may not be entirely socioculturally determined. Whereas in boys, symptoms occur at seven years of age, they are less severe in girls and occur later, at thirteen (20). Later in this paper is described a sex-related difference in certain kinds of sociopathy together with a possible biological explanation.

h. Sociopaths improve as a function of age, supporting the concept of delayed maturation (21). However, we predict that only a certain type of sociopath will improve while others will continue to demonstrate symptoms for life unless otherwise modified.

i. On the basis of the assumption that sociopathic behavior is somehow a consequence of hypoarousal, MacCulloch and Feldman (22) suggested that stimulants such as amphetamine might have utility in the treatment of sociopaths. However, Hare (23) rightly adds social processing to this chemotherapy as a potential means of rehabilitation.

Heterogeniety of Sociopathy

It is clear that much of the research in sociopathy suggests a highly probable biological etiology, yet often there has been little statistical validation of this hypothesis within and between studies from different laboratories. Possible explanations of this lack of validation may lie in the operational definitions of sociopathy, and the selection of different sociopathic types for experimentation purposes.

After attempting to replicate the seminal work of Schacter and Latané (6) in which a unique biologic response was described in sociopaths, it became clear to us that even the rigorous selection procedures used by them had failed to provide us with a homogeneous group; marked variability in biologic and other measures made interpretation meaningless. We soon concluded that much of this variation, also noted by others, could be explained on the basis of at least two subgroups.

Our multidisciplinary investigation, begun in 1967 at the Ohio

Penitentiary and involving 19 "primary" sociopaths, 10 mixed, and 14 non-sociopaths, as defined by clinical, psychometric, and criminal history criteria, revealed that the "primary" sociopaths were not homogenous with regard to such sociocultural variables as previous anti-social history, family characteristics, psychological profiles, and attitudes. As a result, using the Lykken Scale scores as the criterion, the "primary" sociopaths were divided into two types -- "hostile" and "simple". These types were clearly and significantly different from each other on nearly all of the sociocultural and psychological measures. Most importantly, only the "simple" (reasonably nonaggressive) sociopaths demonstrated the cardiac lability to epinephrine previously ascribed to sociopaths in general.

The simple sociopaths' exaggerated autonomic responses demonstrates that his characteristic overt behavior is paralleled by a characteristic physiologic behavior.

We believe that a logical case can be made for both abnormal autonomic and abnormal social behavior in the simple sociopath resulting from a single, simple, structural biological defect. We suggest that the most parsimonious lesion consistent with the available physiologic data is simply a diminished function (partial or total) of the catecholamine-secreting nerve endings, including those involved with sensory receptors. Such a sympathetic denervation would produce a denervation sensitivity of the structures innervated by these neurons, of a sort long familiar to physiologists. Such a supersensitivity - of whatever origin - is testable by current technology. This hypothesis in no way precludes extension of the defect to monoaminergic interneurons modulating both sensory input and motor output at higher levels of nervous system integration.

It is reasonable to assume that a defect already observed for three disparate effectors - heart, skin, and pupil (14) - is general among catecholamines-secreting neurons. Since other evidence, both physiologic and anatomic (27-33) indicates that the sympathetic nervous system modulates sensory input at several levels, including interoceptors and exteroceptors themselves, one result of such a general sympathetic nervous system defect would be a reduction and distortion of incoming stimuli in the simple sociopath. In point of fact, both Schoenherr (24) and Hare (25) have already demonstrated an elevated threshold for electric shock in sociopathic prisoners. Such diminution and distortion of sensory data on a chronic basis must markedly modify conditioned responses to emotion-laden stimuli, thereby distorting the attitudes and values erected during the formative years. If, in the presence of this sort of sympathetic nervous system defect, the simple sociopath retains an otherwise intact nervous system, the following predictions may be made.

(a) In reaction to perceived diminution of sensory input (cf, the better sensory deprivation experiments of the 1950's), he will seek stimulation in an attempt to optimize his input.

(b) Due to his functional sympathetic denervation, he will perceive emotional coloration only for events strong enough to trigger adrenal medullary secretion. Worse, as a result of denervation supersensitivity, he will perceive all such events as having a single-leveled maximum emotion. In other words, he would be expected to demonstrate "on-off" labile, impulsive behavior, and be quite unable to make graded emotional responses. Support for this predicted two-valued responsivity in the sociopath is found in the work of Schoenherr and Hare, both of whom have demonstrated that while normals have a low threshold to electric current, the sociopaths have a high threshold; the latter do not perceive and respond to electric current until the level of administration far exceeds that of the normals. Equally important, the maximum current level tolerated by the sociopaths is no more than that of the normals'. Thus, the perceptual range of extreme sociopaths may be compressed into what is literally a switching function.

(c) As this altered perception of incoming information becomes chronic, the maturing organism accumulates a store of faulty learned responses (more correctly, fails to accumulate a store of mature responses) which prevents his making socially acceptable emotion-laden decisions. (Parenthetically, consider also that in this formulation, the sociopath must represent one extreme along a continuum of sympathetic nervous system function. It follows then, that one must anticipate the existence of the other extreme, the case in which sympathetic function is excessive. As a result, one can anticipate in the adult an augmentation and a different pattern of distortion of sensory input). This being the case, it would follow that there would be: 1) hyposensitivity of sympathetic effectors to catecholamines; 2) an attempt to optimize input by avoiding simulation; 3) perception of an extreme emotional coloration for all events - a "one valued" logic again precluding graded emotional responses; and 4) a faulty learned program precluding acceptable emotion-laden decisions secondary to the chronically distorted reception of incoming information. (This describes the behavior of certain classes of schizophrenics).

No evidence is currently available to permit a choice (or even to narrow the choice) among the essentially limitless genetic and acquired etiologies possible for the postulated "defect", nor does any evidence preclude its being the common consequence of multiple causes. It is as conceivable that the defect is "congenital" and "innate" as that it is "environmental" or "acquired". The very location and character of the postulated neuronal defect is obscure. For example, it may occur at the nerve terminal, it may be ganglionic or preganglionic or it may be extraneuronal, even involving non-nervous structures such as the liver.

Assuming that the defect is in the catecholamine-secreting neurons, two classes of etiologies may be distinguished; 1) those in which the neurons fail to develop normally, a hypoplasia or "arrested or delayed maturation" -- if maturation should be merely delayed, a possible mechanism for the often postulated "burn out" of older sociopaths is apparent; and 2) those in which the neurons develop normally, but then

latter regress or degenerate. Merely as one example of plausible etiologies, the operation of nerve growth factor (26) may be involved in either class. In the first, failure of nerve growth factor secretion (either genetic origin or due to the absence of a necessary environmental stimulus) could be the mechanism of the delayed or arrested maturation; in the second, the sociopath might produce antibodies to his own nerve growth factor, either as a result of a genetic defect or due to an untimely environmental stimulation of nerve growth factor secretion having increased the probability of antibody formation.

It is conceivable and desirable that lesions such as those mentioned could be reversed or at least compensated by medical means. Such medical treatment would probably suffice as a preventive measure when applied prior to the onset of the disease. But in those in whom detection is delayed until the syndrome has developed, the defect will have influenced behavior already; years of faulty programming would continue to determine behavior even after any original biologic basis had been removed or compensated. Hence, even a medical solution to the sociopath's problem would be insufficient; if our assumptions are correct, therapeutic intervention of necessity will have to include reprogramming and resocialization.

Ramifications of the Arousal Paradigm

This biological model of sociopathy, widely presented, aroused considerable interest about its applicability to other behavioral disorders. For example, a number of colleagues (34) called attention to at least a superficial similarity between sociopathy in the adult and "classical" hyperkinetic activity in the child. The hyperkinetic syndrome, as in the case of sociopathy, appears to be a "diagnostic cesspool". At least two authors have published attempts to organize criteria into three categories (35).

308.0 Hyperkinetic reaction (with immaturity, inadequacy, lability, and poor organization).

308.4 Unsocialized aggressive reaction (aggressiveness and hostility with denials of feelings and personal responsibility; otherwise well-patterned behavior).

308.2 Overanxious reaction ("nervousness" and possible activity with subjective distress, otherwise well-organized behavior).

There are reminiscent of Wender's (36) "classical hyperactive", "sociopathic" and "neurotic" subsyndromes, respectively. These are also reminiscent, at least in the first two instances, of our "simple" and "hostile" sociopaths, respectively.

On yet another level, behavioral manifestations, mimicking some aspects of human sociopathy, are found in dogs who defy conditioning by

conventional Pavlovian methods (38). The "nervous" and "aggressive" components of the hyperkinetic syndrome in dogs can be distinguished pharmacologically just as they are clinically (34) -- for it would appear that in both dogs and children that "classical" hyperkinetic behavior responds best to D-amphetamine whereas the "aggressive" behavior can be ameliorated by L-amphetamine. This suggests that, according to Snyder's interpretation, a noradrenergic arousal mechanism plays a role in the former behavior whereas a dopaminergic mechanism is involved with the latter behavior pattern.

As a consequence of such thinking, a series of interdisciplinary seminars was organized to explore the possible relationships between hyperkinetic behavior in children and in dogs and "simple" sociopathy in human adults. We realized that the hyperkinetic child (308.0 of Fish) showed many of the same attributes as the "simple" sociopath -- impulsivity, a great deal of patently manipulative behavior (however, of things rather than people) and an inability to learn from experience.

Cleckley (3) and others (20) have suggested that central nervous system depressants such as alcohol or neuroleptics worsen the condition of sociopaths. This is not unlike the well-known paradox that sensory arousing drugs such as D-amphetamine or imipramine (39) improve the condition of "hyperkinetic" children. The paradoxical nature of these responses to arousing drugs disappears if one views the effects through another and simpler paradigm. This new paradigm stresses that both of these behaviors result from a sensory deficit and from under -- not over -- arousal; both are stimulus-seeking devices. The performance of hyperkinetic children (15) and dogs is improved, and the behavior of sociopaths ought to improve, by titrating each with a sensory arousing drug sufficient to restore his level of arousal to "normal" levels. Exceeding this dose level should produce the same, commonly observed symptoms of over-arousal which occurs in normal subjects, animal or human: anorexia, restlessness, insomnia and irritability.

Further consequences of this line of thinking are limited only by the imagination. However, one prediction has borne fruit, namely that females, before the menopause, ought to display a lower incidence of the "simple" form of sociopathy because chronic hypoarousal was less likely encountered in cycling women than in men. This slim working hypothesis was backed, in turn, on the work of Leslie Iversen and others (40,41), suggesting that estrogens modulate the postsynaptic actions of catecholaimines peripherally and probably, centrally as well. For whatever the reason, this was in fact the case in the population of women at the Ohio Reformatory for Women - which represents the entire felon population for the State of Ohio. Of the women who met all of our criteria for sociopathy, only 10% could be considered "simple"; on the other hand, among male sociopaths [at the Ohio Penitentiary], 50% were diagnosed as "simple", selected by the same criteria.

Other Diseases of Arousal

The drive to expand and explain in biological terms other forms of behavior which appear to be examples of either hypo- or hyperarousal has led us to consider the various monoaminergic neuron systems in the brain and spinal cord, in addition to those in the periphery, as substrates of all levels of behavioral arousal.

The pharmacologic evidence, albeit circumstantial, is great that the relatively sparse noradrenergic, dopaminergic and serotonergic neurons which arise in midbrain and brain stem structures profoundly modulate nervous structures at the level of the neuraxis -- from the sensory ganglion cell (44,46) and motoneruron in the spinal cord (43,45) to neurons of the first cortical layer (56); from the regulation of pain appreciation (42), the operation of the mesodiencephalic activating system (47), the integration of space and time by the basal ganglia (Hornekewickz) to neuroendocrine organization of the entire organism via the diencephalon. Monoaminergic devices appear to modulate all neuronal activities -- input, output and transactions between these processes -- processes from the modulation of the peripheral receptors themselves such as fine touch (31,33,51), proprioception (27,30) and olfaction (49) through the regulation of skeletal and smooth muscles (43) and secretory activity (50), both exocrine (54) and endocrine.

Beginning about 1963, Swedish investigators (44, 46) and others have systematically outlined the locations of these neurons, their soma, fiber tracts and terminations. Pharmacologists have been close behind, tracing their functions, and demonstrating that drugs or lesions which modify the operation of these neurons produce a spectrum of arousal disturbances that depend on the degree and specific involvement of such monoaminergic neurons.

Returning to a previous example, subgroups of children labeled hyperkinetic appear to have different kinds of hypoarousal; the aggressive type respond equally well to L and D amphetamine (34) as do "hostile-aggressive" hyperkinetic dogs (34,38); the classical hyperkinetic child or dog responds best to the D form or to imipramine. The modification of the behavior of the first group depends, very likely, on the action of amphetamine on dopaminergic neurons (37) which are located exclusively in the central nervous system; changes with the latter drugs, particularly impramine, are related to noradrenergic innervation centrally and/or peripherally. A quaternary form of imipramine which would not pass the blood-brain-barrier easily thereby preventing its entry into the central nervous system could be employed to distinguish a peripheral from a central mechanism. Similarly, "simple" sociopathy, which we suspect involves a peripheral hypoarousal mechanism, should be treatable in the same way with noradrenergic facilitation, by means of a compound with few central actions.

On the other end of the spectrum of arousal-hyperarousal, several disease entities appear to be begging discovery when viewed through this

paradigm. Various aspects of schizophrenic behavior clearly involve different groups of noradrenergic and/or dopaminergic neurons; crude arousal at the level of the reticular formation, more complex integrated patterns of limbic system and basal ganglia performance. Drugs with rather selective antidopaminergic actions (52) for example, are relatively effective in reducing hallucinations, but less so in reducing anxiety or general arousal states, whereas, primarily anti-adrenergic compounds may be effective calmatives but ineffective anti-hallucinogenic agents.

Little is known about the roles of serotonergic neurons which almost always parallel the noradrenergic and dopaminergic neurons in the central nervous system. However, most information about serotin again centers on arousal mechanisms, particularly those related to sleep (53). The hallucinatory actions also appear to involve serotonergic mechanisms (55).

There are some twenty-five histochemically anatomically distinct central monoaminergic neuronal groups. It seems reasonable that unusual operation of any one or a combination of these could result in unique arousal pathologies which manifest themselves in the current and poorly described behavioral disorders.

A comprehensive nosology of behavioral disorders based upon dis-function of these discrete neuronal groups and subsequent arousal mechanisms appears to be potentially far more productive for purposes of classification and treatment of mental illnesses than existing nosologies. Not the least of the benefits of this fresh orientation toward monoaminergic arousal mechanism is the likelihood of attracting and stimulating a broad spectrum of neuroscientists to explore the relationship between mental disorder and specific neuronal pathologies.

Prevention

The comments above have several implications. First, it should be assumed that in discussing environmental design that the internal environment of an organism is designed in a fashion similiar to the design of urban locales, architectural plans, or system analysis and is modifiable to the extent that it is dictated by our present knowledge.

A second implication of these comments above suggest that drug therapy in treating sociopathy is in itself insufficient as a means of preventing further criminal behavior on the part of those labeled sociopaths. It would be necessary under any circumstances to wed resocialization/training treatment programs to drug therapy, inasmuch as faulty socialization (or imprinting) would probably have occured, resulting in what Cleckley (3) might agree would be a "mask of sanity". Such a resocialization technique will be employed with our work with sociopaths at the Chillicothe Correctional Institute.

A third suggestion of this paper is that the traditional role of a

therapist as "listener" or as "druggist" is redefined. Since repairing the organic functioning of the body is not sufficient, the subject's inappropriate behavior must be changed through interventional techniques to render him more acceptable to the general population. This is the wedding of the "listener" and "druggist" role of therapy, and has considerable implication for the fields of psychiatry.

A fourth suggestion is that early isolation of potential sociopaths and sociopathic offenders may be possible through diagnosis based upon a knowledge of abnormal nervous system functioning. Those persons whose medical, social and perhaps deviance histories indicate previous sociopathic states could receive drug therapy coupled with socialization techniques before the onset of behavioral symptoms severe enough to eventually bring them to the attention of the criminal justice system. An assumption here is that organic indications will emerge through further experimentation and research with sociopathic populations, which have been operationally defined in fashions acceptable to the majority of experimenters and clinicians.

The proposal for early isolation and intervention before the onset of behavioral symptoms is beset with ethical, moral and legal questions which would more probably be discussed at a later time. The ethics of State intervention, as well as the passive, uncritical, and frequently enthusiastic acceptance by the public of such intervention with potential offenders, is fraught with a number of problems, and discussion of these issues will be of necessity effected. While we could not underwrite in any sense the ethics of State intervention at the level in which it is theoretically possible, obviously such techniques may be permissible with (1) incarcerated, incorrigible felons for whom no other treatment is possible, (2) subjects who volunteer for this treatment, and (3) minors whose parents request such treatment. All three major categories assume the competence and willingness of practitioners to combine these modalities of treatment.

Inherent in the question of the power of the State versus the right of the individual is a conflict which cannot be resolved at this time. In sociolegese, this would be a conflict between humanism versus "technological Fascism". In long-range terms, and in light of traditions of American culture, it may be that our ability to intervene at an early age would "cost" too much, and a certain degree of tolerance of deviance may be necessary.

