Interdependence Between Social Processes and Neurochemical Operations

Antonio J. DeLiz, M.D. 1

The central concern of this paper is the formulation of a *unifying hypothesis encompassing the relationships mediating between stressful social relations, central neurochemical processes, and abnormal behavior, based on recent experimental evidence and the author's personal field experience in Appalachia and South East Africa.*

Introduction

This paper can be considered a model for reflection and guidance, and as such, it may be used as a point of reference and interpretation to all people living in similar conditions all over the world. The pioneer of the theory of interpersonal relations, Harry Stack Sullivan (1953), emphasized that human organisms live in communal existence in a physical, social, and cultural environment. Inevitable stresses and anxieties develop between individuals and social groups during the process of interpersonal relations from birth onward. These stresses and anxieties lead often to abnormal behavior, or, as he puts it, malevolent behavior. Sullivan's thesis has been abundantly validated and has inspired many schools of psychotherapy. Sullivan was, however, aware of the relationship of social stress and behavior via intermediary brain mechanisms; but, like Freud, he could not, at that stage of neurochemical knowledge, explain how the stress of interpersonal relations could be expressed biochemically in behavior. By the same token neither he nor Freud could possibly have been acquainted with our recent knowledge of neurotransmitters as related to behavior, or of the interdependence of social processes and pharmacodynamic mechanisms correlated with psychological activities of the human mind in health and disease.

Many psychiatrists have, until recently, considered separately, if not totally different in nature, genetic or biological factors on one hand and sociocultural factors on the other. One of the reasons for this dichotomy has been the insuperable difficulty—the world's knot of Schopenhauer—to explain

Antonio J. DeLiz, M.D., M.P.H., Ph.D. (Cultural Anthropology and Psychology, Columbia University 1952, under a postdoctorate fellowship from Dr. Wenner-Gren Foundation, New York, N.Y., for Anthropological Research); at the time of writing this paper: Staff Psychiatrist at Cumberland River Comprehensive Care Center, Harlan, Ky., presently Clinical/Medical Director of District VIII Mental Health-Mental Retardation Center, Marysville, Kentucky 41056. 116 Christopher Road. Aberdeen, Ohio 45101.

how the mind acts upon the body. Freud himself was particularly puzzled about this mysterious link in behavior. He nevertheless always showed scientific concern with inborn, constitutional, and accidental causes in the genesis of neurotic processes. Later, in 1964, Heinz Hartmann (1964) conceptualized personality structures as the result of the interaction between inborn biological potentialities or heredity forces and environmental selective stimulation of these processes. He developed a thesis entailing that personality is molded by anlagen that, during the process of maturation, may differentiate itself into character traits.

In spite of these insights, the controversy between nature and nurture, or body and mind, is still raging. Considering this situation, there has been recently a strong concern for a more clear-cut delineation of a unifying theory of personality. This theory should unfold out of an integration of social and interpersonal processes and neurochemical transformations. Fortunately, we have now the results of biochemical experimentation on animals and humans and are perhaps for the first time in a position of formulating a more rational theory. This is the aim of this paper. In discussing this theory, I am merely contributing with field-work material gathered in the Appalachian section of Kentucky and during eight years of fieldwork as an ethnopsychiatrist in Africa.

Both in my work in Appalachia a few months after the last catastrophic flood which had reduced several villages to swamps, and South East Africa, people were subjected to indescribable stress, demoralization, and despair. In Appalachia, because they had lost all their possessions; in South East Africa, because of brutal strategies of colonization including forced labor, beatings, imprisonment without the right to legal counsel, and mass rape. There is no doubt whatsoever that the cultures of Appalachia and those of South East Africa are totally and profoundly disparate. But—and this is paramount for our argument—both share similar properties as members of human species, for when Appalachians, South East Africans, or any other social group in the world are not permitted for a long time the satisfaction of their spiritual, emotional, social, and intellectual needs, they develop inner irresistible needs or stress which inevitably lead to the cessation of the circumstances that caused their misery. In Appalachia, the population, used to being continuously harassed by lack of decent dwellings, proper nutrition or schooling, and deficient medical assistance, has apparently reached a fatalistic attitude of what will be, will be.

