

SCHIZOPHRENIA: A CRUEL CHAIN OF EVENTS

Schizophrenia is like a labyrinthine maze through which researchers crawl, searching for a way out. Is schizophrenia a genetic condition? Is it the result of brain damage caused by prenatal or birth complications? Could schizophrenia be triggered by environmental or social causes? Are faulty learning processes to blame? Any one of these questions might lead to the correct answer, and there are theories and data to support each position. But which way to turn?

Schizophrenia—a cruel, disabling condition that accounts for almost half the patients in mental institutions and may affect as many as four million people in the United States (estimates range from 0.85 percent to 2.0 percent of the population)—is a major mental health problem with no simple solution. The fact that there is evidence to support almost every theory of schizophrenia is what makes the maze so confusing. But this same fact may also be a clue to the way out. There are solutions that lead down all paths, cover all angles and encompass all theories. One such approach has come from the work of Sarnoff A. Mednick of the Psykologisk Institut, Kommunehospitalet in Copenhagen, Denmark, and the New School for Social Research in New York.

In 1958, Mednick theorized that “schizophrenia is a learned evasion of life.” Since then, he has been involved in a long-term study of individuals predicted to become schizophrenic. Results of that ongoing study lend support to Mednick’s theory, shed light on the many factors involved in schizophrenia and have been the impetus for a large-scale intervention and prevention program that is already yielding promising results. Mednick discussed some of his most recent findings at this year’s meeting of the Kittay Scientific Foundation (SN: 4/16/77, p. 248). Fini Schulsinger and Thomas W. Teasdale of the Psykologisk Institut, Hanne Schulsinger of the University of Copenhagen, Peter H. Venables of the University of York in England and Donald R. Rock of the Educational Testing Service in Princeton are co-authors of this interim report.

The emphasis of Mednick’s project is on prevention, and the first step in prevention is the identification of persons who are most likely to become schizophrenic. A great deal of solid evidence indicates that the probability of schizophrenia is relatively high (10 percent or more) among children of schizophrenic

A pioneering longitudinal study predicts who will become schizophrenic, finds significant sex differences and suggests possibilities of prevention

BY ROBERT J. TROTTER

mothers. Using this as an indication of high risk for the condition, Mednick and his colleagues selected and examined 207 children (average age of 15) at high risk and 104 children at low risk. They did this in Copenhagen in 1962. By 1967, 20 of the high-risk individuals had suffered serious psychiatric or social breakdowns.

The researchers next went back to their data from 1962 and looked for any characteristics that might distinguish the breakdown individuals from the others. Several characteristics stood out: The sick group had suffered considerably more early separation from their parents. They had presented discipline problems and had been domineering and aggressive in their classroom behavior. Physiologically, they had been found to have abnormally reactive autonomic nervous systems (ANS). And finally, the sick group had suffered more pregnancy and birth complications than either the high-risk or low-risk controls who had not suffered breakdowns. This last finding suggested that there is a special interaction between some genetic predisposition for schizophrenia and pregnancy and delivery complications. It was almost as if in order for the high-risk individuals to fare well they needed a complication-free pregnancy and delivery.

The abnormal ANS responsiveness of the sick group, as measured by galvanic skin response (GSR), was especially evident in those who had suffered birth complications. “This,” says Mednick, “further suggested that the pregnancy and delivery complications trigger some characteristics that may be genetically predisposed.” In other words, birth complications may result in abnormal ANS functioning in genetically predisposed individuals but not in others.

The genetic and birth trauma factors might explain why some individuals become schizophrenic, but these conditions do not necessarily lead to schizophrenia. Another factor is implicated—the environment in which a child is reared. According to Mednick, schizophrenic be-

havior is an abnormal avoidance reaction, learned in a harsh environment. This learning takes place gradually over a period of many years (25 is the peak age of schizophrenic admissions at all types of mental institutions in the United States). The genetic and birth factors can result in an abnormally reactive ANS, and then environmental factors take over in the chain of events that seems to lead to schizophrenia.