REFERENCES

1. Fischer, R. "A Cartography of the Ecstatic and Meditative States." Science, 174:897-904, 1971.

2. Maughs, S. "A Concept of Psycopathy and Psychopathic Personality: its Evolution and Historical Development." J Clin Psychopath., 2: 465-499, 1941.

3. Cleckley, H. The Mask of Sanity, 4th Ed., Mosby, St. Louis, 1964.

4. Funkenstein, D.H., M. Greenblatt, and H.C. Solonion. "Psychophysiological Study of Mentally Ill Patients." Amer. J. Psychiat., 106: 359-366, 1949.

5. Lykken, D.T. A Study of Anxiety in the Sociopathic Personality. dissertation. University of Minnesota, Minneapolis. University Microfilms, Ann Arbor, Mich., 1955, No. 55-944.

6. Schacter, S., and B. Latane. "Crime, Cognition and the Autonomic Nervous System."In D. Levine (ed.) Nebraska Symposium of Motivation. Lincoln: University of Nebraska Press, 1964, pp. 271-274.

7. Lippert, W.W. The Electrodermal System of the Sociopath. dissertation. University of Cincinnati, University Microfilms, Ann Arbor, Mich., 1965, No. 65-12921.

8. Hare, R.D. "Psycopathy, Autonomic Functioning, and the Orienting Response." J Abnorm. Psychol. 73 (suppl.): 1-24, 1968.

9. Kiloh, L., and J.W. Osselton. Clinical Electroencephalography. Washington: Butterworth, 1966.

10. Lindsley, D.B. "The ontogeny of Pleasure: Neural and Behavioral Development." In R.G. Heath (Ed.), The Role of Pleasure in Behavior. New York: Harper & Row, 1964. pp. 3-22.

11. Scheibel, M.E., and A.B. Scheibel. "Some Neural Substrates of Postnatal Development." In M. Hoffman and L. Hoffman (eds.), Review of Child Development Research, Vol. 1. New York: Russell Sage Foundation, 1954, pp. 481-519.

12. Hare, R.D. Psychopathy. New York: Wiley & Sons, 1970, p. 33.

13. Hare, R.D. Psychopathy. New York: Wiley & Sons, 1970, p. 36.

14. Lindner, L.A., H. Goldman, S. Dinitz, and H.E. Allen. "Antisocial Personality Type with Cardiac Lability. Arch. Gen. Psychiat. 23: 260-267, 1970.

15. Irwin S. "A Rational Framework for the Development, Evaluation, and Use of Psychoactive Drugs." Amer. J. Psychiat. 124: Suppl. on Drug Therapy, 1-19, 1968.

16. Quay, H.C. "Psychopathic Personality and Pathological Stimulation Seeking." Amer. J. Psychiat. 122: 180-183, 1965.

17. Petrie, A. Individuality in Pain and Suffering. Chicago: Univ. of Chicago Press, 1967.

18. Eysenck, H.J. The Biological Basis of Personality. Springfield, Ill. C.C. Thomas, 1967.

19. Hare, R.D. Psychopathy. New York: Wiley & Sons, 1970, p. 89.

20. Robbins, L.N. Deviant Children Grow Up. Baltimore: Williams & Wilkins, 1966.

21. Ziskind, E. Presented at "Workshop on Psychophysiological Responses in the Sociopath." New Orleans, La. Nov. 1970.

22. MacCulloch, M.J. and M.P. Feldman. "Personality Structure and its Relation to Success in the Treatment of Homosexuals by Anticipatory Avoidance Conditioning." Unpublished manuscript. In R.D. Hare, Psychopathy. New York: Wiley & Sons, 1970, p. 117.

23. Hare, R.D. Psychopathy. New York: Wiley & Sons, 1970, p. 118

24. Schoenherr, J. Avoidance of Noxious Stimulation in Psychopathic Personality, dissertation. Univ. of Calif. at L.A. University Microfilms, Ann Arbor, Mich. 1965, No. 64-8334.

25. Hare, R.D. "Detection Threshold for Electric Shock in Psychopaths." J. Abnorm. Psychol. 73: 268-272, 1968.

26. Levi-Montalcini, R., and P.V. Angeletti. "Nerve Growth Factor." Physiol. Rev. 48: 534-569, 1968.

27. Bulbring, E. "Biophysical Changes Produced by Adrenaline and Noradrenaline." In J.R. Vane, G.E.W. Volstenholme, and M. O'Connor (Eds.), Adrenergic Mechanisms, Boston: Little, Brown & Co., 1961, p. 275-287.

28. Burn, J.H. "The Relation of Adrenaline to Acetylcholine in the Nervous System." Physiol. Rev. 25: 377-394, 1945.

29. Chernetski, K.E. "Sympathetic Enhancement of Peripheral Sensory Input in the Frog." J. Neurophysiol. 27: 493-515, 1964.

30. Eldred, E., H.N. Schnitzlein, and J. Buchwald. "Response of Muscle Spindles to Stimulation of the Sympathetic Trunk." Exp. Neurol. 2: 187-195, 1960.

31. Lowenstein, W.R., and R. Altimirano-Orrego. "Enhancement of Activity in a Paciniam Corpuscle by Sympathomimetic agents." Nature, 178: 1292-1293, 1956.

32. Beidler, L.M. "Mechanisms of Gustatory and Olfactory Receptor Stimulation." In W.A. Rosenblith (Ed.), Sensory Communication. New York: John Wiley & Sons, Inc. and MIT Press, 1961, pp. 294-307.

33. Rodriguez-Perez, A.P. "On the Existence of Accessory Unmyelinated Fibers in the Meissher's Corpuscles of the Pulp of the Human Toe." Dermatologica, 129: 468-474, 1964.

34. Arnold, L.E., V. Kirilcuk, S. Corson, and E. Corson. "Levo-Amphetamine and Dextro-Amphetamine: Differential Effect on Aggression and Hyperkinesis in Children and Dogs; Diagnostic and Biochemical Implications." Am. J. Psychiat. 1972 (In Press).

35. Fish, B. "The 'One Child, One Drug' Myth of Stimulants in Hyperkinesis." Arch. Gen. Psychiat. 25: 193-203, 1971.

36. Wender, P. "Minimal Brain Dysfunction in Children." New York: John Wiley & Sons, Inc., 1971.

37. Snyder, S., K.M. Taylor, J.T. Coyle, and J.L. Meyerhoff. "The Role of Brain Dopamine in Behavioral Regulation and the Actions of Psychotrophic Drugs."

38. Corson, S.A., E.O'L. Corson, V. Kirilcuk. "Tranquilizing Effects of D-Amphetamine on Hyperkinetic Untrainable Dogs." Fed. Proc. 30: 206, 1971.

39. Winsberg, B.G., I. Bialer, S. Kupietz, and J. Tobias. "Effects of Imipramine and Dextro-Amphetamine on Behavior of Neuropsychiatrically Impaired Children." Amer. J. Psychiat. 128: 1425 ff, 1972.

40. Eisenfeld, A.J., L. Krakoff, L. Iversen, and J. Axelrod. "Inhibition of Extraneuronal Metabolism of Noradrenaline in the Isolated Heart by Adrenergic Blocking Agents." Nature, (Lond.) 213: 297-298, 1967.

41. Kalsner, S. "Steroid Patentiation of Responses to Sympathomimetic Amines in Aortic Strips." Br. J. Pharmacol. 36: 582-593, 1969.

42. Way, E.L. "Role of Serotonium in Morphine Effects". Federation Proc. 31: 113-120, 1972.

43. Anderson, E.G. "Bulbospinal Serotonim - Containing Neurons and Motor Control." Federation Proc. 31: 107-112, 1972.

44. Dahlstrom, A., and K. Fuxe. "Evidence for the Existence of Monoamine-Containing Neuron in the Central Nervous System." Acta Physiol. Scand. 62: Suppl. 232, 1-55, 1964.

45. Anden, N.- E., M.G.M. Jukes, and A. Lundberg. "Spinal Reflexes and Monoamine Liberation." Nature, (Lond.), 202: 1222-1223, 1964.

46. Fuxe, K., and N.- E. Anden. "Distribution of Monoamines in the Central Nervous System." In Costa, Cote and Yahr, (Eds.), New York: Raven Press, 1965, pp. 123-129.

47. Himwich, H.E. "Functional Organization of the Brain, Past and Present." J. Nerv. Ment. Dis. 130: 505 ff, 1960.

48. Hornykiewicz, O. "Dopamine (3-Hydroxy Tyramine) and Brain Function." Pharmacol. Rev. 18: 925-964, 1966.

49. Dahlstrom, A., K. Fuxe, L. Olson, and U. Ungerstedt. "On the Distribution and Possible Function of Monoamine Nerve Terminals in the Olfactory Bulb." Life Sciences, 4: 2071-2074, 1965.

50. Cegrell, L., B. Falck, and A. Rosengren. "Dopamine and 5-Hydroxytryptamine in the Guinea-Pig Pancreas." Life Sciences, 6: 2483-2489, 1967.

51. Santini, M. "New Fibers of a Sumpathetic Nature in the Inner Core of Pacinian Corpuscles." Brain Res. 16: 535-538, 1969.

52. Janssen, P.A.J., C.J.E. Niemegeers, and K.H.L. Schellekens. "Is it Possible to Predict the Clinical Effects of Neuroleptic Drugs (Major Tranquillizers) from Animal Data?" Part I Arzneimittel-Forsch. 15: 104 ff, 1965; also 15: 1196 ff, 1965.

53. Jouret, M. "Biogenic Amines and the States of Sleep." Science, 163: 32-41, 1969.

54. Ehinger, B., J.R. Garrett, and P. Ohlin. "Adrenergic Nerves in the Major Salivary Glands of the Rabbit." Experimentia 23: 924, 1967.

55. Aghajanian, G.K. "Influence of Drugs on the Firing of Seratonin - Containing Neurons in the Brain." Federation Proc. 31: 91-96, 1972.

56. Fuxe, K., B. Hamberger, and T. Hokfelt. "Distribution of Noradrenaline Nerve Terminals in Cortical Areas of the Rat." Brain Res. 8:125-131, 1968.

PSYCHOPHARMACOLOGIC FACILITATION OF PSYCHOSOCIAL THERAPY OF VIOLENT BEHAVIOR*

Samuel A. Corson, E. O'Leary Corson, Walter Knopp, and L.E. Arnold

Drugs and Psychosocial Therapy of Violence

I. Definition of the Problem

We are using the word "therapy" advisedly because of the accumulated evidence indicating that violent behavior in man and other higher organisms is a form of psychopathology, comparable to hyperkinetic behavior disorders, cerebral palsy, mental retardation, and convulsive disorders (Mark and Ervin, 1970, p. 12).

A great deal of confusion has arisen because of the interchangeable use of the words "aggression" and "violence." In psychiatric, psychologic, and sociologic literature aggressive behavior has been used to denote not only fighting behavior but also assertiveness. In the language of psychodynamic therories the term "aggression" has been used to denote "an essential motive power, a primary drive or instinct, necessary for human survival and achievement" (R.H. Cawley, 1969, p. 321). Violence, on the other hand, can be looked upon as morbid aggression. To quote Dr. Cawley again: "What is morbid is potentially avoidable, so it follows that we can look at pathological aggression as a disease process which affects human individuals and groups."

Certainly in man, violence is an example of a nonadaptive self-defeating activity, since all interpersonal and social-economic conflicts can be solved best and at a lower energy expenditure by means of constructive cooperative efforts. Among the factors responsible for violent behavior, social and behavioral scientists have included social disorganization (Scott, 1958, 1971), economic poverty, frustration, and irresponsible abuse of communications media, especially television. Corson (1971) summarized some evidence suggesting that violent behavior represents one form of psychopathology resulting from lack of effective and viable feedback channels in our social structure and educational institutions.

However, one must realize that all these psychosocial forces must exert their influence on man and other higher organisms via the behavior controlling system: the brain. Just as in the case of psychosomatic diseases, individuals with different constitutional makeup develop different disorders (or none) even though they may be exposed to the same kind of psychologic stress, so also proneness to different types of violent behavior will depend on the constitutional differences in brain

*Illustrated by a 16 mm B/W Cinema

function. Mark and Ervin (1970) reported that many cases of violent behavior in humans are related to brain dysfunction. Some of these cases can be treated with psychotropic drugs, others can be treated only with appropriate neurosurgical procedures.

Our presentation will describe a case of a model of uncontrollable violent canine behavior which we were able to eliminate by a combination of psychopharmacologic and psychosocial therapy.

This particular dog was one of several hyperkinetic dogs, some of which responded favorable to moderate doses of amphetamines. The development of these animal models in our laboratory came about as a by-product of our studies on psychobiologic individuality during the past several years (Corson, 1966a and b, 1969; Corson et al, 1969, 1970; Corson and E. O'l. Corson, 1971). We have chosen dogs for our studies because of the availability of a large assortment of mongrels as well as a variety of pure breeds. As pointed out by Scott and Fuller (1965), "the dog is a veritable genetic gold mine." Moreover, the dog is one of the few domestic animals exhibiting a rich spectrum of emotional responses comparable to those exhibited by humans.

In the course of our studies on the comparative reactions of different dogs to emotional stress (induced by Pavlovian conditioning with electrocutaneous reinforcement), we came across certain dogs which could not be trained to adapt to a Pavlovian stand. These animals became particularly unmanageable and destructive to everything within reach as soon as the experimenter left the conditioning room and closed the door. The longer the experiments proceeded, the more unmanageable these dogs became. Neither time, reward, nor punishment had any favorable effects. Major or minor tranquilizers were of no avail. Because these animals could not learn to tolerate the essential Pavlovian conditioning restraints and failed to filter information input, these dogs essentially became "Pavlovian school dropouts."

It then occurred to us that the behavior of these hyperkinetic untrainable dogs might be comparable to that of hyperkinetic children suffering from the minimal brain dysfunction syndrome, as reviewed extensively by Wender (1971). Since many of these hyperkinetic children respond favorably to central nervous system stimulants, such as amphetamine or methylphenidate, we decided to investigate the effects of amphetamines on our hyperkinetic dogs. Our experimental methods have been described elsewhere (Corson et al, 1972).

II. Interaction of Drugs and Psychosocial Therapy in the Modification of Violent and Hyperkinetic Behavior: Case History of Dog "Jackson."

Our canine model of violent behavior was dog Jackson, a 1.5-year-old cocker spaniel x beagle hybrid who in addition to uncontrollable violent behavior also exhibited hyperkinesis. Jackson had a "rejecting master"

who was so eager to donate the dog to our laboratory that he could hardly be persuaded to wait long enough to sign the ownership transfer papers.

It soon became obvious why Jackson was rejected by his original master. As can be seen in Fig. 1, the dog's response to any approach was to snap, snarl, growl, or, if possible, bite. His reaction to humans or other canines always involved terrifying barking. Even experienced, gentle dog handlers were bitten by him until eventually laboratory personnel refused to approach him. One might say he had poor relations with authorities and caretakers.

His peer relations were equally poor. As can be seen in the cinema, on exposure to a gentle, friendly dog, Jackson viciously lunges, attacking the larger dog without bothering to learn his intentions. Jackson is socially clumsy; in fact, anti-social.

Jackson also has "school" maladjustment. Unlike normal dogs, he cannot tolerate the Pavlovian stand. Even though he has not been hurt, he thrashes about in panic, his usual reaction to restraint. During his notorious career in our laboratory, he ruined hundreds of dollars worth of equipment. Tranquilizers like chlorpromazine and meprobamate failed to help. Eventually, he had to drop out of the Pavlovian conditioning school.

Finally, we decided to try amphetamine on Jackson. The only safe way to administer the drug was in a meatball. Jackson would literally bite the hand that fed him, behavior comparable to human poor judgment and failure to assess consequences. Such behavior is non-adaptive. It leads to rejection by caretakers. The social feedback is predictably negative, leading to and seeming to justify a paranoid view of the world.

Within one hour after the very first dose of d-amphetamine, 1mg/kg, approximately the same daily dosage range as used with hyperkinetic children, we saw a dramatic change in Jackson, as illustrated in Fig. 2. His vicious barking and snarling suddenly and completely disappeared. If the original sound were on the film, one could hear him whimpering and whining as if he wanted to be petted. The laboratory personnel, well conditioned by Jackson's previous behavior, at first approached him only gingerly but became more confident as he seemed to welcome the petting and even whimpered for more when it was stopped. Soon the laboratory personnel felt safe enough to handle Jackson and experiment with him. Eventually, one technician developed such a fondness for him that she wanted to take him home as a pet. The drug made possible the psychosocial therapy of tender loving care he has learned to enjoy.

His peer relations also improved. He was no nonviolent, even submissive, towards the same dog to whom he was so vicious in earlier encounters. In contrast to his previous spontaneous, aggressive viciousness, he now appeared quietly perplexed and unsure what to do, but not attacking. His school performance also improved with amphetamine. Now, in the same

Figure 1

Uncontrollable aggressive behavior of hyperkinetic dog

Jackson, male, 10.5 kg.

equipment which he previously would have destroyed with his panicky thrashing, he stood still in a Pavlovian stand, much as a normal dog would without medication. In fact, under the influence of amphetamine he behaved in the stand as if he had been trained for months. He quickly learned the conditioned responses and was able to discriminate between excitatory (danger) signals and inhibitory (safe) signals after five experimental sessions. This learning was evidenced by his discriminated conditional motor defense (leg lift) responses as well as by conditional cardiac and respiratory reactions.