One Appalachian told me that "We Appalachians will always be Appalachians and our situation will never be better no matter what the Government promises"; he was simply expressing a shared Appalachian attitude.

In my work as a psychiatrist, I had the opportunity of observing a spectrum of depressions, neurotic or psychotic, anxious, retarded, hostile, circular, unipolar, bipolar, grief reactions, and apathetic demoralizations. Many were becoming alcoholics and drug addicts in response to and escaping from anxiety-ridden situations. This picture makes it absolutely clear that the social stress exerted upon this people was being transduced to the brain causing neurochemical dysfunctions, leading secondarily to psychiatric behavior.

The Bantus of South East Africa reacted differently. Living under the dictatorship of Salazar, they were not free to talk publicly or to abreact their pent-up tensions and anxieties openly. However, covertly, the tremendous increase in sorcery and magical operations was a clear-cut sign of a needed outlet. Nevertheless, these culturally conditioned defense strategies were not sufficient, and therefore I noticed clinically an increase in prevalence and incidence in psychiatric disorders and psychosomatic conditions, always dramatized by secret voodoo explosions which I was to witness.

This paper is divided into four parts. In the first part, I am submitting a complete case history of a 23-year-old Appalachian native who, since the age of 10, spent nine years in jails and reformatories under gruesome conditions.

In the second part, I shall present recent

data on social stress and the pharmacological action of drugs in animals and humans. In part III, I am presenting some unusual and new data concerning the interdependence of social structure and psychiatric disorders in South East Africa. The paper ends with a short conclusion.

Case History

John Smith,* the oldest of 11 children, by now 23 years old, married, a white male patient, was interviewed by me several times in an Appalachian jail in Kentucky. While he was disclosing his life story to me, he was cooperative, his sensorium was clear, his insights and judgment were not impaired. He complained of the cold in his cell which was not heated despite the very low winter temperatures. He was beaten for disclosing the harsh treatment in this jail to me. In one of my visits, the guard refused to let me see the patient, and I had to call the judge to intervene for the guard wanted to conceal the fact that the prisoner had again been brutally beaten and was confined to a solitary cell.

John Smith's delinquent history is tragic. At the age of 10, he began missing school since he was ashamed to walk barefoot. His father, a coal miner and an alcoholic, had an explosive personality and would beat his son brutally with a belt when learning about his disobedience, without yielding to his son's excuse. His mother was overprotective and inconsistent.

He was first arrested at the age of 12 for stealing candy and firecrackers from a grocery store and was sent for six weeks to the Kentucky Reception Center for Boys. From there, he went to the Barkley Boys' Camp, Louisville, Ky., for a period of four months. His parents never visited him. When the boy finally came home, his reception was an icy one. Consequently, he became depressed and started drinking. At the age of 13, he took barbiturates and amphetamines and would mix these drugs with alcohol. He had visual hallucinations, became overactive, and could not sleep.

He was sent to the Kentucky Village for six months after being again arrested and sentenced for breaking and entering into a store. Here, in Lexington, the guards would beat him as well as the other boys. Collective homosexuality was common practice. Hard-core drugs were brought in frequently, including heroin and syringes. He was never visited by friends or relatives.

After returning home, his parents ignored him completely; so he moved away. A short time had passed when he broke his parole for being drunk and carrying barbiturates. This time, he was sent to Woodsbend Boys' Camp where he had to stay for five months. He was then 15 years old. In this reformatory there were no drugs available, nor was homosexuality practiced. Boys were divided into groups of 12, and nobody was to laugh or tell jokes. If a boy would break the rule, the guards instructed the group to put their hands around the boy's neck and shake him. If the punishment was not carried out, another group was instructed to carry out the order not only against the first victim, but also against the boy/boys who refused to torture. At one time, John had to stay in a push-up position for several hours until his arms turned to "rubber" and he could not use them for the rest of the day. During one of these tortures, a boy, who had been slammed brutally to the floor, was killed. John was 17 years old when he was sent home.

