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## Jose Delgado's "Physical Control of the Mind"

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### Ethical Considerations

Placing electrodes inside of the brain, exploring the neuronal depth of personality, and influencing behavior by electrical stimulation have created a variety of problems, some of them shared with general medical ethics and others more specifically related to moral and philosophical issues of mental activity.

#### *Clinical Use of New Procedures*

One of the main objectives of animal research is the discovery of new principles and methods which can be applied for the benefit of man. Their potential advantages and risks cannot be ascertained until they have been extensively tested in human subjects, and preliminary trials must always be considered experimental. Evidence that penicillin or any other new drug may be therapeutically effective is obtained initially in vitro and then in different species of mammals, but the conclusive demonstration of its clinical safety and efficacy requires application to man. In spite of established safeguards, there is an inherent possibility that unforeseen, slowly developing side effects may have serious consequences. A thorium product used in the early thirties as a contrast medium for X-ray analysis of the liver was found to be radioactive and caused the slow death of hundreds of patients. A supposedly innocuous drug, the ill-famed thalidomide given as a sedative, had damaging effects on fetal development, creating the tragedy of children born

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with severe physical deformities. Accidents like these have promoted more stringent regulations, but the gap between animal and human biology is difficult to fill and in each case a compromise must be reached between reasonable precautions and possible risks.

The historical demonstration by Fulton and Jacobsen (81) that frustration and neurotic behavior in the chimpanzee could be abolished by destruction of the frontal lobes was the starting point of lobotomy, which was widely used for treatment of several types of mental illness in human patients. This operation consisted of surgical disruption of the frontal lobe connections and demonstrated the important fact that psychic manifestations can be influenced by physical means as bold as the surgeon's knife. The Nobel Prize bestowed on the first neurosurgeon to perform human lobotomies, Egas Moniz, recognized the significance of the principle that the mind was not so unreachable as formerly believed, and that it could be the object of experimental investigation.

In spite of initial acclaim, lobotomy was soon severely criticized as a therapeutic procedure because it often produced concomitant undesirable alterations of personality, and more conservative treatments were actively sought in order to provide a "less damaging, less sacrificial means of dealing with mental disorders than are lobotomy, leucotomy, gyrectomy, thalamotomy, and other intentional destructions of nervous structures" (145). Among these efforts, implantation of electrodes in the brain offered promising possibilities. In monkeys, stimulation or limited destruction of the caudate nucleus produced several of the symptoms of frontal lobotomy with more discrete behavioral changes (191).

Implantation of electrodes in man permitted access to any cerebral structure for recording, stimulation, or destruction. Their potential clinical application raised controversial issues about risks, rationale, and medical efficacy, but there is general agreement that depth recordings may provide significant information which cannot be obtained by other means and is essential for the proper diagnosis and

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treatment of patients with some cerebral disturbances. Therapeutic use of electrodes in cases of mental illness has been more doubtful and must still be considered in an experimental phase.

Recordings and stimulations in a patient equipped with intracerebral leads provide basic information about neurophysiological mechanisms in man which may be of great value for the patient himself, for the welfare of other patients, and for the advance of science. In addition, they provide a unique opportunity to obtain important data about neuronal functions which may not be directly related to the patient's illness. In this case we are facing ethical issues of human research which must be carefully considered.

### *Human Experimentation*

While medical practice has generally accepted guidelines based on the hippocratic oath - to do what "I consider best for my patients, and abstain from whatever is injurious" - research with human subjects has lacked traditional codes and has followed the investigator's personal criteria-which have not always been correct. According to Beecher (12), leading medical schools and renowned doctors have sometimes conducted unethical research. Extremely high doses of a drug have been administered, with resulting behavioral disturbances, in order to evaluate the toxicity of the product; placebos have been given instead of a well-known beneficial drug, with a resulting increase in the incidence and severity of illness; live cancer cells have been injected under the skin of twenty-two elderly patients without telling them what the shots were, at New York's well-respected Sloan-Kettering Institute. Beecher does not believe that these studies demonstrate a willful disregard of the patient's rights, but a thoughtlessness in experimental design.

Although no formal ethical code has been universally accepted for the performance of research in man, basic guidelines have been formulated by the American Psychological Association (43); by the judges of the Nuremberg war crime trials (218); by

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the World Medical Association (246); and by the Medical Research Council of Britain (153). A 1966 editorial in the *New England Journal of Medicine* (161) states that in medicine and in human investigations the welfare of the sick patient or the experimental subject has traditionally been of prime importance. "This implies clearly that therapeutic or theoretical experiments with significant risk of morbidity or mortality are undertaken only with a view to the immediate benefit of the patient; for the experimental subject to whom no benefit may accrue, the most meaningful possible informed and unforced consent must be secured." In the summer of 1966, the United States Public Health Service issued regulations for their sponsored research involving humans, specifying the need for full consent by the participating subjects and careful review of the projects by an ad hoc committee. In a detailed discussion, Wolfensberger (245) clarified the meaning of informed consent: The experimental subject understands all the essential aspects of the study, the types and degrees of risks, the detrimental or beneficial consequences, if any, and the purpose of the research.