This rapid learning shows that his previous failure in the Pavlovian school was not a result of canine mental retardation, but rather a secondary effect of his behavioral problem, just as is seen to be the case in many hyperkinetic children of normal intelligence who cannot learn in school without the normalizing effects of stimulant drugs. Neurophysiologic counterparts of this apparently paradoxical effect of stimulant drugs were reported by Knopp et al (1972).

After six weeks of drug-facilitated psychosocial therapy, Jackson's amphetamine medication was withdrawn. Much to our surprise, the violent behavior did not reappear. Apparently, the violent behavior had been trained out by the durg-facilitated social interaction with other canines, experimenters, and caretakers, and by the conditioning experiments. Now, even without medication he was still friendly, not only to authorities but also to his peers. On meeting the same large dog to whom he had been aggressive before the amphetamine therapy, Jackson barked but now the barking seen in the cinema is a spontaneously friendly type of barking in contrast to the vicious snarling, snapping and growling he showed before medication and the rather perplexed, submissive whimpering when first medicated.

However, even though the morbid aggression seemed permanently suppressed, the hyperkinesis reappeared in the no-drug situation. Jackson remained hyperkinetic without amphetamine, but he did not forget what he had learned under the influence of amphetamine. Even without medication, he settled down on hearing the safe inhibitory tones, seeming to be reassured by them. However, when the danger tones were presented, he began thrashing about in just as panicky a manner as he has previously done without medication. But this time it was for a good reason: he knew he was about to be shocked. After being shocked, the safe inhibitory tones helped him to settle down.

This has interesting implications for the learning of hyperkinetic or violent children in school under the influence of stimulants. Insofar as it is valid to extrapolate from animals to humans, this suggests that what such children learn in school while medicated with amphetamine they would tend to retain later. The observations on dog Jackson are at variance with the theory of state-dependent learning. The learning in Jackson persisted without medication although with a hyperkinetic flavor.

After two more months of experimenting and psychosocial therapy

Figure 2

Transformation of Jackson into a friendly, lovable, trainable dog one hour following oral administration of d-amphetamine (1 mg/kg).

with amphetamine, the hyperkinesis was also reduced, even after the drug was withdrawn. At the time of these experiments, Jackson was between 1.5 and 2 years old, roughly corresponding to late adolescence in human beings. Therefore, in this preliminary work, one cannot rule out maturation as a possible cause of the cure in this cinema. However, we doubt this, because six older hyperkinetic dogs which we studied did not outgrow their symptoms.

The dosages required for the control of Jackson's violent behavior were the same for dextro-amphetamine or the levo isomer. In contrast, the control of hyperkinesis required four times as much levo-amphetamine as dextro-amphetamine. These differential effects of the two isomers would suggest the involvement of a dopaminergic system in violent behavior and primarily a noradrenergic system in hyperkinesis (Snyder et al, 1970; Taylor and Snyder, 1970).

One of the most interesting and promising amphetamine effects in dog Jackson is the elimination of violent behavior even after the drug was withdrawn. At this writing, the dog has been without any medication for more than six months without exhibiting any indication of his former pre-drug pattern of violent behavior. Our tentative hypothesis is that amphetamine enabled the dog to develop positive adaptive social interactions which seemed to persist even after the drug was discontinued. This postulate would have to be tested by genetic breeding experiments, controlled postnatal experience, including exposure of litter mates to different degrees of socialization, and the administration of drugs with and without opportunities for positive social interactions.

BIBLIOGRAPHY

1. Cawley, R.H. (1969): Summing up. Journal of Psychosomatic Research, 13, 321-24.

2. Corson, S.A. (1966a): Conditioning of water and electrolyte excretion. In: Endocrines and the Central Nervous System. Research Publications, Association for Research in Nervous and Mental Disease. Williams and Wilkins, Baltimore, 43, 140-99.

3. Corson, S.A. (1966b): Neuroendocrine and behavioral response patterns to psychologic stress and the problem of the target tissue in cerebrovisceral pathology. Proceedings of the Conference on Psychophysiological Aspects of Cancer, Annals of the New York Academy of Sciences, 125 (Article 3), 890-918.

4. Corson, S.A., Hajek, J., Hajkova, M., Kirilcuk, V., and Corson, E. O'L. (1969): Psychogenic and constitutional factors in energy metabolism. The Physiologist, 12(3), 201.

5. Corson, S.A. (1969): Physiologic responses to avoidable and unavoidable psychologic stress in relation to genetic differences. Annals of the New York Academy of Sciences, 164, 526.

6. Corson, S.A., Corson, E. O'L., and Kirilcuk, V. (1970): Individual differences in respiratory responses of dogs to psychologic stress and Anokhin's formulation of the functional system as a unit of biological adaptation. International Journal of Psychobiology, 1, 1-16.

7. Corson, S.A., Corson, E. O'L., Kirilcuk, V., and Arnold, L.E. (1971): Tranquilizing effects of d-amphetamine on hyperkinetic untrainable dogs. Federation Proceedings, 30, 206.

8. Corson, S.A. (1971a): Pavlovian and operant conditioning techniques in the study of psychosocial and biological relationships. In: Society, Stress and Disease, volume 1, The Psychosocial Environment and Psychosomatic Diseases, edited by Lennart Levi, The Oxford University Press, London, pp. 7-21.

9. Corson, S.A. (1971b): The lack of feedback in today's societies - a physhosocial stressor. In: Society, Stress and Disease, volume 1, The Psychosocial Environment and Psychosomatic Diseases, edited by Lennert Levi, The Oxford University Press, London, pp. 7-21.

10. Corson, S.A., and Corson, E. O'L. (1971): Psychosocial influences on renal function - implications for human pathophysiology. In: Society, Stress and Disease, volume 1, The Psychosocial Environment and Psychosomatic Diseases, edited by Lennart Levi, The Oxford University Press, London, pp. 338-51.

11. Corson, S.A., Corson, E. O'L., Kirilcuk, V., Knopp, W., and Arnold, L.E. (1972) Differential interaction of amphetamines and psychosocial factors in the modification of violent and hyperkinetic behavior and learning disability. Federation Proceedings, 31, 820.

12. Corson, S.A., Corson, E. O'L, Kirilcuk, V., Kirilcuk, J., Knopp, W., and Arnold, L.E. (1972): Differential effects of amphetamines on clinically relevant dog models of hyperkinesis and stereotypy: relevance to Huntington's disease. In: Huntington's Chorea Centennial Symposium, Raven Press, New York, in press.

13. Corson, S.A., Corson, E. O'L, Kirilcuk, V., Arnold, L.E., and Knopp, W. (in press): Bridging the gap between psychobiology and medical practice - development of an animal model for the study of the hyperkinetic syndrome. In: Psychiatric Eclecticism: A Festschrift for Ralph Patterson, edited by H. Goldman, The Ohio State University Press, Columbus.

14. Knopp, W., Arnold, L.E., Andras, R.L., and Smeltzer, D.J. Electronic pupillography: predicting amphetamine response in hyperkinetic children. Submitted to Am. J. Psychiat., 1972.

15. Mark, V.H., and Ervin, F.R. (1970): Violence and the Brain, Harper & Row, New York.

16. Scott, J.P. (1958): Aggression, University of Chicago Press, Chicago.

17. Scott, J.P. (1971): The control of violence. Conditional Reflex, 6, 63-66.

18. Scott, J.P., and Fuller, J.L. (1965): Genetics and the Social Behavior of the Dog, University of Chicago Press, Chicago.

19. Snyder, S.H., Taylor, K.M., Coyle, J.T., and Meyerhoff, J.L. (1970): The role of brain dopamine in behavioral regulation and the actions of psychotropic drugs. American Journal of Psychiatry, 127, 199-207.

20. Taylor, K.M., and Snyder, S.H. (1970): Amphetamine: differentiation by d and l isomers of behavior involving brain norepinephrine or dopamine. Science, 168, 1487-89.

21. Wender, P.H. (1971): Minimal Brain Dysfunction in Children, Wiley-Interscience, New York.

PREVENTION OF VIOLENT BEHAVIOR:

A PSYCHIATRIC CLINICIAN'S POINT OF VIEW*

Walter Knopp

Introduction

Violent behavior is an extremely complex pheonomenon which will never be completely untangled by any one man. It seems to be an inevitable part of life. If corrective measures for the recent increase in violent behavior are to be successful, all of us interested in such prevention will have to form a very personal approach to the problem (at least to begin with) with respect to our own life experience as well as our professional qualifications: knowledge, skill, experience and conceptual frame of reference. Unless we develop a method of sharing our experiences, communicating impressions to one another, and integrating our observations into meaningful and scientifically testable hypothetical assumptions, we shall not comprehend the complete picture. We will find ourselves in the position of those proverbial blind men who tried to study and describe the appearance of an elephant.

What I Have Learned In This Workshop

The five days of this fascinating workshop acquainted me with much honest and excellent work being done already, in addition to that of Corson[3-7] and that of the sociopathy study groups as represented by Goldman[9] and Ziskind[28] with whom I had been familiar. This workshop made it possible for me to discover new worlds which I never dreamt would be relevant to the study and prevention of violent behavior. Of particular interest and importance was Jeffery's[11] emphasis on the inclusion of the internal environment (as I conceive of it) in the study and prevention of crime by environmental design. By "internal" Jeffery obviously means a different kind of internal environment than that described by Studer[24]. If I understand rightly, Jeffery defines internal environment as the so-called "black box", i.e. the human brain and organs controlled by it. In my opinion, its importance in the genesis, maintenance, prevention, and treatment of violent behavior should not be overlooked. Thus, Jeffery helped me to identify that little niche in the interdisciplinary network of activities and studies where I could contribute best with my background as a behaviorally and neurobiologically oriented clinician.

---

*Most of the thoughts expressed in this paper would not have been possible without the implicit or explicit contributions of the following colleagues: H. Allen, S.A. Corson, E.O'L. Corson, H. Goldman, M. Kindig, A. Koestner, L. Liss, and D. Smeltzer.

How Can I Contribute

There seems to be agreement that the prevention of violent behavior and crime can only be accomplished by the cooperation and integrated effort of many pragmatic scientists who have knowledge and experience in dealing with the problem at different levels of organization, from the molecular, organ, organismic (i.e. individual) levels to small group (i.e. family, neighborhood, peer group, classroom, co-workers and others), and large group levels. The psychiatric clinican could assist by working at the individual level. He is trained in observing, describing, and quantifying symptoms, in examining their interrelationship and their responsiveness to therapeutic intervention, and in classifying them into diagnostic and prognostic categories. He is also experienced in recognizing subtle or sub-clinical forms of aggression before their overt expression takes place. Thus, he seems well equipped to supplement the valiant efforts of attitude and behavior modifiers, city planners, criminologists, neurobiologists, pharmacologists, psychologists, and sociologists in the study and prevention of violent behavior. In addition, the psychiatric clinician has been trained in a method seldom experienced by other scientists: the method of longitudinal study of the individual patient, in contrast to the cross-sectional study of groups which is the domain of the epidemiologist.

The clinician studies the frequency or intensity of both external parameters (observable behavior) and internal parameters (pulse, pupillary response, etc.) and judges the effectiveness of his treatment approach accordingly. He classifies his treatment as a success or a failure on this basis. All clinicians have had treatment failures and successes and they have hopefully learned from both. An effective clinician is the one who successfully integrates his knowledge derived from single case studies with that derived from literature and epidemiology and who has identified the factors which lead to success and prevent failure. This does not mean that he approaches each of his patients with a rigid or pre-designed master plan in mind. On the contrary, the clinical model is a very flexible and very tentative model. Daily observation frequently corrects the course of action planned by the clinician the day before. He is in a situation similar to the NASA scientists during the moon flight. There is a pre-designed course of action, but negative feedback prompts the clincian to change his course to one which (in his opinion) is better suited to reach his goal, i.e. the recovery or improvement of his patient. Thus, although the clinician is trained and experienced mainly in the practice and application of secondary and tertiary prevention he could be of great help to others by establishing a more sensitive data base for primary prevention.

A Psychiatric Clinician's Model Of The Internal Environment

In addition to being a clinician, I personally am very much interested in neurobiology and in bridging the gap between neurobiology and improvement of the treatment. This latter interest brought me into close contact

with Drs. Corson, Goldman, Dinitz, and others. Through contact with an eminent neurologist[1], I learned and modified the following model[13] of "black box" functioning and of integrative organization of the internal environment alluded to by Jeffery.

Our felling of "well being" is based on a continuous "motion" within our nervous system. Keeping a balance within itself, with the rest of the body, and with the external environment is indeed no easy task. Incoming information from the external environment reaches the brain via senses of sight, hearing, smell, taste, and the skin functions of touch, pain, and temperature, among others. This information is joined by "signals" from our internal environment (i.e., viscera, muscles, tendons, joints, and others) to constitute the afferent input into our brains. There it is "metabolized," as it were, and translated into efferent output. The latter we usually call "healthy" or "normal" behavior and by it we mean a harmonious teamwork between perception, thinking, memory, mood, motor activity, and visceral functions. A person's behavior, of course, influences his or her environment which, in turn, influences the future input by a "feedback." To say it bluntly: "If you behave like an SOB you'll be treated (by your external environment) like an SOB."

This homeostatic cycle can be disturbed by essentially two mechanisms:

1. Defects of input: too much (input overload), too little (sensory deprivation), or inappropriate (input) stimulation; or

2. Faulty Transmission

   a. within the brain, or

   b. between the peripheral structures.

On the basis of many separate observations there is ever-growing circumstantial evidence that our brain is subserving essentially three functions of human behavior[1,13,14,27]:

1. An intimately private and unshareable visceral experience, function, and behavior.

2. The no-so-private, potentially shareable emotional experience, function, and behavior, and

3. The publicly shared, and conscious experience, function, and behavior.

The first function, the private visceral experience, seems to be subserved by the "visceral brain" which controls metabolism, nutrition, digestion, respiration, and motility of the smooth-muscle apparatus. It is here where alerting and limited but sustained emergency responses

take place. Clinical evidence indicates that pervasive self-awareness and psychic motivation may be located in this system. In short, this system mediates what in clinical language we call feeling, or feeling state; i.e., the state of "internal motion."

The second function, the not-so-private emotional experience, is subserved by the system of emotional expression. It mediates the outward expression of inner feeling states, i.e., it brings out internal or visceral motion and expresses it in some overt bodily motion. Fear, anger, affection, reproductive stimuli, pleasurable sensations, and some of the appetites are expressed through this system such as by laughter, weeping, gestures, facial mimicry, or sexual behavior.

Finally, the third function, which mediates the public, shared, and conscious experience, is subserved by the system of effectuation. It is designed primarily for dealing with the environment. This system permits dexterity of the distal parts of the body, the use of tools, as well as substitution of symbols for objects. The use of these symbols is thought and their expression in language is another function of this system. With it man explores his environment by direct palpation (touch, taste), or indirect "palpation" such as sight, hearing, and smell.

A well-balanced and continuous reconcilliation of all these three functions could be called the "rational brain." In its totality of struction and function, this is the basis for our feeling of well-being and healthy behavior.

Monitoring of these three levels of function is the backbone of the psychiatric clinician's ability to monitor success or failure of a treatment modality.

How Can We, As One Of The Nuclear Sub-Groups, Contribute

By "we" I mean an interdisciplinary group which has been working and planning together for the past two years on the design and implementation of a project to be described. The group consists of a biochemist and endocrinologist, a computer specialist, a neuropathologist, a psychophysiologist, and applied psychologist, and, peripherally, the sociopathy study group represented at this workshop. Our approach is to carry out studies in secondary and tertiary prevention to form a basis for primary preventing, i.e. to use therapeutic intervention as a dissecting tool to split the diagnostic "wastebasket" of violent behavior into smaller, more homogeneous subgroups.

There seems to be agreement that the present form of secondary or tertiary prevention in criminology (by incarceration, custodial care, teaching appropriate skills and other similar approaches) leads to about 80% recidivism in a given prison population. There is some preliminary evidence that remotivational approaches and those focussing on

attitude change,[12] cerebral training[23] and behavior modification[21] decrease this recidivism rate from 80% to 30%. Thus, effective motivational and attitudinal psychosocial intervention seems to split the group 80% recidivists into two groups: 50% responders and 30%. Thus, effective motivational and attitudinal psychosocial intervention seems to split the group of 80% recidivists into two groups: 50% responders and 30% non-responders. It stands to reason that the latter group must have "something" in common which prevents it from responding to remotivational rehabilitation as defined above. The psychiatrically trained physician is reminded immediately of:

1. Patients suffering from depression, with low frustration and pain thresholds and tolerances, with their tendency to assume that others think and talk negatively about them, with their tendency to be aggressive, verbally or physically, with their tendency to use alcohol to numb their feelings of despair, fears, hopelessness, and with their inability to cope with their external environment. Indirect evidence found in the world literature[13] makes it possible to assume that these patients are suffering from imbalance of their enzymatic make-up in the visceral brain. In these patients, pharmacological intervention is necessary to bring the patient within reach of psychosocial rehabilitation, reminding us of Dr. Corson's[6] successful treatment of the violent canine fear-biter Jackson.