This time he did not even want to see his parents. After two weeks of newly gained freedom, he was again under arrest for stealing money from a College library. He apparently was completely drunk during the act. He was imprisoned for six months in the County jail together with rapists, murderers, and thieves like himself. Drugs would drift in frequently. From here he was sent to LaGrange State Reformatory for 11 months, where he became 18 years old. There he was angry and rebellious and was put into solitary most of the time. He was shipped to Eddyville State Penitentiary where he saw four people killed in knife fights during his stay of six months.

*** The name has been changed to protect the patient's identity.**

He survived for six months outside prison walls before he was sentenced again for breaking and entering a hardware store to steal guns, radios, and other valuables. He was subsequently confined to the Rockcastle County jail. With a special saw smuggled into the jail and the help of a companion, he managed to escape. Three months later he was arrested in Indiana and sentenced to the Federal Prison. During the following two years, he was moved four times, finally winding up near home in the Ashland Prison in 1975, where he was to stay for 14 months. At his release, he was 20 years old. He married in November, 1976. Under the weight of his responsibilities of a husband and father-to-be, he became disturbed, drank a bottle of whisky and took a great number of Valiums to which he added morphine derivatives. In a semistuporous condition, he broke into a drugstore and was subsequently arrested.

Comments

This case study contains enough dynamic elements to permit us to conjecture clinically a cause-effect relationship which, as a whole, had inevitably to lead to John's personality structure and his long-range delinquent behavior. In the light of the material of this interview, it is easy to explain John's past history in terms of the backwardness of the Appalachian society and of the pathological dynamics of his family. Born in sheer poverty, isolated from well-integrated systems of interpersonal relations from which a normal self emerges, tormented by cruel punishments of his alcoholic father with whom he could not identify, flooded by the feminine values of an over-protective mother, his choice of severe depression with consequent addicting behavior and violent criminal career was a logical one. Reduced to the image of a "thing," to the self-concept of "nothingness," his anger against society was nothing but his way of violent protest against a malignant social milieu, and an attempt at self-destruction as well.

Basic Experimental Data

Most of what we know about human neuropharmacology is the product of extrapolation from modern methods of bioassay and other techniques carried out in animals. Behavioral disorders can be produced both in humans and in animals by stress or by drugs. Stress may follow disruption of healthy interpersonal relations in an almost infinite number of ways, particularly in our present culture, fraught as it is with unbearable tension, anxiety, and uncertainty. In animals, for example mice, stress evokes elevation of blood pressure, and in men leads to brain, heart, and kidney changes, the most ominous of which is sustained high blood pressure. Mice and men, whenever they are exposed to physical or emotional stress, develop higher vulnerability to the action of certain viruses and bacteria. It is only too well known that the action of stress is conducive to stomach ulcers, ulcerative colitis, and arthritic conditions, to cite only a few of the psychosomatic conditions.

Recent work on the pituitary-adrenal reactions against anxiety states and acute depressions has revealed that the endocrine system represents an integrated and functional feedback machinery under adaptive modulation of the brain where catecholamines appear to have primordial roles which make themselves felt as well in the periphery of the autonomic nervous system. Quite recently it has been shown that catecholamines interact with other neurotransmitters, such as prostaglandins and cyclic AMP, compound P and histamine, glycine, glutamic acid, and GABA. It is also becoming evident that channels of communication exist between neuroendocrine processes and the immune system which (as a complex buffer system) has the capacity to "remember" and recognize foreign substances during their continuous interplay with the social and material environment. On the other hand, it has very recently been hypothesized that genes themselves may control cells individually, leading one to suspect that hormones—in many cases—may control the activity of the genes.