One of the main ethical issues is the conflict of interest between science, progress, and society, and the rights of the individual. The principles of personal dignity, privacy, and freedom are often waived - voluntarily or forcefully - in favor of the group. Firemen, policemen, and soldiers may risk or lose their

lives for the benefit of the community. Civilized activities are full of regulations which limit behavioral freedom. We are obliged to reveal our income, to pay taxes, and to serve in the army. We cannot walk around naked, take flowers from public gardens, or leave our cars where we please. We are searched when crossing borders and put in jail if our conduct is considered antisocial by the law. Although respect for the individual is highly prized and accepted in theory, in practice it is often challenged and curtailed. The balance between social duties and individual rights is decided not by the individual but by customs and laws established by the group.

In the case of medical research, it is difficult to write an ethical

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code. As the Panel Of Privacy and Behavioral Research concluded in 1967, "legislation to assure appropriate recognition of the rights of human subjects is neither necessary nor desirable," and "because of its relative inflexibility, legislation cannot meet the challenge of the subtle and sensitive conflict of values under consideration." Ethical decisions in science require not only moral judgment but also factual information, technical knowledge, and experience, especially in the evaluation of risks and benefits. In order to decide to undergo open heart surgery, a patient must have a medical evaluation of his condition and of the state of the surgical art, a judgment which the doctor, but rarely the patient, is prepared to make. In medical research, consent is certainly essential, but the main responsibility still lies with the investigator and his institution. The request for consent from a patient-or from a student participating in a research project carries a heavy weight of moral authority and a degree of coercion, and granting of it does not relieve the director of full responsibility in the experimental design and consequences. The simple request to perform a dubious procedure must be considered unethical because it represents psychological stress for the patient. Children and adults with mental disturbances cannot give proper consent, and relatives must be consulted. Their decisions, however, are easily influenced by the picture presented by the attending physician, thus increasing his responsibility which preferably should be shared by a group of three or more professional consultants.

There is one aspect of human research which is usually overlooked: the existence of a moral and social duty to advance scientific knowledge and to improve the welfare of man. When important medical information can be obtained with negligible risk and without infringing on individual rights, the investigator has the duty to use his intelligence and skills for this purpose. Failure to do so represents the neglect of professional duties in some way similar to the negligence of a medical doctor who does not apply his full effort to the care of a patient. Subjects with implanted electrodes provide a good example, because the use

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of telemetry, and video tape recordings in them makes possible many studies concerning the sources of normal and abnormal activities, spectral analysis of electrical waves, conduction time, evoked potentials, and electrobehavioral correlations. This type of research may provide data of exceptional value-available only from man-without any risks or even demands on a patient's time or attention. Information can be obtained while the subject is engaged in spontaneous normal activities like reading a paper, watching television, or sleeping. Only the recording equipment and research team need to be alert and working. Methodology for the telemetric study of the brain is very new, and it will take some time before its potential and practicality are recognized and its use spreads to different hospitals. In my opinion this research is both ethical and desirable.

However, procedures which represent risk or discomfort for the patient should be ruled out. The implantation time of electrodes cannot be prolonged unnecessarily, and-administration of drugs, injections, or catheterizations for research purposes are not acceptable. Any contemplated exception to

this rule should be very carefully evaluated and clearly explained to the experimental subject.

When a patient needs to have electrodes in his brain for a period of weeks or months, the medical doctors in charge face a dual responsibility, first not to do anything harmful or unpleasant for the sake of science, and second to do as much research as possible provided it is safe and comfortable for the patient.

The use of healthy volunteers in medical research is controversial, partly because they are usually recruited from prisons, the military services, universities, or other groups which are more or less bound to authority and therefore have a diminished capacity for free choice. One of the most famous experiments was a study of antimalarial drugs which had to be performed in man. In a well-planned research project 1,000 army volunteers in Australia were deliberately infected with malaria. This study was later continued in several federal penitentiaries in the

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United States. A most dramatic and successful mass experiment was the application of poliomyelitis vaccine to thousands of school children a few years ago, statistically demonstrating the effectiveness of a new vaccine. Decisions about experiments like these must be reached by careful consideration of the factors involved, with the basic ethical guidelines clearly in mind.