2. Another group which comes to mind is the group of schizophrenics with their lack of self-confidence, tendency to distort reality and suspiciousness leading to aggression as "defense"[22].

3. A third group, called sociopathic, was well described by Drs. Goldman and others at this workshop.[9,28]

Our group has been planning to assess the level of functioning[2,7-10,14-20,22,25,26,29] at the visceral and the other two levels in all participants prior to remotivational intervention and thereafter. Detailed comparison at all levels of investigation between responders and non-responders before and after remotivational treatment could help us discover differences in their internal environmental "machinery" subserving overt and covert behavior. These findings in humans would be correlated with those of Dr. Corson's animal models and further investigated by him and by the neuropathologist at the tissue culture levels. Better understanding of the nature of the differences would lead to improved therapeutic approaches and to a basis for better primary prevention.

Where Do We Go From Here

The complexity of the problem, the necessity of an interdisciplinary

approach, the difficulties with which interdisciplinary group communication is beset, and many other ethical and moral handicaps will make heroic and preconceived interdisciplinary master plans impossible. In my opinion and experience, talking and listening to one another, designing of goal-directed short-term studies, paying attention to the feedback received from these studies, and appropriate changes and adjustments suggested by such feedback, are the only methods which will enable us to find the proper path in the approach to our goal: crime prevention by environmental design. No one person, or one interdisciplinary group has enough knowledge, skill and wisdom to "go it alone." Let each of us, or each of our groups, begin where it seems best at this time, as long as proper scientific methodology is being used. Let us have similar workshops in the future where we review each others' progress (or lack of it). Thus, around several nuclei of approaches new information and hopefully new facts will be added layer by layer, like in the growth of crystals. Experience shows that great achievements are seldom accomplished by a single grand theoretical design. To the contrary, preliminary definition of a problem, meaningful experimentation, evaluation of feed-back, its application in new experimentation, crystalization of isolated facts, their conglomeration into groups of facts, and finally confluence into one model of testable assumptions is in my opinion the only way to progress. Unless we succeed in establishing such a path and re-introduce and reassert the importance of individuality and individual differences to supplement and, when needed, to counter the cherished group approach, we shall fail. The problem has been eloquently summarized by Mark and Ervin[20] as follows:

"In summary, the separation of 'mind' from body was the historical idea that nurtured the separation of 'environment' from brain. Brain scientists have largely discredited the mind-body dualism; but the environment-brain dualism lives on in the minds and actions of many social scientists and is encoded in our laws. They see behavior and especially violent behavior as being caused only be defects in the environment. Some of them go so far as to admit that the brain may play a significant role in behavior, but many claim it is no good investing time and money in brain research because the train is too complicated and poorly understood. On the other hand, they predicate their efforts to control violent individuals by rehabilitation or by punishment on the basis that these individuals (a priori) have a completely normal brain. That some of these people may have brain disease and are candidates for a combined medical-sociological approach seems to have eluded them. Often, in their isolation from biologists, they fail to realize that every element of environment is intimately connected to brain and brain function, and by ignoring this fact they not only disregard the futility of their solo efforts to treat people with brain injuries, but they pass up the opportunity to study and learn from the brain physiologists new techniques that may be powerful tools of the future for the re-habilitation of violent individuals with normal brains. Thus does the doctrine of separation - the 'either/or' philosophy - continue to exert its pernicious and separatist effect on those of us who are concerned with the diagnosis and treatment of the violent individual."

Mark and Ervin's eloquent paragraph speaks for itself. There is nothing to add except to emphasize that many of us physicians, too, have similar problems in paying less than lip service to the importance of emotional and social factors in the precipitation of illness and morbid aggression.

BIBLIOGRAPHY

1. Allen, N. (1968) A cerebral hierarchy and its diseases. Presented at the Neuropsychiatric Society of Central Ohio Meeting, April.

2. Aitken, R.C.B. (1969) Measurement of feelings using visual Analogue Scales. Proceedings of the Royal Society of Medicine, October, 62, 10:989-996.

3. Corson, S.A., Corson, E.O'L., Kirilcuk, V., and Arnold, L.E. (1971). Tranquilizing effects of d-amphetamines on hyperkinetic untrainable dogs. Federation Proceedings, 30(2):206.

4. Corson, S.A., Corson, E. O'L, Kirilcuk, V., Knopp, W., and Arnold, L.E. (1972). Differential interaction of amphetamines and psychosocial factors in the modification of violent and hyperkinetic behavior and learning disability. Federation Proceedings, 31:820.

5. Corson, S.A., Corson, E. O'L., Kirlicuk, V., Arnold, L.E., and Knopp, W. (1972). Bridging the gap between psychobiology and medical practice -- development of an animal model for the study of the hyperkinetic syndrome. In: Psychiatric Electricism: A Festschrift for Ralph Patterson, Harold Goldman, ed. The Ohio State University Press, Columbus, Ohio, in press.

6. Corson, S.A., Corson, E. O'L., Knopp, W., Arnold, L.E. (1972). Psychopharmacologic facilitation of psychosocial therapy of violent behavior. Presented at the Crime Prevention through Environmental Design Workshop, June. Sponsored by the Program for the Study of Crime and Delinquency, Division of Public Administration, Ohio State University, in press.

7. Corson, S.A. (1971) Pavlovian and Operant Conditioning Techniques in the Study of Psychosocial and Biological Relationships. In: Lennart Levi, ed., Society, Stress and Disease, Vol. 1. The Psychosocial Environment and Psychosomatic Diseases, Oxford, Londin, p. 7-21.

8. Friedman, M., Brown, A.E., Rosemann, R.H. (1969). Voice analysis test for detection of behavior pattern. JAMA, May 5, 208:5, 828-836.

9. Goldman, H. (1972). Sociopathy and diseases of arousal. Presented at the Crime Prevention through Environmental Design Workshop, June. Sponsored by the Program for the Study of Crime and Delinquency, Division of Public Administration, Ohio State University, in press.

10. Hease, H.J. (1961). Extrapyramidal modification of fine movements - a "conditio sine qua non" of fundamental therapeutic action of neuroleptic drugs. Revue Canadienne de Biologie 20:425-450.

11. Jeffery, C.R. (1971). Crime prevention through environmental design. Sage Publications.

12. Kindig, M. (1971). Personal communication.

13. Knopp, W. (1970). Pathophysiology of the depressed state. In: Enelow, ed. Depression in Medical Practice, Merck & Company, p. 1-20.

14. Knopp, W. (1970). Man's tripartite brain and psychosomatic medicine. In: Pierlott, ed. Recent Research in Psychosomatics, 8th Europ. Conf. Psychosom. Res., Knokke. Psychother. Psychosom. 18: 130-136.

15. Knopp, W., Arnold, L.E., Andras, R., Smeltzer, D. (1972). Electronic pupillography: Predicting amphetamine response in hyperkinetic children. Submitted, American Journal of Psychiatry.

16. Lacey, J.I. (1967). Somatic response patterning and stress: Some revisions of activation theory. In: H.H. Appley and R. Trumbull (eds.) Psychological Stress: Issues in Research, New York, Appleton-Century-Crofts, p. 14-37.

17. Lazarus, R.S. (1968). Desensitization and the Experimental Reduction of Threat. Journal of Abnormal Psychology, 73:2, 100-113.

18. Levi, L., (1967). Stress sources, Management, and Prevention. Liverright Publishing Corporation, New York.

19. Lowenstein, O., and Loewenfeld, I.E. (1958). Electronic pupillography A new instrument and some clinical applications. Arch. Ophthalmol. 59: 352-363.

20. Mark, V.H., Ervin, F.R. (1970). Violence and the brain. Harper & Row, Medical Department, New York.

21. McKee, John M. (1970). The Re-education of criminals. Mental Health Program Reports - 4, National Institute of Mental Health, January, p. 13-26.

22. Rubin, B. (1972). Prediction of Dangerousness in Mentally Ill Criminals. Arch. Gen. Psychiat. 27:397-407.

23. Schmidhofer, E. (1970). Cerebral training: An application of Clinical Neurophysiology. Hafner Publishing Company, New York.

24. Studer, G. (1971). Human systems design and the management of change. General Systems, 16, 131-143.

25. Tobach, E. (1969). Experimental approaches to the study of emotional behavior. Annals of the New York Academy of Sciences, 159-3, 621-1121.

26. Wolpe, J. (1969). The practice of behavior therapy. Pergamon Press, New York.

27. Yakovlev, P.I. (1948). Motility, behavior, and the brain. J. Nerv. Ment. Dis. 107:313-335.

28. Ziskind, E. (1972). The maturational lag hypothesis and sociopathy: Prevention Techniques. Presented at the Crime Prevention through Environmental Design Workshop, June. Sponsored by the Program for the Study of Crime and Delinquency, Division of Public Administration, Ohio State University, in press.

29. Zubin, J., Shagass, C.H. (1969). Neurobiological aspects of psychopathology. Grune & Stratton, New York, London.

CONTRIBUTIONS OF SYSTEMS ANALYSIS TO CRIME PREVENTION

Albert B. Bishop and Ned B. Wilson

Introduction

It has become forcefully evident from listening to the presentations at this workshop and reading the associated papers that an immense quantity of high level research pertinent to crime and delinquency is being performed in many scientific fields. Work in genetics, biology, psychotherapy, psychopharmacology, and brain physiology is directed at determination of the physical influences on behavior. The influences of learning processes, life styles, urban design, and the organization and operation of the criminal justice and legal systems on deviant behavior are being studied by many researchers. With the great diversity and large numbers of participants in crime-prevention related research, it is of little wonder that many, if not most, such researchers, isolated within their own scientific disciplines, work in relative ignorance of what others are doing. In dealing with an area as complex as deviant human behavior, it seems apparent that real progress will occur only after mechanisms become available not only to aquaint the various interested parties with each others' activities, but also to explicitly structure the phenomena involved to better direct the research and indicate how the myriad of findings fit together as they are obtained.

The discipline involved with the conceptualization of such structures, or models, and the interrelating of the available knowledge concerning the components of the structure is commonly described by the generic title of Systems Analysis. In light of the foregoing, systems analysis appears to hold a potentially vital role in the study and ultimate elimination of crime and delinquency.

This paper is an attempt to describe this role and indicate some of the potential benefits of a systems approach in this area. First, a working definition of a system is presented to facilitate the ensuring discussion. This is followed by a brief description of the general modus operandi of systems analysis and the intimately related activity of systems design, with particular emphasis on the role of the system model. Several of these procedures are illustrated by some results of a study of the juvenile justice system in Ohio conducted by the Systems Research Group of the Department of Industrial and Systems Engineering of Ohio State University under the sponsorship of the Ohio Youth Commission.[1] Finally, some initial efforts to describe the effects of the various components of the juvenile system on juvenile behavior are presented.

System Definition

A system is most simply defined as a collection of components or elements which interact in some significant way with one another.

Components which are not part of the system constitute the environment of the system. Some of the components in the environment may influence one or more of the components in the system. These influences are called system inputs, or just inputs. Similarly, some of the system components may influence one or more of the environmental components. This type of influence is a system output or simply output.

These definitions are straight-forward and may, as a result, seem trivial. However, since interactions among components may take place not only with the system but also between those in the system and those in the environment and further among those in the environment, the identification of which elements constitute a given system is not necessarily clear. "The system" as defined for a given analysis is thus greatly dependent on the specific goals of the researcher who is conducting the study.

As a general guide to the selection of components to be included in a system, care must be exercised to include all those elements whose functions bear on the problems which motivated the research. On the other hand, blind inclusion of all elements which might have some remote relationship to the problem at hand is not necessarily helpful because the increased complexity of the resulting system may mask the relationships of real importance. Thus, some experimentation involving a certain amount of trial and error, system development, and empirical research will usually be required to synthesize a workable system definition.

The most important factor in defining a system, however, is the research question one is attempting to answer. For example, if we wished to determine optimal treatment programs for juveniles institutionalized for delinquent behavior, the system would probably include the institution itself, plus any supporting personnel such as psychiatrists, educators, social workers, etc., and the parole agency which would deal with the juveniles after they left the institution. On the other hand, if the research question were how to allocate resources generally to reduce the occurrence of delinquent acts, then the system would have to includ not only the institutions and parole agency, but also the police and courts, the community aspects of home, school, employment, economic conditions, and recreation, and the full range psychological, pharmacological, physiological, and genetic factors which influence behavior. The more far-reaching the research questions, the more complex the system which must be analysed.

In similar manner, choices must be made concerning which elements of the environment require explicit mention or representation. Again, the research question provides general constraints, but the research approach or design employed by the researcher also play an important role. In attempting to find ways to lower the delinquency rate, one researcher may choose to investigate the overall effects of certain types of legislative activities. In this case, the legislative component of the system is specifically identified as an element in the juvenile justice

environment and laws become an important set of inputs to the system. In a study of halfway houses, however, the elements of the general community with which the residents come into contact must be clearly defined, with public attitudes and behavior toward the residents as system inputs.

Systems Analysis and Systems Design

Although the term "systems analysis" is commonly used as a catch-all for any activity involving a general systems approach, the correct usage of the word analysis makes the term too restrictive in a literal sense to properly describe all phases of the activity involved. For this reason, it is helpful to differentiate between systems analysis and systems design.

Analysis is an investigative effort to discover how and perhaps why things behave the way they do. It is a descriptive function. The steps usually followed in systems analysis are depicted in Figure 1. Note the cyclic nature of the ideal procedure, an ideal which is often not obtained due to the frequent short-run, periodic nature of available research support. As shown, the initial effort is to list those components which have some reasonable chance of having a significant effect on the answer to the research question. Next the interrelationships among the components must be determined. At first these may be described only qualitatively, but hopefully quantitative functions can eventually be evolved. A first cut at selection of a set of components to comprise the system can now be made and the system structure determined. The elements not included are relegated to the environment. At this point, the inputs and outputs become defined. Further study and observation of the appropriate portions of the real world often accomplished during efforts to answer specific research questions, will usually point up weaknesses in the initial definitions which may lead to revisions in the system structure. Sometimes components are added or deleted; sometimes descriptions of interrelationships are changed; and sometimes research time runs out before either can be accomplished.

As opposed to analysis, design is a synthesis function. Systems design is generally prescriptive in that one configuration of components must be selected from among the many, possibly infinite number of, feasible configurations that could be used. The basis of selection for a design is the satisfaction of some objective, such as lowering the cost of operating an institution or decreasing recidivism among delinquent juveniles. Often multiple objectives are encountered, many of which may be conflicting such as lowering cost and recidivism rate simultaneously. In such cases, composite criteria must be developed.

It is not uncommon for the selection of a measure of effectiveness to itself be the object of considerable research effort. When societal problems are being studied, the effectiveness of any proposed solution

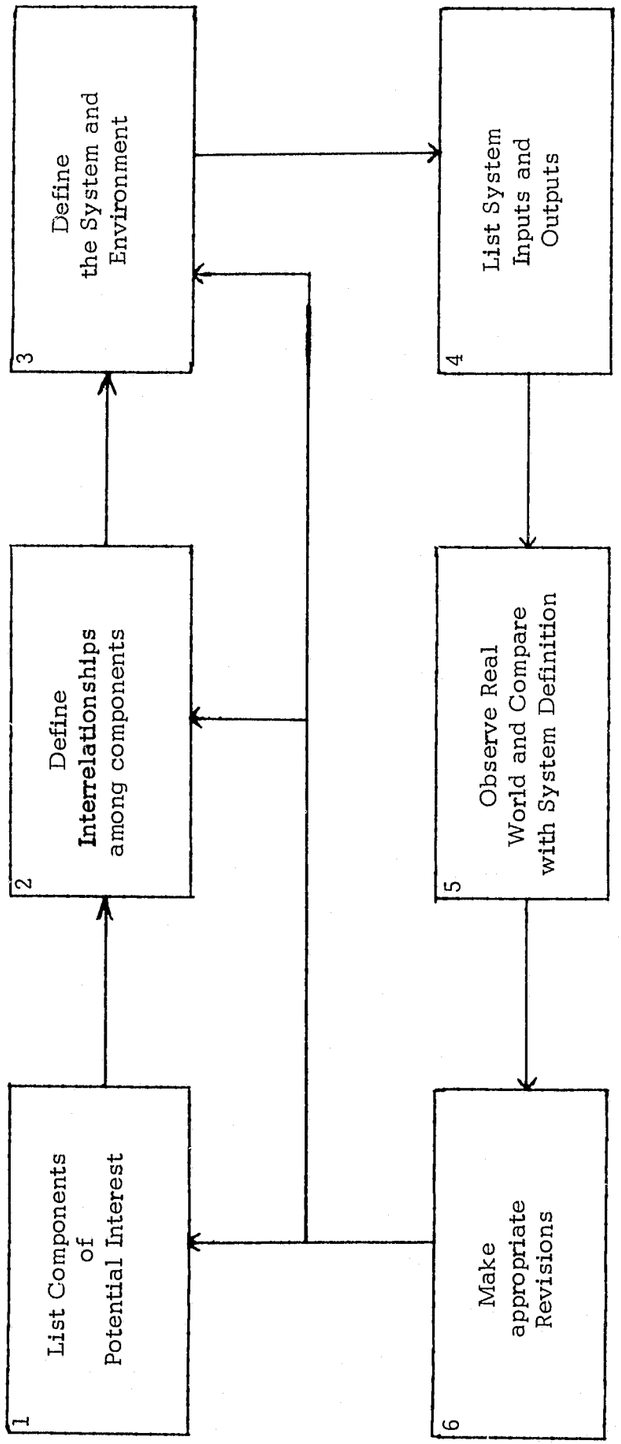


Figure 1. The Cyclic Nature of Systems Analysis

depends on what is important to the segments of society involved. Thus determination of individual and group value systems becomes an integral part of many system-design efforts. Consider the evaluation of delinquency prevention programs. One could use as a measure of program effectiveness the reduction of the number of delinquent acts committed in the region of interest. However, some programs selectively influence various types of acts. For example, a car-lock program would conceivably lower car thefts by juveniles but would have little effect on incidents of breaking and entering. Street lights must cut down on muggings and rapes but do little to prevent armed robberies of stores. In fact the frustrated mugger could very well switch to hold-ups of business establishments. Thus, to properly guide decision-makers in allocating resources to delinquency programs, the relative importance or severity of different types of delinquent acts, as viewed by the community involved, must be determined. The feasibility of such determinations has been illustrated by Sellin and Wolfgang (1964) in an effort which was later replicated by Kenner, Wilson, and Yao (1971). Nevertheless, extensive research was required to obtain this measurement scale.