This fact has led some to conjecture the logical existence of a theoretical link mediating ecology and biological organization at the molecular-genetic level. If these speculations prove to be correct, we might be able to conceptualize soon a workable hypothesis entailing a multiplicity of structural correlations in a continuous steady state, encompassing genetic, neuroendocrine, neurochemical, immunological, enzymatic, physiological, psychological, and social systems of action making for all or most vital aspects of adaptation and survival of all forms of living matter. However, are there any experimental studies linking organismic physiology or neurochemistry to specific social or cultural traits? The answer appears in the affirmative. In fact, studies have found endocrine correlates of diverse traits, namely status maintenance, status behavior, normative expectations, conformity or nonconformity with cultural compulsives, patterns of deviance. For example, in a study of monkeys it was found that in the most dominant was a correlation between their attitude and the serum androgen levels. On the other hand, when rodents were exposed to stressful situations, like male confrontation, the amount of catecholamines synthesizing enzymes was found to be decreased in the dominant animal.

In humans, it has been found that during stressful social interactions, persons with higher acquired social status had a higher serum epinephrine secretion and lower norepinephrine secretion levels. A correlation has also been found between levels of fatty acids and behavioral measures of conformity and leadership. On the other hand, evidence has also been found of a correlation in humans between changes in brain catecholamine utilization and aggressive behavior. By the same token, there is evidence that neurophysiologies processes may be altered by social structure manipulations, experimentally or politically.

If these views prove to be correct, we may say that social structures can alter neuro-physio-genetic endocrine functions and consequently change behavior like certain drugs do. The behavior so altered may boomerang in its turn and affect social structures and the processes which maintain them.

African Experience

During my fieldwork in Mozambique, Angola, and South Africa (1934-45) as Assistant of Anthropology of Oporto University, Oporto, Portugal, I observed that the action of native alkaloids, i.e., erythrophloeum, toad macerate (bufotenine), opium derivatives, mescaline, etc., used to cure "possession," appeared to be a function of the degree, intensity, and quality of modulation of voodoo fear, anxiety, kinetics of dancing, music, or singing as well as the vibrancy and degree of the contagiousness of the magical environment and its many specific subtle particulars, like shades of belief and meaning of the supernatural as a power exercised by the sorcerer. The dynamic totality appeared to have the function of "modifiers" of the pharmacological effect of the drugs administered by the sorcerer. In a sense drug action seemed to feedback on the social specificity of the voodoo ceremonies and rituals.

In the same vein, I observed other voodoo incantations centered around dissociative reactions, namely fugues, amnesias, hypnagogic states, sleep paralysis, trances, ecstasy—conditions generally following fright reactions. For example, I observed a pregnant woman pounding her abdomen with rocks and pulling it upward in the delusion that her own pounding heart was actually that of her child. Other pregnant women received messages in their dreams to the effect that their newborn child will be reincarnated in a plant or animal. When the child grows up, she has to adhere to the severest warnings to the effect that she ought not, under any circumstances, harm or eat the personal totem for were she to do so, she would commit auto-cannibalism and become insane.

I treated a schizophrenic woman in my hospital in Mayombe (Angola) who, according to her husband, was lured by a demon to eat her totem, which, in her case, happened

to be a rodent of the family of rabbits. Subsequently, she began eating herself, and at the time she arrived at the hospital she had consumed big chunks from her breasts and legs. Treatment with Metrazol failed when given by me. But she recovered after a few injections of the same medicine, when administered by the medicine man. Here we have another instance of a subtle interplay between socially determined magic and the only treatment known for schizophrenia at the time.

Lots syndrome

Lots wife is the Biblical woman of the Old Testament who was transformed into a statue of salt after looking back at the burning, sinful cities of Sodom and Gomorrah while fleeing from them.

I observed several cases of this syndrome. The symptoms of this psychiatric condition are indistinguishable from catatonia, as they are all heralded by complete mutism, masklike face, cogwheel rigidity, flexibilitas cerea, and complete immobility. In all these cases, the patients failed to show sensitivity to pain at the prick of a pin on most of the body and complete absence of defense reflexes when touched with a live cigarette. The sorcerer explained this situation to me while I was giving an intravenous injection of Metrazol to a female patient with the Lots syndrome. When no positive result was achieved with one injection, I gave her a second shot of Metrazol which caused a light twitching of her fingers only. The blood pressure started falling alarmingly, her breath became shallow and her heart beats barely audible.