Mednick explains how schizophrenic behavior might be learned: Studies of avoidance learning have been conducted mostly with rats and mostly in shuttle boxes. The rat is first placed in compartment A; a bell rings and 10 seconds later the floor of compartment A is electrified. The rat leaps up, runs around, defecates, urinates and eventually runs into compartment B and safety. After about 10 trials the average rat will learn to avoid the shock by running into B at the sound of the bell. Some rats learn this quickly, and some rats learn this extremely slowly.

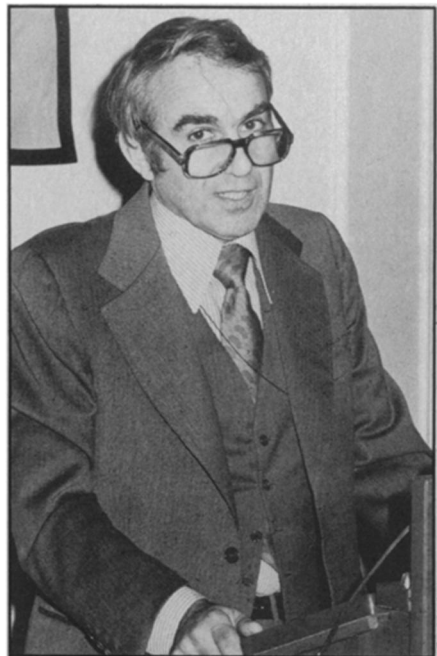
Why? One critical factor is that the rat must fear the shock and must be capable of learning to transfer this fear to the bell. Another critical factor, perhaps a bit less obvious, is that when the rat runs into the safe compartment, the avoidance response is rewarded by fear reduction. The value of a reward is directly related to its speed of delivery and to its magnitude. The faster and greater the reduction of fear, the greater the reward value. In the case of the rat in the shuttle box, the rate at which this fear is reduced depends almost completely on the rate at which its ANS recovers from a fear state to a normal level. The faster the rate of autonomic recovery, the faster the delivery of the reinforcement and the greater the reinforcement. If the rat recovers very slowly, then its avoidance response will not be rewarded very quickly, or with any great magnitude when it enters compartment B. If, on the other hand, the rat has abnormally fast ANS recovery, its reinforcement will come abnormally quickly, and it will learn this type of avoidance response quickly. Two factors, the level of ANS responsiveness and the rate of ANS recovery, help to determine the rate at which the rat will learn the avoidance response.

Running away is not the only form that an avoidance response can take. A human can learn to avoid threatening stimulation by simply thinking irrelevant thoughts. These irrelevant thoughts will, at least partially, remove that person from a fear-

producing stimulus. If the individual has fast ANS recovery and is highly responsive, the avoidant thoughts will be richly rewarded and will increase in their probability of being elicited in the presence of anxiety. Other more complex and even more bizarre responses may be learned to avoid threatening or unpleasant ANS stimulation. Beginning in childhood and through adolescence, an individual with a highly responsive and fast recovering ANS will have a tendency to learn more and more of these avoidance responses if faced with an unkind environment. One of the critical life consequences for such an individual, says Mednick, is the fact that *this avoidance learning will obviate the need, and thus the possibility, of learning more positive, "normal" manners of dealing with life's vicissitudes* (his emphasis). It is perhaps this isolation from the experience of direct dealings with "life," says Mednick, that is responsible for the social helplessness and inappropriateness of the adolescent and adult schizophrenic.

With this theory as a working model of the causes of schizophrenia, Mednick and his co-workers have continued their follow-ups of the original high-risk and low-risk groups. Their work has isolated some of the important environmental and social factors involved and is now finding significant sex differences in the development of schizophrenia.