No matter how complex or extensive the criterion picture becomes, however, an essential element of any systems design is some sort of measure of effectiveness. Details concerning construction and use of such measures may be found in Quade and Boucher (1968) and Churchman, Ackoff, and Arnoff (1954).

Systems design involves the application of the scientific method of observation, hypothesis, and test. Thus, the first step in the design is an analysis of the system involved, i.e., the function just discussed as systems analysis. This provides the researcher with a basic understanding of the inner workings of the system and results in the synthesis of a systems model. Model as used here simply refers to an abstraction of the real world, described by Miller and Starr (1960) as "...a representation of reality that attempts to explain the behavior or some aspect of it." If the analysis is done well, it will meet Miller and Starr's criterion for usefulness. They state:

> "Since a model is an explicit representation of reality it is always less complex than the reality itself, but is has to be sufficiently complete to approximate those aspects of reality which are being investigated."

The systems model is the researcher's basis for the derivation and test of hypotheses regarding system operation and for the development of the sought-after systems design. It also serves as a guide for further observation of the real world and for its own subsequent modification or enrichment. It also provides a ready means of trying out new ideas and proposed changes, both in input-output relations between the system and the environment and in structural changes in the system itself. Models are generally more rapidly and less expensively manipulated than the real world they represent; and, further, the manipulation can usually be

accomplished under much better control, which facilitates interpretation of results.

Churchman, Ackoff, and Arnoff (1957) have classified models into the categories of iconic, analogue, and symbollic. Table 1 provides definitions of these categories and some examples and characteristics of each of them.

Table 1. Categorization of Models by Degree of Abstraction

Iconic - a scale representation of some or all aspects of the real world.

1. Examples
   a) Photograph
   b) H-O trains
   c) Terrain board

2. Characteristics (relative)
   a) Looks like what it represents
   b) Easily conceived
   c) Lacks flexibility, manipulability
   d) Does not show cause and effect relationships
   e) Does not show dynamic (time based) performance

Analogue - one physical property is used to represent another according to a fixed set of rules.

1. Examples
   a) Graph
   b) Analogue Computer

2. Characteristics
   a) Can show quantitative relationships
   b) Changes not hard to make
   c) Lacks some ease in conception
   d) Can represent many different real-world processes with same general model.
   e) Can show some cause-and-effect and dynamic relationshipa

Symbollic - a symbol is used to represent a physical quantity according to a fixed coding system.

1. Examples
   a) Logic statements ($p \wedge q$)
   b) Mathematical equations ($F = ma$)

2. Characteristics
   a) Can draw on the vast technology of logical (mathematical) systems to govern model construction and manipulation.

   b) Can show quantitative, dynamic, and cause-and-effect relationships
   c) Can represent many different real-world processes with same general model
   d) Lacks any physical resemblance to real world

Note that as we move from iconic through analogue to symbollic the physical similarity between model and real world diminishes; but, with this increase in abstraction one gains considerably increases in manipulability. Often systems researchers, like most researchers, will employ numerous forms of models in a given study as the needs arise.

Systems Research

It should be stated that systems analysis (or systems analysis and design as described here) is basically an approach to problem solving. It is an approach in which one attempts to bring all relevant factors and information pertinent to a problem together and to structure the system made up of these factors in a meaningful way. Models (abstractions) are used to guide the research, to help determine solutions, and to evaluate potential solutions by a relevant measuring scale. Rarely does the systems engineer initially possess an intimate knowledge of all, or even parts, of the system under study. This forces him to pursue seriously the initial step of the scientific method, namely that of objective observation. He must work closely with those who are knowledgeable of the system and those who are experts with respect to the system components. Hence, interdisciplinary teams consisting of the systems engineer and the experts directly familiar with the system and its parts are often found in studies of complex systems. Interdisciplinary teams without a clearly identified systems person are of course also common, but a close analysis of the workings of the group will usually reveal that someone is functioning in that role.

The previously referenced Ohio Youth Commission (OYC) sponsored study by the Systems Research Group (SRG) of the Industrial and Systems Enginerring Department at Ohio State University illustrates this process. The SRG team has consisted through most of the study of persons with formal training in mathematics, computer science, psychology, business organization, political science, and electrical engineering. All, however, have received or are currently working on advanced degrees in systems engineering and operations research. The OYC personnel, with whom very close working relationships have been continually maintained, have backgrounds in social work, sociology, engineering and law, and possess a detailed familiarity with not only the OYC but also many of the aspects of the workings of law enforcement agencies and courts.

A great deal of early effort was expended by both SRG and OYC personnel in visiting juvenile courts, law enforcement agencies, juvenile institutions, and some community-service facilities. These visits

involved detailed questioning concerning the functions and objectives of the unit being visited, the decisions for which it was responsible, who made decisions of various types, the information available upon which to base these decisions, the interrelationships among the unit and other agencies, and any problems or difficulties they faced. This and available published information formed the basis of SRG's initial version of a model of the juvenile system, which took the form of a flow diagram showing the passage of a juvenile through the various components of the system. Later models incorporated quantitative measures and provided the capability to perform quantitative evaluations.

In the following sections, simplified versions of the flow model and a quantitative model based on estimated conditional probabilities of a juvenile following various branches in the system are presented. Their purpose is to illustrate the uses of system models in systems analysis and design and not to provide detailed descriptions of the system or its elements. More detailed versions exist and are being profitably employed in the OYC research, but presentation of this amount of detail here would simply complicate the discussion.

The Basic System Flow Model

The factors influencing crime and delinquency are far reaching and complex. The primary focus of public knowledge of criminal activity centers on the police and courts. There are, however, many other agencies and factors playing active roles in influencing criminal activity. Following a series of interchanges with the JDPPP team, Figure 2 was developed to provide a summary representation of the interactions among the major identifiable influences acting to produce, deter, and deal with delinquent activity. Let us examine the major components of the system represented by Figure 2.

The juvenile is subjected to many influences which play a significant role in determining whether his actions will be socially acceptable or delinquent. Individuals are strongly affected by family, friends, schools, and home situation. In addition, a formal controlling influence is exerted by law enforcement agencies. The effect of the police control depends upon the attitudes learned within the framework of the juvenile's environment as well as the observed actions of the police. These effects are labeled A and B, respectively, in Figure 2. It should be noted that the acceptable and delinquent acts being committed within a community are strong environmental factors influencing subsequent juvenile behavior.

Of the entire collection of delinquent acts and attempted acts, only a small percentage ever come to the attention of the police. The undetected and unreported crime and delinquency, labeled C in Figure 2, is difficult to assess. Some indirect methods, such as anonymous self reporting can provide indications of such activity, but routine direct measurement is not economically feasible. Similarly, crimes prevented

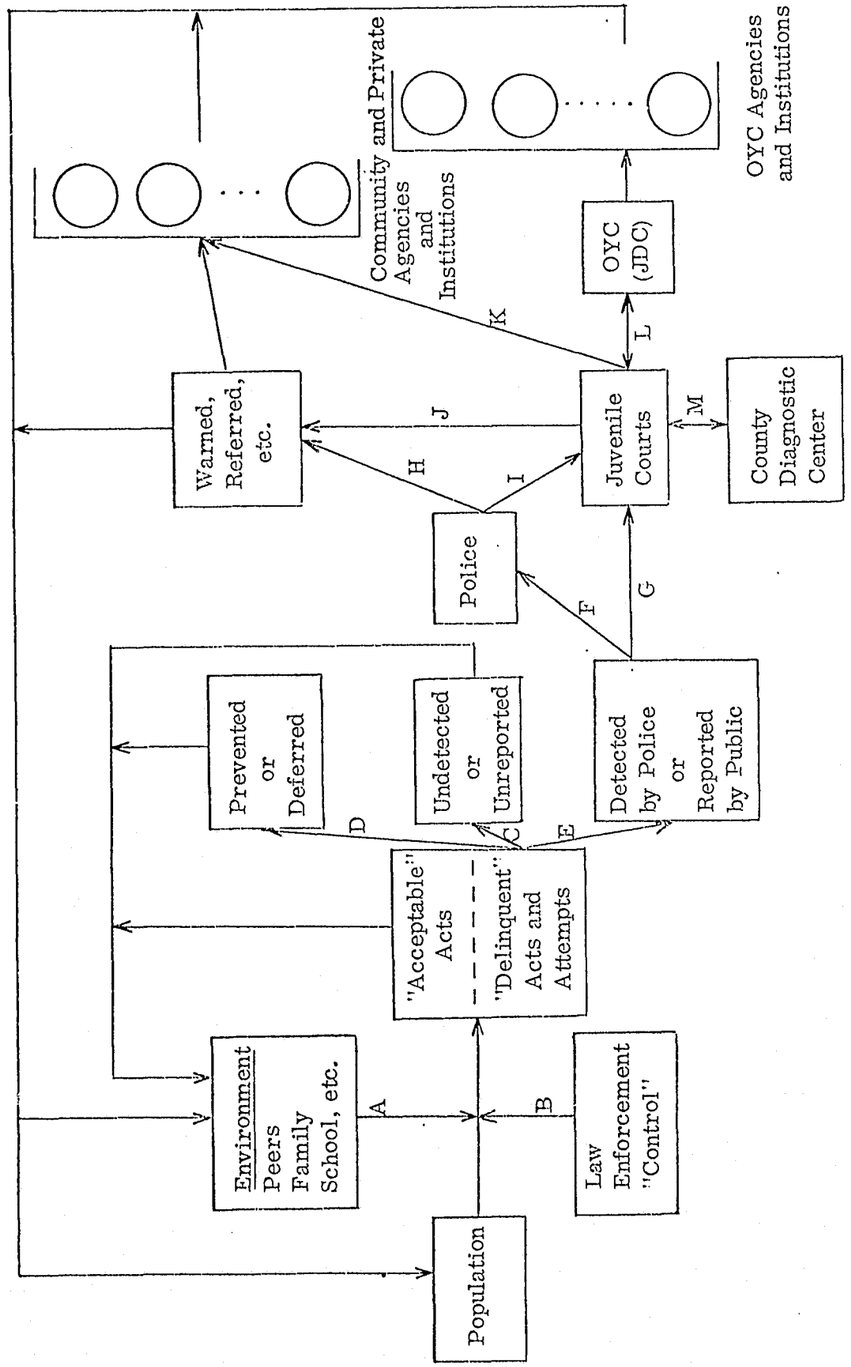


Figure 2.--Delinquency Cycle

by police control and environmental influences, labeled D, are not subject to direct observation and measurement.

The most readily observed and measured subset of delinquent activity is that which is detected by the police or reported by the public, labeled E in Figure 2. Records of such detections and reports are generally kept with some degree of regularity and consistency. These records provide the most complete indication of delinquent activity, especially of serious criminal acts, that can be obtained through direct means. There are certain types of reported delinquency which do not come to the attention of the police. These, labeled G in Figure 2, include primarily juvenile status offenses such as truancy, waywardness, or unruliness. These offenses can be reported directly to the juvenile courts and are recorded in the court records.

When an offense comes to the attention of the police, two major options are available. The offender may be warned, reprimanded, referred to a community or private agency, or simply released. Such "office dispositions," labeled H, typically account for a large minority of juvenile dispositions. The second major alternative, labeled I, includes charging the juvenile with delinquent behavior and forwarding him to the juvenile court.

The juvenile courts have three major alternatives. The juvenile may be warned, admonished, or simply released, possibly on probation, labeled J. He may also be referred to any of several community and private agencies for guidance and assistance, labeled K. In extreme cases, the juvenile courts may commit the youth to the Ohio Youth Commission, labeled L. Such commitments can be temporary or permanent. In the case of temporary commitment, diagnoses are performed at the Juvenile Diagnostic Center and the youth is returned to the juvenile court for disposition. In some counties, the court maintains its own diagnostic center, labeled M, to replace such temporary commitment to the JDC. In the case of permanent commitment to the OYC, the final treatment of the youth is determined and administered by the Ohio Youth Commission, with a legally-required five-month minimum institutionalization.

Upon returning to society, after passing through the Juvenile Justice System, the youth is a strong environmental factor influencing the actions and attitudes of other juveniles. He, too, is necessarily altered by his experiences with the formal system. The effects of such influences are certainly critical, but are difficult to assess.

The Markov Model

The presence of decision points in the system, as implied when more than one possible exit exists from a box in Figure 2, would suggest that branching ratios could be estimated to describe the general behavior of each subsystem. If the movement of a juvenile through the system is

taken as the process of interest, a Markovian representation of this process can logically be considered, with the juvenile's location in the system or his circumstance at a particular time being defined as his "state." Use of the Markovian representation requires that the states in which a juvenile may be categorized can be defined such that his probabilities of transition to subsequent states are independent of his prior states, and depend only upon his present state. Preliminary examination of the system would tend to imply that the Markov assumptions are not always met within the system as structured in Figure 2. This is especially apparent when one reviews the major differences in police and court handling of juveniles with prior records. To circumvent this problem, additional states are defined to distinguish between a juvenile with no prior court or police record (unlabeled) and one who has a prior record (labeled). Once a juvenile becomes "labeled" he can never return to the "unbaleled" states.

Expanding the concept, instead of viewing the Markov model as representative of only one juvenile, we can view it as representative of the entire juvenile population or a specified large juvenile population. In essence, the branching ratios can be considered as the percentage of the population in a state which moves, or is moved, to each of the subsequent states. This way of viewing the system allows us to talk about the total population of juveniles and not simply individuals, particular age groups, or psychological types.

A Markov representation of a system dealing with people, such as the JJS, suffers from the problems presented by an absorbing state (for each individual). In the JJS model, the absorbing state represents aging or death of juveniles. Once an individual enters such a state, he can never return to any other state of the system. When a juvenile attains adult status, the JJS generally ceases to have jurisdiction over him. Thus, after a finite number of transitions (time intervals) of the process, an individual will enter this absorbing state and remain there. No matter how large the initial population being studied, each juvenile will eventually enter the absorbing state. This would leave the system empty, except for the fact that new generations of juveniles are continually entering the system.

To avoid the absorbing state problem in the analysis of the operation of a system which deals with a transient population of juveniles entering and leaving the system, a "reincarnation" process has been included in the model. This process simply moves an individual from the absorbing state to the "young innocent" state with probability one (certainty). This is physically analagous to replacing that portion of the population which entered the absorbing state during a period of time with new entries to the system at the subsequent period of time. This has the effect of representing a juvenile population of individuals who are constantly departing from the system and being replaced.

A Markov model of the JJS suitable for studying the impact of

general types of system changes (programs) is shown in Figure 3. This model includes only the major components of the system and allows for distinction between the labeled and unlabeled states. Application of this model will be discussed later in this paper.

Data to support Markov model of the JJS and associated community influences are still being collected. On the basis of available data and professional estimates, a matrix of transition probabilities has been prepared to approximate the overall operation of the Ohio JJS (Figure 4). These probabilities (branching ratios) are based on a transition period of one month. The data can be adjusted to reflect other transition periods, but one month was felt to be appropriate for most JJS studies. Other period lengths could be used in the future if it became advantageous to do so.

Implicit in the present Markov representation is the assumption that the transition matrix is stationary for the duration of a single investigation, that is, the probabilities do not change. It appears, however, that this assumption is not desirable in certain special cases. Consequently, methods are being developed to permit varying transition probabilities with time or loads on the components of the system.

To illustrate the use of the existing Markov model, a delinquency prevention "program" is hypothesized and studied. The analysis is based on a "basic configuration" of the system. This configuration is the one approximating the present Ohio JJS, as reflected by the transition probabilities in Figure 4. The example "prevention program" is presented in terms of changes in this matrix of transition probabilities. Graphical representations begin at the levels of system operation which are characteristic of the basic configuration of Figure 4.

Increased Probation Usage

This example program illustrates the effect of an increased tendency to use probation instead of institutionalization. This tendency is reflected in the change of four branching ratios as shown in Table 2.