"Her baby had been 'possessed' by the devils," he explained, she was doomed to die; the medicine man had asked me for help. I took the mother, child, and rest of her family to a mound of termites and washed the child over it. The termites devoured the "devils," and the child was healed. Before we left the mound, the child's eyes were covered with "butter" of palmtrees so that she would not be able to see if she would try to look back. The mother was equally urged not to look back, but she did. So the devils stormed from within the termites and transformed this woman into a statue of "death." Surrounded by the family and the sick woman, I felt uneasy, to say the least. I surrendered to the sorcerer and asked him to help. The sorcerer proceeded slowly to talk to her in a dialect which I did not understand. She then uttered some unintelligible words; from her lips flew a few exotic morphemes. Little by little, the dialogue took momentum; her lips trembled, her eyes moved, her mouth opened in a yawn. Then she stretched her arms. Suddenly her legs flexed and she fell heavily to the ground. An intense convulsion followed, resembling grand mal epilepsy, while the sorcerer continued talking to her calmly and monotonously, and controlled, as it were, her jerkings and counter-jerkings, as if the "possessed" was to find herself at the intersection of a wild experience which she would integrate according to her perceptions in intensity and quality of the sorcerer's verbal exhortations and incantations (DeLiz, 1941a).

In this connection, one could generally say that the experience and the perception of the "possessed" were in great part fashioned by the complexity of the social process, i.e., her assimilations and constructions (overt or covert) which the "possessed" was erecting for herself. Furthermore, by responding consciously or subliminally to the sorcerer's magical linguistic semantics and kinetic modulations, the "possessed" was able, through her reactions (negative or positive), to modify the sorcerer's performance and the structure of the social group. This intertwined process would produce a steady flood of feedbacks between the social, the neurochemical, and the behavioral dynamics of the small assembly (DeLiz, 1941b).

Tribal social life appeared then to me inextricably bound to biological life, each influencing and setting the stage for the other and, in a broader sense, encompassing cosmic consciousness. Thus, the assumption follows that changes in biology may perhaps be clarified by reference to the individual's quality of relationship to his social group and the ecological environment.

The Killing of Twins

In all primitive peoples, including the Africans, all natural events encompassing birth, growth, old age, and death of men, his diseases and mental afflictions are postulated as caused by supernatural forces according to the laws of magic which guide their thinking processes in terms of absolute determinism.

The killing of twins is considered one of the most serious taboos found in all Africa.** In fact it is thought that if twins (being called children of heaven) are not killed, drought, epidemic, and famine will befall the countryside. The mother is called Mother of Heaven. The ceremony of the killing of the twins is a series of complex magical operations and begins with the decapitation of the twins by the sorcerer. In the second step, the sorcerer leads the mother, who is carrying the bodies of the children, and the following relatives to a wet hole dug in the ground. Then water is poured over the mother's head and the twins. Since the mother of the twins is being identified with heaven, the natives believe that the moment water falls on her, it simultaneously falls on heaven and so conditions heaven by contagious magic to pour water on the land. This procedure is to save their country from drought.

I had a cook who had attended many of these ceremonies which, although prohibited by the white authorities, were being carried out secretly. He gladly left for the ceremony, but never returned home. Meanwhile I was called to the hospital to see a patient. I found my cook in the emergency room in a state of acute schizophrenia, conversing with the spirits. I was gradually informed that, while the sorcerer was going to cut the children's heads, my cook intervened and stabbed the sorcerer to death. After that incident, he ran completely amuck, stabbing at random friends and relatives present at the assembly. He was arrested and brought to the hospital. During three days, he was in a continous dialogue with the spirits who were

**** Not killing the twins is a violation of a taboo. It is an accepted fact in the society that twins have to be killed.**

telling him that what he did was good, for he should not allow anybody to kill his children nor would their assassination prevent any catastrophe in the land. The spirits recommended to him to give up his belief.