Ten of the high-risk subjects have died in the course of the study, seven by suicide, two by accidental causes and one of natural causes. None of the low-risk subjects have died. Of the remaining high-risk subjects, 13 have been reliably diagnosed as schizophrenic. Data on this group have been compared with that of 29 individuals diagnosed as borderline schizophrenics, 34 as neurotics and 23 high-risk subjects who did not become mentally disturbed. The high-risk individuals who became schizophrenic were characterized by several factors. Although all of the mothers of the high-risk group were seriously ill, the mothers of those who later became schizophrenic had developed their illness at an earlier age. This led to earlier separation of parents and children, and most of the 13 schizophrenics had been placed in children's homes quite early in their lives. School teachers reported that the future schizophrenics had been extremely disturbing in class, showed inappropriate behavior, were easily angered and were violent and



Mednick: Prediction aimed at prevention.

aggressive. ANS recovery rate (as originally measured in 1962) was found to be the strongest predictor of later schizophrenia. It predicted especially well those individuals suffering symptoms of hallucinations, delusions and thought disorder.

Because some research indicates sex differences in schizophrenia, Mednick and his colleagues are now analyzing their data on males and females separately. Their preliminary findings indicate that schizophrenia may take a different form in men and women and that the etiology of schizophrenia may be different in men and women. The age at which the high-risk child's mother becomes seriously disturbed seems to be an especially important factor in the development of schizophrenia in males but not in females. The earlier the onset of the mother's illness, the more separation from the mother the child experiences, and it is this early separation that seems to be especially damaging to males. There are several ways of explaining this phenomenon, but perhaps the reason early separation is a more important variable for boys is that boys experience more separation anxiety. Among other things, studies have shown that boys cry more than girls when separated from their parents. This stronger separation reaction, says Mednick, may in some way be involved in the chain of events leading to schizophrenia.

Physiological factors also differ between males and females in the eventual development of schizophrenia. The abnormal ANS reactivity that appears to be so closely related to the development of schizophrenia in males plays a less significant role in females. The onset of schizophrenia is usually later for women than for men, so the hypothesized relationship could turn up later if more of the women have breakdowns, but Mednick

admits this unexpected difference is puzzling. There are, however, possible explanations, one of which has to do with the manner in which society deals with the sexes. Little girls are freer than boys to express fears and to cry when disappointed. Parents show more concern over a boy being a "sissy" than over a girl being a "tomboy." Perhaps girls have less need than boys of hiding fear and anxiety. Perhaps girls need *not* learn deviant ways of thinking and behaving to avoid emotional expression.

What about female schizophrenics? If females are not as influenced as males by an abnormally reactive ANS, they should develop a less withdrawn form of schizophrenia. The clinical evidence supports this. The clinical picture for the male schizophrenics is dominated by withdrawal, isolation, thought disorder and hallucinations. The women show evidence of serious thought disorder but are frequently quite promiscuous and socially active. The fact that schizophrenic women become married three times as often as schizophrenic men probably has many explanations but does testify to less avoidant, withdrawn behavior than is the case for males. Mednick cautions that these findings need further investigation but, he says, they do suggest that the condition we call schizophrenia may take a different form in men and women and that the causes may, in part, be different for men and women.

"It is the fate of longitudinal researchers," concludes Mednick, "to continually be presenting interim results. Now we must await the next wave of schizophrenic breakdowns. . . . In addition to these inexorable developments and changes in our subjects over the years, we also face the problem of analyzing literally lifetimes of data. In our case, we are slowly and more-or-less systematically (but certainly slowly) analyzing the individual and life-event factors related to the outcome, schizophrenia. This is an analysis which is very much in progress."

Although Mednick is cautious about his conclusions and schizophrenia still presents a mazelike puzzle for researchers, the Copenhagen study does point in some interesting directions. The strongest predictive factor in the study (the ANS variable) has already been used to select 200 children for participation in a prevention program on the island of Mauritius in the Indian Ocean. This project will be described in a future article. □