Table 2

Alteration of Basic Transition Probabilities
to Represent Increased Probation Usage

Prob of going from		to	prior (base) value	new value
$P_{4,6}$	court (unlabeled)	probation	0.22	0.23
$P_{4,7}$	court (unlabeled)	institution	0.01	0.00
$P_{11,6}$	court (labeled)	probation	0.30	0.40
$P_{11,7}$	court (labeled)	institution	0.20	0.10

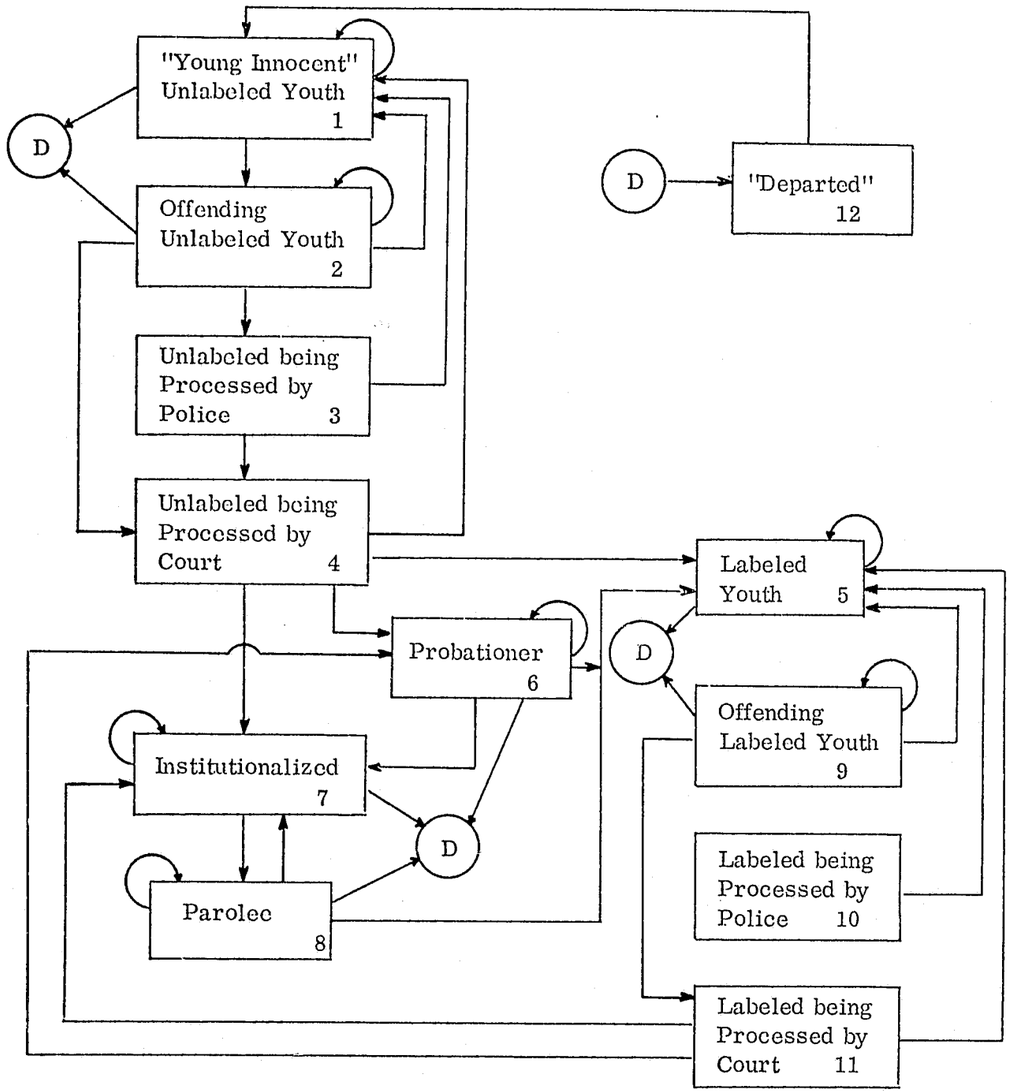


Figure 3.--Juvenile Behavior Flow Model

P-MATRIX (OHIO, 1970)

	1	2	3	4	5	6	7	8	9	10	11	12
1	.925	.070	.0	.0	.0	.0	.0	.0	.0	.0	.0	.005
2	.865	.100	.025	.005	.0	.0	.0	.0	.0	.0	.0	.005
3	.450	.0	.0	.550	.0	.0	.0	.0	.0	.0	.0	.0
4	.400	.0	.0	.0	.370	.220	.010	.0	.0	.0	.0	.0
5	.0	.0	.0	.0	.900	.0	.0	.0	.090	.0	.0	.010
6	.0	.0	.0	.0	.083	.900	.007	.0	.0	.0	.0	.010
7	.0	.0	.0	.0	.0	.0	.945	.045	.0	.0	.0	.010
8	.0	.0	.0	.0	.083	.0	.020	.877	.0	.0	.0	.020
9	.0	.0	.0	.0	.800	.0	.0	.0	.150	.030	.010	.010
10	.0	.0	.0	.0	.300	.0	.0	.0	.0	.0	.700	.0
11	.0	.0	.0	.0	.500	.300	.0	.0	.0	.0	.0	.0
12	**1.0**	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Figure 4.--Basic Transition Probabilities for Basic System Configuration

In the basic transition matrix $P_{4,7}$ = .01, implying that it is very rare for an unlabeled offender to be institutionalized. In this example, that value has been changed to zero, and $P_{4,6}$ increased by .01 to .23, effectively shifting all unlabeled commitments to probation. For labeled offenders, half of the present commitments have been shifted to probation. The results of these changes, if made statewide, are projected in the following outputs from the Markov model (Figures 5 and 6).

The results of this study imply that the changes in transition probabilities indicated above would eventually increase probation department loads by approximately 10% and decrease institution and parole loads by approximately 40%. If is interesting to note that the major impact of the change occurs within 1 1/2 years for probation but takes at least six years for institutions and parole. No change of significance occurs in any other formal JJS agency. Figure 5 indicates that probation loads increase by 1200 while institutional loads decrease by 1300 and parole loads decrease by 800. The other major change is an increase in the number of labeled juveniles in the community not offending.

Uses in Program Evaluation

The state occupancy levels obtainable from the Markov model, or from some more complicated model where more detail is required or where the Markov assumptions do not hold, form the basis for quantitative evaluation of any proposed program. The first step, after structuring the model, would be the determination of the effects on the various transition probabilities of the proposed program. This is not a trivial matter and may require considerable mobilization of expert judgement in the absence of hard data. Next comes the calculation of the expected state occupancies versus time. It is also necessary to develop a cost and a benefit (perhaps positive for the occupancy levels of each state. Cumulation of these measures over all states of the system then yields a cost and a benefit (often called "effectiveness" in military systems analysis) for the system as a function of time. This provides the wherewithall for a cost-benefit (cost-effectiveness) analysis of the proposed programs, thus producing an explicit basis for decisions regarding allocation of resources.

Cost analyses of the probation program and several other proposed activities have been made, the results of which are currently available in a recent progress report from SRG to the OYC.[2]

Behavioral Models

The major goal of the overall Juvenile Justice System and most of its components is the alternation or influencing of behavior. The various agencies of the justice system employ varying degrees of directness and varying approaches toward modifying the behavior of the juveniles with

NOTE: Numbers represent percentage of state juvenile population and hundreds of juveniles.

months	UNLAB-OFF		UNLAB-CRT		PROBATN		PAROLEE		LAB-PGL		DEPARTED
	UNLABELED	UNLAB-PGL	LABELED		INST		LAB-OFF		LAB-CRT		
1	.8512	.0662	.0017	.0012	.0619	.0033	.0016	.0006	.0065	.0002	.0002	.0053
	30645	2383	60	45	2227	120	58	21	236	7	7	192
7	.8512	.0662	.0017	.0012	.0619	.0035	.0014	.0006	.0066	.0002	.0002	.0053
	30645	2383	60	45	2228	126	52	20	236	7	7	192
13	.8512	.0662	.0017	.0012	.0619	.0036	.0013	.0005	.0066	.0002	.0002	.0053
	30645	2383	60	45	2230	129	47	19	236	7	7	192
19	.8512	.0662	.0017	.0012	.0620	.0036	.0012	.0005	.0066	.0002	.0002	.0053
	30645	2383	60	45	2233	130	44	18	236	7	7	192
25	.8512	.0662	.0017	.0012	.0621	.0036	.0012	.0005	.0066	.0002	.0002	.0053
	30644	2383	60	45	2235	131	42	17	237	7	7	192
31	.8512	.0662	.0017	.0012	.0621	.0037	.0011	.0004	.0066	.0002	.0002	.0053
	30644	2383	60	45	2237	132	40	16	237	7	7	192
37	.8512	.0662	.0017	.0012	.0622	.0037	.0011	.0004	.0066	.0002	.0002	.0053
	30644	2383	60	45	2239	132	39	15	237	7	7	192
43	.8512	.0662	.0017	.0012	.0622	.0037	.0011	.0004	.0066	.0002	.0002	.0053
	30644	2383	60	45	2241	132	38	15	237	7	7	192
49	.8512	.0662	.0017	.0012	.0623	.0037	.0010	.0004	.0066	.0002	.0002	.0053
	30643	2383	60	45	2242	132	37	14	237	7	7	192
55	.8512	.0662	.0017	.0012	.0623	.0037	.0010	.0004	.0066	.0002	.0002	.0053
	30643	2383	60	45	2243	132	37	14	237	7	7	192
61	.8512	.0662	.0017	.0012	.0623	.0037	.0010	.0004	.0066	.0002	.0002	.0053
	30643	2383	60	45	2244	132	36	14	238	7	7	192
67	.8512	.0662	.0017	.0012	.0623	.0037	.0010	.0004	.0066	.0002	.0002	.0053
	30643	2383	60	45	2244	132	36	13	238	7	7	192
73	.8512	.0662	.0017	.0012	.0624	.0037	.0010	.0004	.0066	.0002	.0002	.0053
	30642	2383	60	45	2245	132	36	13	238	7	7	192
79	.8512	.0662	.0017	.0012	.0624	.0037	.0010	.0004	.0066	.0002	.0002	.0053
	30642	2383	60	45	2245	132	35	13	238	7	7	192
85	.8512	.0662	.0017	.0012	.0624	.0037	.0010	.0004	.0066	.0002	.0002	.0053
	30642	2383	60	45	2246	132	35	13	238	7	7	192

Figure 5.--Increased Probation Usage (Estimated)

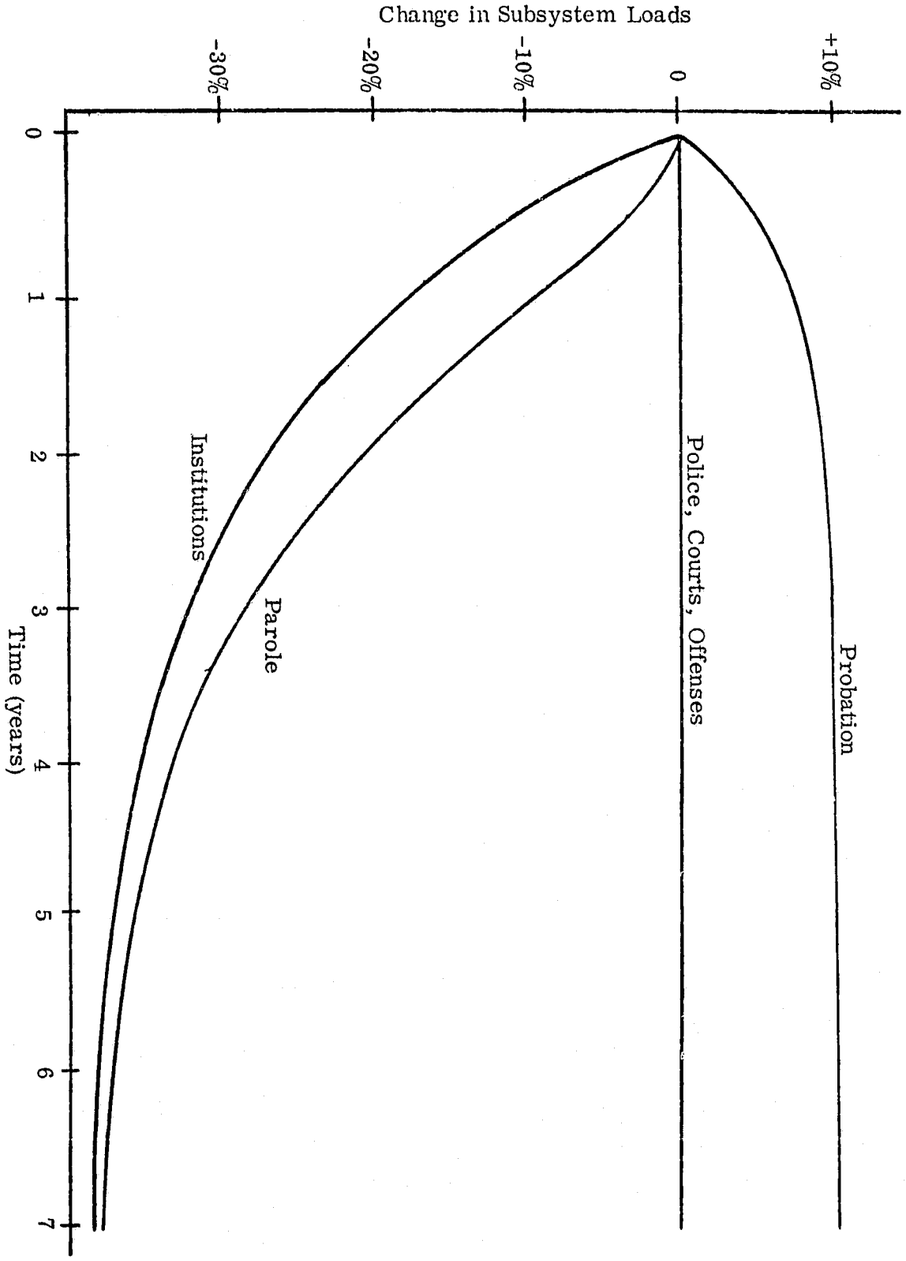


Figure 6.--Results of Increased Probation Usage

whom they come into contact. These approaches range from sophisticated behavior modification techniques, counselling and other forms of treatment to simple incarceration. Regardless of the form of the behavioral control technique being used, the major emphasis of the decision maker is to influence the subsequent behavior of the juvenile. The flow models discussed earlier in this paper are concerned only with the flows of groups of juveniles through the system. No attempt has yet been made to study the influence of the system on the juvenile. The purpose of this section of the paper is to discuss a systematic conceptualization of human behavior. This conceptualization, or model, will interact with the flow models discussed earlier and be subject to similiar quantitative analysis.

Prior to discussion of behavior models, some definitions of concepts and terms must be provided. These definitions take the form of probabilistic statements which are consistent with empirical behavioral data which have been or easily could be collected. The first concept we will call propensity. This concept will be operationally defined as the conditional probability of attempting a delinquent act given the opportunity to commit that act. Propensities to commit various types of delinquent acts can be thought to vary as a function of the individual, environments, time, place, and numerous other factors. The next concept to be defined is opportunity. This will mean the perceived opportunity to engage in various types of delinquent acts. Sociological studies have shown that opportunity plays an important role in determining deviance rates. An illustration of the influence of opportunity on deviance lies in a comparison between urban and rural deviance rates. A convenient analytic assumption is that opportunities are Poisson distributed. This assumption can be logically developed from the relationships between binomial and Poisson distribution. The next concept to be defined is the success of the attempted deviant act. Throughout the development of this model it is assumed that behavior is goal directed. The goals do not necessarily have to be material in nature. They may be psychological, such as release of tension, revenge seeking, etc. The perceived success of the attempted act depends upon how well the act satisfies the goals which motivated the act. Operationally, we will define the conditional probability of perceived success given an attempt. The success or failure of the attempt is important in determining the subsequent liklihood of recurrence of the particular behavior which was exhibited. The final concept which will be defined is apprenhension. Operationally, we will define the conditional probability of apprehension, given an attempt. Apprehension in this context will imply the intervention of some individual or group which could lead to formal action being taken against the offender.