A few weeks later, he was discharged completely recovered. Coming home, he told his family that their belief was wrong. But he was not followed and had to leave the country for fear of being assassinated.

The breaking of a 500-year-old taboo by a native during a psychotic episode was a true insight of creativity. It is quite obvious to see in this case, as in the previous account, a subtle but profound relationship of a self-contradictory nature between two opposing social systems, the magical and the Christian.

Conclusion

I started this paper with the case history of John Smith, his dramatic delinquent career from the age of 10 to 23, during which he was exposed to cruel forms of discipline allegedly aiming at regenerating him. He suffered for nine years unimaginable tortures and both physical and psychological torments. During such a lengthy time of imprisonment, he was conditioned to crime and drug addiction. He confronted assassination four times while incarcerated. By the age of 23—the time of the interview—he was a sociopath without any hope for rehabilitation.

John Smith was one of the many youths of the social system in Appalachia that stretches from West Virginia to Alabama. Appalachia is a vast "prison," alienated from civilization, lacking decent dwellings, visited by rats and rattlesnakes, kept mentally retarded for lack of socialization, barely subsisting on a poor welfare check, deprived of work and sufficient medical assistance. Appalachia is a sad region in America. It is not without reason that I mentioned my African experience in which I lived many years in contact with the native underground with its covert threat of an inevitable revolution, and I predicted then the forthcoming violent warfare against the Portuguese settlers

(DeLiz, 1952). And why? Because the natives were in revolt against forced labor, physical punishment, massive rapes, and despair. Although a strong native revolt was already germinating, it was never really met by the eye of the white settlers in 1945; and yet, it was common knowledge that if the biological and psychological needs of the people were unsatisfied, they tended to the extinction of forces—extinction of forces that cause them, for the process of social readjustment relentlessly continues until complete emancipation of peoples under stress, blacks in Africa or the Appalachians. Contrary to what happened in Africa, I am firmly confident that the present unhappy situation will be corrected for the prestige of a greater America.

I stressed throughout this paper that human behavior, normal or abnormal, cannot yield to simplistic or unitary explanations. I defended the thesis that the study of behavior requires much more than the study of a black box with its inputs and outputs so dear to operant conditioning for it should include the study of the total environment, the organism's reactions to it, and vice versa, as well as the study of neurochemical processes. I have presented, in a perfunctory form, some of the more recent experimental work on correlations between the social behavior of man and animal and the endocrine as well as the neurochemical modulations.

My final inference from John Smith's traumatic experiences is that if a disorganized, impoverished, and asocial system may lead to abnormal behavior with serious forms of mental retardation and depression, neurotic or psychotic, and consequent alcoholism, then, conversely, a social system that enhances communication from above downward and vice versa should contribute to information sharing and encourage interaction between individuals and their society. This system shall have the potential for learning and creativity. By social learning I mean to point to a two-way communication channel motivated by inner needs or stress, leading to overt or covert expressions of feeling, emotion, and action, and the involving cognitive processes and change. This change will then be incorporated into the subject's personality and self-image leading him, according to Abraham Maslow (1954), to that self-actualization of that which he believed to be inherently good in men. Thus, positive change in personality and self-image may subsequently bring about change in the individual's way of living (economic, moral, and spiritual) and shall then be shared and generally accepted.

My theory of the polarity or complementarity of social and neurochemical processes entailed in this study implies that there is some degree of interdependence or mutual dependence, or autonomy of social and neurochemical factors. In this way and in this way alone can one evade dichotomies in theoretical psychiatry that caused heretofore interminable controversies. According to the theory expounded, one may avoid the extreme of social and biochemical causation in the genesis of mental disorders. As it follows from these premises, human biochemical nature is both logically and genetically prior to any form of culturalistic or sociological determination of behavior. As a matter of fact, my argument inevitably leads to the postulate that human agents with biological, social powers and impulses are capable of initiating the social process as a means of adjusting to their environment, from a network of symbolic communications and expressions towards a continuous improvement of the human condition.

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