Before discussing a quantitative application of these concepts, an overview of the behavioral model will be provided. Figure 7 illustrates the major sub-systems or influences on individual behavior. This system can be viewed as the process which constantly is altering propensities toward various types of behavior. From the viewpoint of

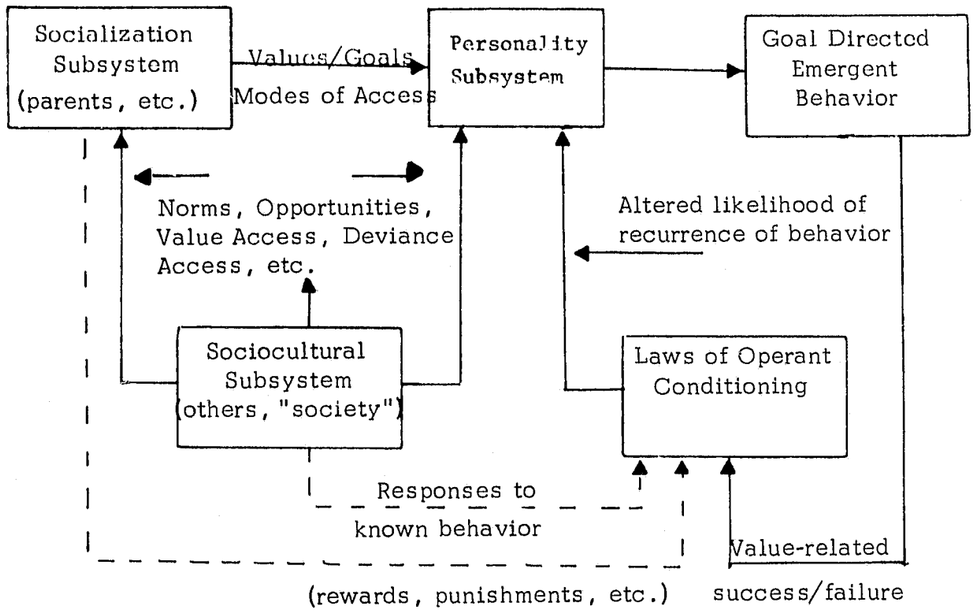


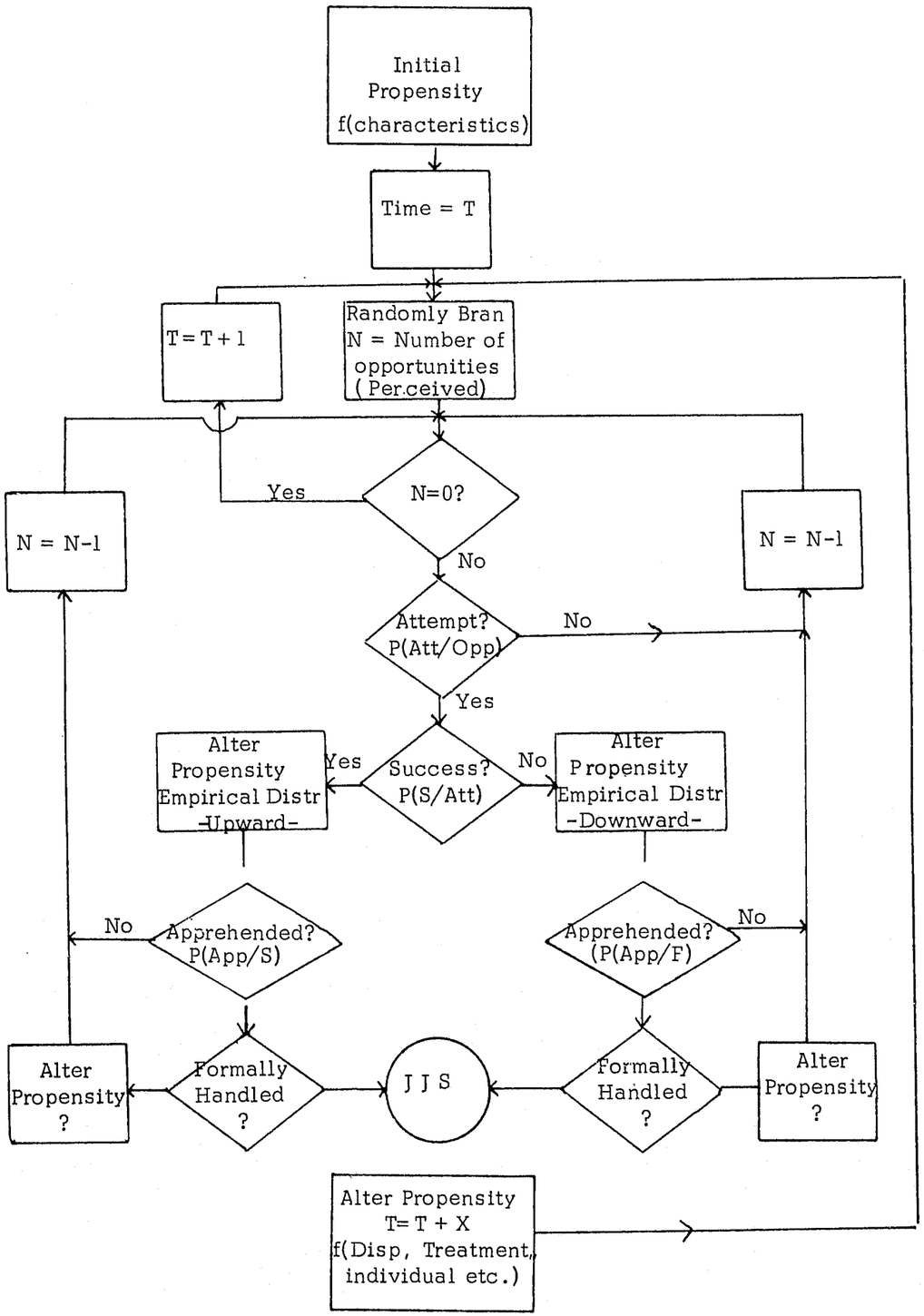
Figure 7. -- Socialization - Reinforcement System

learning theory, the probability of recurrence of every goal-directed emergent behavior can be seen as being altered by both the success or failure of that behavior and by the response to that behavior from the socialization or social cultural sub-systems. The nature of the response of the individual to the success or failure of the behavior and to the societal response to that behavior are functions both of his prior experience and of the inherited tendencies he may have.

In seeking to deal with delinquency or crime it is generally desirable to predict what the response will be to a particular type of program. Such a prediction can result only from a meaningful consolidation of available sociological and behavioral data. Once technique which lends itself to this task is Monte Carlo simulation. A simplified flow diagram of a Monte Carlo simulation of the behavioral model discussed earlier is depicted in Figure 8. Such a simulation could be used to randomly generate behavior of various types of individuals or groups of individuals on the basis of empirical data. If the available data adequately represent the behavior of the individuals being stimulated, then a small change in simulation parameters could permit the prediction of the response of this type of individual to the programs represented by the changes in the parameters describing the individuals to be modeled as well as the individuals in the community in which they live. For example, the crime reporting characteristics of the community must be described probabilistically. The operation of the police departments and courts must also be described. The most difficult data to obtain are those describing the alterations in individual characteristics resulting from various societal responses to the behavior of the offenders. Some initial attempts have been made to collect this type of data in a study performed in Southern California in the late 1960's, supported by the Public Health Service under the title, project SIMBAD (McEachern, et al., 1968).

The major contribution of a systems model as described in Figures 7 and 8 is that it provides the framework for application of existing information and understandings of the behavioral and sociological sciences. It becomes immediately evident when attempting to model a complex system such as human behavior that existing data often do not truly describe the process. Before meaningful advances can be made in decreasing the levels of crime and delinquency in our society, much more behavioral and sociological data must be collected to adequately describe the process which produces and deals with this type of behavior.

Figure 8. - BEHAVIORAL SYSTEM - SIMULATION



Footnotes

1. "Systems Analysis and Operations Research Support of The Ohio Youth Commission Juvenile Delinquency Prevention Act Planning Project", April 21, 1971.

2. Interim Progress Report for Period July 27 to November 30, 1971, EES 386X/SRG-1PR 2, Systems Research Group, Department of Industrial Engineering, The Ohio State University, January 25, 1972.

Systems Analysis in the Justice System
A Brief Bibliography

1. Belkin, Jacob and Blumstein, Alfred, "Models of a Total Criminal Justice System", Journal of the Operations Research Society of America, Vol. 17, No. 2, March-April, 1969, pp. 199-232.

2. Boguslaw, Robert, The New Utopians, Prentice-Hall, Englewood Cliffs, N.J., 1965.

3. Churchman, C.W., Ackoff, R.L., and Arnoff, E.L., Introduction to Operations Research, Wiley, New York, 1957.

4. Hare, Van Court, Jr., Systems Analysis: A Diagnostic Approach, Harcourt, Brace and World, New York, 1967.

5. Hiller, Frederick and Lieberman, Gerald, Introduction to Operations Research, Holden-Day, San Francisco, 1967.

6. Klein, Malcom, et al., "System Rates: An Approach to Comprehension Criminal Justice Planning", Crime and Delinquency, October, 1971, pp. 355-372.

7. Quade E.S., and Boucher, W.I., Systems Analysis and Policy Planning, American Elsevier, N.Y., 1968.

8. Miller, D.W., and Starr, M.K., Executive Decisions and Operations Research, Prentice - Hall, 1960.

9. Sellin, T., and Wolfgang, M.E., The Measurement of Delinquency, Wiley, New York, 1964.

10. Kenner, H., Wilson, N., and Yao, I., "A Measure of Juvenile Delinquency" unpublished project report, Department of Industrial and Systems Engineering, The Ohio State University, Columbus, Ohio, 1971.

11. McEachern, A., Taylor, E., Newman, J., and Ashford, A., "Project SIMBAD," The American Behavioral Scientist, January-February, 1968, pp. 1-45.

PUBLIC POLICY AND ENVIRONMENTAL CRIME PREVENTION

Frederic L. Faust and Harry E. Allen

Introduction

Criminologists have traditionally concerned themselves with one major problem: Why do some persons become involved in criminal activity, while others do not? It has been hoped that the answer to this question would serve as the basis for effective social action in the areas of crime prevention and control. The search for the answer has led both theoreticians and researchers in a number of different directions, with resulting explanations being in turn posited in terms of biological, psychological, and social variables. While each of these explanations has helped to improve the level of understanding in relation to certain types of persons who engage in specific forms of criminal behavior, no one of them successfully met the challenge of the broader issue. In fact, it has been noted that the very nature of the question itself sent the search for answers in an unproductive direction by focusing concern upon individual characteristics rather than upon behavior *per se*.[1]

The ultimate conclusion to be reached from the current state of knowledge is that human behavior in general, and criminal behavior in particular, is so diverse that nothing less than multi-causative theories validated through broad interdisciplinary research can substantially advance the development of a *bona fide* science of human behavior. Notwithstanding the widespread acceptance of this position, social scientists largely remain in hot pursuit of their own narrow disciplinary interests, while practitioners and public policymakers become increasingly disenchanted with the prospects of a panacean breakthrough. In addition to the issue of the fundamental research question a good part of the problem lies in the research techniques that both are associated with and are preferred by the members of different academic disciplines, a phenomenon which Kaplan has referred to as law of the instrument: "Give a small boy a hammer, and he will find that everything he encounters needs pounding".[2] In explanation, he says:

> It comes as no particular surprise to discover that a scientist formulates problems in a way which requires for their solution just those techniques in which he himself is especially skilled. ... What is objectionable is not that some techniques are pushed to the utmost, but that others, in consequence, are denied the name of science. The price of training is always a certain 'trained incapacity': the more we know how to do something, the harder it is to learn to do it differently.[3]

To this we would add: "... and the less likelihood there is of meaningful

communication with those who do it differently." Kaplan goes on to observe:

> ... The fragmentation of a science into 'schools' is by no means unknown even in as rigorous a discipline as mathematics; what is striking in behavioral science is how unsympathetic and even how hostile to one another such schools often are. Their internecine struggles bring into play the tactics of 'defensive incorporation' and 'exclusion': "everybody ought to work on--" and "nobody ought to--." In the end, each goes his own way, and goes alone.[4]

As experience has so aptly demonstrated, problems of this nature do not foster confidence in the minds of legislators and public administrators, nor do they lead to the establishment of clear-cut public policy in support of behavioral research. Instead, the need for public support for research as expressed by the separate academic disciplines simply fall into line with the claims of other vested interests, a line in which narrow disciplinary research on criminal behavior has traditionally been lost. Thus public policy, to a large extent, has relegated criminological research to the provision of "scientific justification for an action program already selected,"[5] which is actually validation rather than research.

With the advent of an environmental approach to crime prevention, however, a unique opportunity is presented to at least bypass if not overcome some of these persistently plaguing problems. The environmental approach addresses the question: What are the factors of external and internal (biological) environment that either promote or permit the incidence of criminal behavior? This question clearly shifts the focus of study from characteristics of individuals to factors which influence human behavior-- environmental factors which are of such diverse nature that meaningful research must of necessity be an interdisciplinary endeavor. The scope of the question is so broad that it obviates the kind of defensive incorporation and exclusion to which Kaplan referred in his discussion of the law of the instrument. In addition, the type of cooperative effort that will be required among the scientific disciplines in the search for answers to this question holds very real prospects for improving the position of criminological research in terms of supportive public policy. It is to this matter of public policy for environmental crime prevention that the remainder of this discussion is directed.

Public Policy: A Behavioral Perspective

In general, explanations concerning the formulation of public (governmental) policy have been rooted in either of the two major orientations: the *value-consensus* position and the *interest-group* position.

In discussing these theoretical orientations in relation to criminal law, Hills noted that:

> The value-consensus theory implicitly assumes a model of society in which there is a well-integrated, relatively stable consensus on basic values among all segments of the society....
>
> In this view, the legal process regulates, harmonizes, and reconciles any conflicting desires or competing claims to enhance the welfare of the larger social order.[6]

The interest-group position, on the other hand, is explicitly expressed in Quinney's statement that:

> Law is 'formulated' and 'administered' by the segments of society that are able to incorporate their interests into the creation and interpretation of public policy. Rather than representing the institutional concerns of all segments of society, law secures the interests of particular segments. Law supports one point of view at the expense of others.[7]

In evaluating these positions, it would appear that Hills' statement below concerning the criminal law could be appropriately applied to all areas of public policy:

> It may be that each of these two theoretical perspectives is essentially correct for certain criminal laws and largely invalid as an explanation for others (or perhaps valid at different levels of abstration). The 'degree' of coercion and consensus involved in the social genesis of any particular criminal statute and in the forces that shape its change is problematic, although aspects of both coercion and consensus appear to be present in all legal systems. A synetheis of those valid and complementary aspects of each of these theories-- or still others-- awaits further empirical study and conceptual clarification.[8]

It would also appear that the "behavioral perspective" on public policy, which is fundamental to environmental design for crime prevention, provides this conceptual framework that accounts for the major complementary aspects of these two traditional orientations, although one could also argue that it more appropriately replaces than synthesizes them, since it deals with variables on an entirely different and much more concrete level of abstraction.

Both the value-consensus and the interest-group orientations make the assumption that values are separate from, and precedent to, decision-making behavior in the formulation of public policy. The former

emphases values derived from tradition, reason, and perhaps natural law, while the latter focuses upon the temporal values of specific groups. It should be noted, however, that in terms of the behavioral perspective, values do not transcend behavior but are a form of behavior and therefore subject to the same environmental influences as all forms of behavior. As Jeffery has pointed out: "Values are those behaviors people exhibit to bring about expectations as to the future."[9] They are nothing more or less than the type of behavior in which past experiences are transformed into present decisions, based upon expectations for future contingencies. "The causes of behavior are in the future consequences of the act, not the past experiences. Past experiences and present environmental conditions interact to create goal-oriented expectations as to what these future consequences of behavior will be."[10] Thus public policy must be viewed as a reflection of the consequences of behavior, since these tenets are just as applicable to the behavior of legislators in the genesis of social policy as they are to the behavior of persons who deviate from such policy.

If this were the case, then neither the policy-makers nor the offenders have experienced reinforcement for the type of decisions about future consequences that lead to the prevention or deterrence of criminal behavior. Policy-makers and public administrators do not correctly perceive the consequences of alternative courses of action, any more than offenders are 'certain' of the consequences of their acts. The evidence is therefore not surprising that our social policies concerning criminal behavior are more often part of the problem than part of the solution.[11]

Public Policy and Behavioral Science

In terms of the behavioral perspective, it is understandable that public policy concerning criminal behavior has failed to produce the desired results in either prevention or control, in view of the fact that the consequences of alternative courses of action, in response to differential environmental influences, are not generally known. As a result, policy decisions are made in terms of hopes and fears, rather than on the basis of knowledge.

Generally speaking, the objectives of public policy are two-fold: 1) to improve the quality of life for all members of the social order, and 2) to protect and further the vested interests of specific groups. In the area of criminal behavior particularly, the current state of knowledge is too inadequate to permit the establishment of policies that will, with any substantial degree of certainity, improve the quality of life for all people. This is at least in part due to the problems which have confronted the development of an interdisciplinary science of behavior described above. In the absence of such knowledge, it should come as no surprise that social policy would be largely determined by vested interest-groups with the power to influence the legislative and administrative processes in terms of their particular goals, hopes and fears. Unfortunately, social scientists have often allowed them-

selves to be recruited into such groups, in the process of seeking public support for their own specific disciplinary interests. Under the guise of "playing the game required to obtain financial support," they all too often end-up tailoring their research to conform to constraints that virtually preclude the pursuit of knowledge about behavior that might substantially improve the quality of life-- namely, long-term research of an inter-disciplinary nature.[12]

It should be recognized that the constraints to which we refer are not arbitrarily established. It is here that the administrative phenomenon of crisis intervention comes into play. As the crime problem increases and approaches or exceeds crisis proportions in the eyes of the public, policymakers and administrators will react to the pressures for broad-scale governmental intervention, in terms of current limits of knowledge about possible alternative courses of action and the probable future consequences of each. In the absence of new knowledge with scientific credibility, the preferred alternative appears to be an expansion of existing programs and services, even though available evidence demonstrates their ineffectiveness, if not their perniciousness.[13] Should a behavioral theoretician or researcher emerge with a timely new approach to prevention or control, however, it is likely that 'what is hoped' rather than 'what is known' will sufficiently influence the occupational-survival decisions of policymakers and administrators to the extent that the innovative concept and/or technique will be given governmental support and implementation far beyond its appropriate level of applicability.[14] When the extremely costly effort fails to achieve panacean results and the limited applicability of the approach is recognized, the field will await the appearance of the next challenger even while the crisis intensifies. It is also unlikely that public support will soon be forthcoming to further research in the area where the misapplication of limited knowledge has occurred.

Thus the cycle becomes complete and self-perpetuating-- the lack of knowledge about human behavior supports the establishment of vested-interest policies which, in turn, impede the type of research that could advance the state of knowledge. While this may be a gross oversimplification, it would seem to represent a fair view of the overall picture. Too frequently, with regard to public policy, social scientists are inclined to get so co-opted in the interest-group process that they compromise their legitimate role as scientists. At the same time, policymakers and public administrators tend to encourage this as they seek alternative ways to cope with the pressure for crisis intervention. Social scientists can function in a manner that will help to move public policy toward the objective of improving the quality of life without falling prey to vested interests. As Jeffery has strongly argued:

> The best service the behavioral scientist can provide is to let it be known what the future will be like 'if' certain policies are or are not pursued. ...
>
> The scientist can, within the limits of his knowledge, specify the possible alternative courses of action available

> and the possible future consequences of alternative actions, which information can then be used by policy-makers to make decisions.[15]

Public policy might if based on this model, then be determined on the basis of, "... what will happen, not on what we hope or wish will happen."[16]

Implications for Environmental Crime Prevention

On the basis of the foregoing observations, it is possible to make several inferences about the conditions under which basic research on crime prevention through environmental design might be most effectively pursued, with regard to influencing public policy and obtaining public support.

1) Research objectives must be stated in terms of 'improving the quality of life,' rather than in terms of 'behavioral control'. Primary prevention through internal and external environmental design necessarily implies the control of factors which affect all people, not just identified or labeled criminals. To do otherwise would make the endeavor corrective rather than preventive. Since the prospect of behavioral control through the manipulation of internal (biological) and external (physical and social) environmental factors may for some people raise the spectre of an Orwellian 1984-type of social order, the chances for public support of projects presented in these terms would appear very slim. Further, the concept of behavioral control immediately raises the public policy issues of "who will be controlling whom" and "what will be the terms of the transaction," which are issues leading directly into the interest-group process of policy formulation.

These questions notwithstanding, it should be recognized that the environmental approach to crime prevention need not, in fact, require the widespread imposition of rigid constraints upon behavior generally, any more than environmental design for public health, fire prevention, or traffic safety serves to restrict behavior. To the contrary, this approach suggests greater behavioral freedom, particularly in urban centers, through reduction and perhaps even elimination of the threat of many criminal violations and relatively high risk of victimization. By controlling the environmental factors which permit criminal offenses to occur, this approach in reality offers the best prospects for truly improving the quality of life through the science of behavior. Thus whether a particular project is designed to deal with internal or external environmental variables, its presentation should be made in terms of its place in this overall conceptual framework, if influencing of public policy and receipt of public support are basic goals being sought.

2) The objectives of specific projects and programs should be clearly stated in terms of testable hypotheses, so clearly stated that they defy interpretation as "certain solutions" to the problem. In other

words, to facilitate appropriate public policy decision-making and to avoid the crisis intervention reaction, the limitations of the research and its future consequences for the prevention of criminal behavior must be strongly emphasized. Further, the consequences of policy decisions that would extend the implementation of the theoretical orientation beyond its logical or empirically validated range of applicability should also be clearly specified. What "will" happen, from a scientific point of view, should be so clearly stated that it cannot be confused in public policy with what "is hoped" will happen,from a social action standpoint.

3) Closely related to the above is the need for detailing in any particular research effort exactly that public being dealt with and with whose special interests we are specifically trifling. For example, in the re-design of a metropolitan low-cost housing area, such as the Brownsville Project in New York City,[17] it becomes critical from a public policy point of view to anticipate exactly how the proposed changes will affect not only the residents and persons who might consider perpetrating criminal offenses against them but also such other groups as mail carriers, trash collectors, deliverymen, etc. Environmental research obviously has implications for affecting a much wider public than the other approaches to the study of crime prevention, as for example research focusing upon the identification and behavior modification of potential offenders. In addition to a determination of what public will be affected by his work, the researcher must also consider how and by whom the priorities for that public's goals and resource management are established and where crime prevention falls in that priority pattern. It is thus incumbent upon the social scientist to 'do his homework thoroughly' in the planning of research projects for which public support is being sought.

4) The interdisciplinary nature of the project or program should be stressed. This should be presented not only in terms of the anticipated contribution to the development of a bona fide science of behavior but also in terms of the degree of interdisciplinary support that the endeavor is receiving as well as the benefits to the contributing disciplines. As far as influence upon public policy is concerned, it is reasonable to assume that proposals submitted under the joint auspices of a number of disciplines will have a more formidable and favorable impact than those representing single disciplinary interests.

Problems of Implementation

Considering that research in the area of environmental design for crime prevention could conceivably proceed on the basis of projects ranging from laboratory experimentation with animals [18] to the physical redesign of entire urban areas,[19] there are several issues which need to be immediately confronted with the question of "where do we go from here?"

First is the matter of the most appropriate level of intervention. Will it be more fruitful and feasible in the light of current public

policy to design and propose research projects dealing with internal or external environmental variables; with laboratory experimentation or field studies; with relatively simple or with highly complex research designs? The answer, of course, is that we begin where we are. Much research has been accomplished or currently underway which has both direct and indirect implications for the prevention of criminal behavior through environmental design. The appropriate point of intervention would then seem to be at the level of systematically collecting, analyzing, and conceptually synthesizing available data in the theoretical context of the environmental orientation. This would require a long-term, ongoing effort involving a highly competent interdisciplinary team of specialists and from whose activities new concepts and related research designs would emerge. One problem with this need is the question and recruitment of experts from a variety of disciplines who are willing to focus their attention over an extended period of time on the particular area of criminal behavior as well as on other aspects of general human behavior.

A second and undoubtedly more difficult problem is that of convincing public policymakers of the value of basic long-term research as opposed to immediate action or service programs. While we have few illusions about the probability of swift and significant strides in this direction, it does seem possible that the concerted effort of representatives from numerous disciplines, when coupled with the fact that environmental concerns are currently salient, might well have sufficient temporal impact to initiated such change and innovation.

Third is the perennial matter of constraints placed upon human behavioral research by public moral and ethical values as expressed in statutes or other public statements concerning the preservation of human rights and dignity. In this regard, Brantingham has observed that a minimum of difficulty may be anticipated in the area of basic research that deals with the control of physical environmental variables for purposes of primary prevention.[20] For example, improvements in street-lighting, alterations in pedestrian traffic patterns, and architectual changes in the design of buildings are likely to meet with little challenge on moral and ethical grounds. On the other hand, environmental research which focuses upon specific target populations (such as psychobiological experimentation with school children involving the use of drugs) could be expected to be vigorously resisted. Thus, as new concepts of interdisciplinary research emerge, with greater emphasis being placed upon the role of physical environmental factors in crime prevention, it seems at least plausible that the environmental approach may experience somewhat less difficulty in this area than has been the case previously,especially in the testing of other theoretical orientations focusing upon such identified target populations as sex offenders, drug-users and aggressive offenders.

A fourth and highly significant practical problem is that of obtaining the financial support required for research. There is little doubt that environmental design projects will require a considerable and sus-

tained investment of funds; public policy toward such an investment in behalf of behavioral research has never been particularly encouraging. Since it is difficult, at this point, to project the exact nature of research proposals that would follow from the analyzing and synthesizing efforts of an interdisciplinary team of experts, it would be of little value to speculate on either dollar-figures that might ultimately be involved or possible funding resources for such projects. Of more timely concern is the matter of funding the data collection, analysis, and planning operation, which is the level at which initial intervention is being suggested. While one cannot speak specifically to the acceptance of a proposal for this particular endeavor, it is worth noting that the theoretical orientation of environmental design for crime prevention seems to be fundamentally consistent with the position being promulgated by the United Nations Social Defense Research Institute, an organization which does include financial support of research within its scope of activities.[21] Also, the increasing interest in environmental research on the part of the National Institute of Health suggests that a venture of the type in question might fall within this agency's broad objectives in terms of fundable programs.[22]

Conclusions

The environmental approach to crime prevention offers a unique opportunity to facilitate the development of a science of behavior and to enhance the image of behavioral research held by public policy-makers and administrators. In view of its interdisciplinary nature, its emphasis upon scientifically validated consequences of behavior, and its primary concern with environmental factors rather than individuals or target groups, this approach offers the prospect of circumventing or obviating many of the problems which have kept criminological research in a low-priority status in public policy for many years.

We have attempted to suggest that the relationship between public policy and environmental crime prevention is reciprocal, with positive results depending as much upon the behavior of social scientists as upon the behavior of policy decision-makers. Without doubt, there is value-consensus concerning both the desirability of and need for reducing the incidence of criminal behavior. It is therefore quite within the range of possibility that concerted interdisciplinary participation in the area of crime prevention through environmental design might institute the kind of shift in public policy concerning behavioral research that would improve the quality of life.

FOOTNOTES

1. For example see C.R. Jeffery, Crime Prevention Through Environmental Design, Beverly Hills: Sage, 1971, pp. 106-107; and, T. Hirschi, Causes of Delinquency, Berkeley: University of California Press, 1971, pp. 48-49.

2. A. Kaplan, The Conduct of Inquiry, San Francisco: Chandler, 1964, p. 28.

3. Ibid., pp. 28-29.

4. Ibid., pp. 29-30.

5. G.O.W. Mueller, "The Function of Criminology in Criminal Justice Administration," Criminological Abstracts, (January, 1970), p. 585.

6. S.L. Hills, Crime, Power, and Morality, Scranton: Chandler, 1971, pp. 3-4.

7. R. Quinney, Crime and Justice in Society, Boston: Little, Brown, 1969 p. 29, cited in S.L. Hills, Crime, Power, and Morality, op.cit., p. 4.

8. Hills, op. cit., pp. 5-6.

9. Jeffery, op. cit., p. 272.

10. Ibid., p. 277.

11. For example, see D.P. Moynihan, Maximum Feasible Misunderstanding, New York: Free Press, 1968, p. 102 ff.; National Strategy for Youth Development and Delinquency Prevention, Washington, D.C.: Youth Development and Delinquency Prevention Administration, U.S. Department of Health, Education and Welfare, 1971; President's Commission on Law Enforcement and Administration of Justice, The Challenge of Crime in a Free Society, Washington, D.C.: U.S. Government Printing Office, 1967, pp. 7-10.

12. This situation is necessitated in large part by the usual reward system of the universities, in which publications are accepted as indicators of the desired quality of performance. Publications are easy to count, visible and less difficult to accept as indicators of adequate performance. However, publishing is usually done at the expense of quality of teaching, public service, relevance to contemporary life, and an adequate approach to major or substantial problems.

13. This is reflected in the President's Commission on Law Enforcement and

Administration of Justice, The Challenge of Crime in a Free Society, Washington: U.S. Government Printing Office, 1967.

14. Classic examples of this phenomenon are the experiences with group treatment approaches in juvenile correctional programs and the poverty programs for the prevention of delinquency. See R.C. Sarri and R.D. Vinter, "Group Treatment Strategies in Juvenile Correctional Programs," Crime and Delinquency, 11 (October, 1965), pp. 326-340; and, P. Marris and M. Rein, Dilemmas of Social Reform, New York: Atherton Press, 1967, p. 341.

15. Jeffery, op. cit., p. 273.

16. Ibid.

17. O. Newman, Defensible Space: Crime Prevention Through Environmental Design, New York: MacMillan, 1972 (publication pending).

18. S.A. Corson and E. O'L. Corson, "Psychosocial Influences on Renal Function-- Implications for Human Pathophysiology," in L. Levi, ed., Society, Stress and Disease, Oxford, London, 1971.

19. Newman, op. cit.

20. P.J. Brantingham, "Legal and Ethical Issues in Behavioral Control," in Proceedings: Seminar on Crime Prevention Through Environmental Design, Columbus: Ohio State University, Division of Public Administration, Program for the Study of Crime and Delinquency, 1972.

21. United Nations Social Defense Research Institute, "Work Programme and Staffing, 1972-1973", Rome, Italy: UNSDRI, 1971).

22. See for example Planning for Creative Change in Mental Health Services: A Distillation of Principles on Research Utilization. Washington. U.S. Government Printing Office, 1971.

Appendix A

Authors

Professor Albert B. Bishop
Department of Industrial Engineering
288 Systems Engineering Building
The Ohio State University
1971 Neil Avenue
Columbus, Ohio 43210

Professor Samuel A. Corson
Department of Psychiatry
The Ohio State University
N 116 Upham Hall
473 W. 12th Avenue
Columbus, Ohio 43210

Professor Fred Faust
Department of Criminology
The Florida State University
Tallahassee, Florida 32306

Dr. Harold Goldman
Department of Psychiatry
The Ohio State University
473 W. 12th Avenue
Columbus, Ohio 43210

Professor C.R. Jeffery
Department of Criminology
School of Social Welfare
The Florida State University
Tallahassee, Florida 32306

Professor Walter Knopp
Department of Psychiatry
The Ohio State University
D67 Upham Hall
473 W. 12th Avenue
Columbus, Ohio 43210

Appendix B

Genetics and Environmental Control

Reading List

1. Robinson D.N. (ed.) (1970) - "Heredity and Achievement" (Oxford University Press, New York London Toronton).

2. Spuhler, J.N. (ed.) (1964) - "Genetic Diversity and Human Behavior" (Chicago, Aldine Pub. Co.).

3. Strickberger, M.W. (1968) - "Genetics" (Macmillan Co., N.Y.) (a comprehensive introductory text).

4. Thiessen, D.D. (1972) - "Gene Organization and Behavior" (Random House, New York).

5. Thoday, J.M. and A.S. Parkes (eds.) (1968) - "Genetic and Environmental Influences on Behavior" (Plenum Press, New York).

6. Vandenberg, S.G. (ed.) (1965) - "Methods and Goals in Human Behavior Genetics" (Academic Press, New York).

7. Vandenberg, S.G. (ed) (1966) - "Progress in Human Behavior Genetics" (John Hopkins Press, Baltimore).

Appendix C

Participants

for

Crime Prevention Through Environmental Design Workshop

Dr. Harry E. Allen
Director, Program for the Study of Crime and Delinquency
1314 Kinnear Road, Suite 214
Columbus, Ohio 43212

Professor Albert B. Bishop
Department of Engineering Building
288 Systems Engineering Building
The Ohio State University
1971 Neil Avenue
Columbus, Ohio 43210

Professor Paul J. Brantingham
Department of Criminology
School of Social Welfare
The Florida State University
Tallahassee, Florida 32306

Commissioner Bennett J. Cooper
Division of Correction
1944 Morse Road
Columbus, Ohio 43229

Professor Samuel A. Corson
Department of Psychiatry
The Ohio State University
N 116 Upham Hall
473 W. 12th Avenue
Columbus, Ohio 43210

Professor Fred Faust
Department of Criminology
The Florida State University
Tallahassee, Florida 32306

Peg Grey
Office of Congressman Claude Pepper
432 Cannon Building
Washington, D.C. 20515

Margaret L. Hale
Law Enforcement Assistance Administration
State Planning Agency
8 E. Long Street
Columbus, Ohio 43215

Dr. Harold Goldman
Department of Psychiatry
The Ohio State University
473 W. 12th Avenue
Columbus, Ohio

Professor C.R. Jeffery
Department of Criminology
School of Social Welfare
The Florida State University
Tallahassee, Florida 32306

Professor Nicholas Kittrie, J.D.
Washington College of Law
American University
Washington, D.C. 20016

Professor Walter Knopp
Department of Psychiatry
The Ohio State University
D67 Upham Hall
473 W. 12th Avenue
Columbus, Ohio 43210

Dr. Leopold Liss
Professor of Pathology
The Ohio State University
N. 112C Upham Hall
473 W. 12th Avenue
Columbus, Ohio 43210

Professor Perry London
University of Southern California
Department of Psychology
839 S. Holt Street
Los Angeles, California 90035

Professor Yousef Marzeki
City and Regional Planning
School of Architecture
The Ohio State University
190 W. 17th Avenue
Columbus, Ohio 43210

Barry Hersch
Project for Security Design
853 Broadway
New York, New York 10003

Professor Walter C. Reckless
Department of Sociology
The Ohio State University
Columbus, Ohio 43210

Professor Kent P. Schwirian
Department of Sociology
The Ohio State University
164 Hagerty Hall
Columbus, Ohio 43210

Major Clifford E. Simonsen
U.S. Army Police School
Ft. Gordon, Georgia 30907

Professor Raymond G. Studer
Director, Division of Man-
Environment Relations
S 126 Human Development Bldg.
Pennsylvania State University
University Park, Pennsylvania 16802

Professor Sydney S.Y. Young
Department of Genetics
The Ohio State University
391 B & Z Building
1735 Neil Avenue
Columbus, Ohio 43210

Eugene Ziskind, M.D.
Professor of Psychiatry
University of Southern California
School of Medicine
Los Angeles, California

END