Individual volunteers have greater freedom of choice, and I have received letters from many people offering themselves as "human guinea pigs" for implantation of electrodes in their brains. For both ethical and practical reasons their offers cannot be accepted, but it is interesting to note the varied motivations behind these proposals. They included pure scientific interest, hopes for monetary reward or fame, manifestations of psychotic disturbances, and also a most generous intent: Some people wished to donate their brains for study in the hope that information could be obtained leading to the cure of loved ones whose brain dysfunctions could not be cured by standard therapies. The most articulate expression of this wish to contribute one's own brain for scientific research was that of a most distinguished investigator, Dr. David Rioch, who at the close of a conference about the unanesthetized brain, held in Washington, D.C., in 1957, declared:

When I come to retire ... I might quite reasonably approach an experimental neurosurgeon in whose work and scientific orientation I had confidence and say "Let us do an experiment together, as there are a number of things both you and I would like to find out." I would be considerably intrigued to know what "attitudes" and "sensations" a good experimenter could evoke electrically from my amygdala and even more intrigued to check personally on the sense of euphoria and the sense of disphoria (185).

### *Electrical Manipulation of the Psyche*

The most alarming aspect of ESB is that psychological reactivity can be influenced by applying a few volts to a determined area of the brain. This fact has been interpreted by many people

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as a disturbing threat to human integrity. In the past, the individual could face risks and pressures with preservation of his own identity. His body could be tortured, his thoughts and desires could be challenged by bribes, by emotions, and by public opinion, and his behavior could be influenced by environmental circumstances, but he always had the privilege of deciding his own fate, of dying for an ideal without changing his mind. Fidelity to our emotional and intellectual past gives each of us a feeling of transcendental stability-and perhaps of immortality-which is more precious than life itself.

New neurological technology, however, has a refined efficiency. The individual is defenseless against direct manipulation of the brain because he is deprived of his most intimate mechanisms of biological reactivity. In experiments, electrical stimulation of appropriate intensity always prevailed over free will; and, for example, flexion of the hand evoked by stimulation of the motor cortex cannot be voluntarily avoided. Destruction of the frontal lobes produced changes in effectiveness which are beyond any personal control.

The possibility of scientific annihilation of personal identity, or even worse, its purposeful control, has sometimes been considered a future threat more awful than atomic holocaust. Even physicians have expressed doubts about the propriety of physical tampering with the psyche, maintaining that personal identity should be inviolable, that any attempt to modify individual behavior is unethical, and that method and related research -which can influence the human brain should be banned. The prospect of any degree of physical control of the mind provokes a variety of objections: theological objections because it affects free will, moral objections because it affects individual responsibility, ethical objections because it may block self-defense mechanisms, philosophical objections because it threatens personal identity.

These objections, however, are debatable. A prohibition of scientific advance is obviously naive and unrealistic. It could not be universally imposed, and, more important, it is not

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knowledge itself but its improper use which should be regulated. A knife is neither good nor bad; but it may be used by either a surgeon or an assassin. Science should be neutral, but scientists should take sides (242). The mind is not a static, inborn entity owned by the individual and self-sufficient, but the dynamic organization of sensory perceptions of the external world, correlated and reshaped through the internal anatomical and functional structure of the brain. Personality is not an intangible, immutable way of reacting, but a flexible process in continuous evolution, affected by its medium. Culture and education are meant to shape patterns of reaction which are not innate in the human organism; they are meant to impose limits on freedom of choice. Moral codes may vary completely from civilization to civilization. Polygamy was acceptable in biblical times, and it is still practiced among Moslems, but it is rejected by many other civilizations with strong social, legal, religious, and educational pressures to make behavior monogamous. Of course there is no physical impediment to the acquisition of half a dozen wives - at least until the law or the ladies catch up - but then we enter into a play of forces, into the dynamic equilibrium among all of the elements which determine behavioral choice. If there are very strong reasons to react in a particular way (for example, to have only one wife), the chance of living by a different custom is so slim as to be negligible.

This is precisely the role of electrical stimulation of the brain: to add a new factor to the constellation of behavioral determinants. The result as shown experimentally in animals is an algebraic summation, with cerebral stimulation usually prepotent over spontaneous reactions. It is accepted medical practice to try and modify the antisocial or abnormal reactions of mental patients. Psychoanalysis, the use of drugs such as energizers and tranquilizers, the application of insulin or electroshock, and other varieties of psychiatric treatment are all aimed at influencing the abnormal personality of the patient in order to change his undesirable mental characteristics. The possible use, therefore, of implanted electrodes in mental patients should not

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pose unusual ethical complications if the accepted medical rules are followed. Perhaps the limited efficiency of standard psychiatric procedures is one reason that they have not caused alarm among scientists or laymen. Psychoanalysis requires a long time, and a person can easily withdraw his

cooperation and refuse to express intimate thoughts. Electroshock is a crude method of doubtful efficacy in normal people. Although electrical stimulation of the brain is still in the initial stage of its development, it is in contrast far more selective and powerful; it may delay a heart beat, move a finger, bring a word to memory, or set a determined behavioral tone.

When medical indications are clear and the standard therapeutic procedures have failed, most patients and doctors are willing to test a new method, provided that the possibility of success outweighs the risk of worsening the situation. The crucial decision to start applying a new therapeutic method to human patients requires a combination of intelligent evaluation of data, knowledge of comparative neurophysiology, foresight, moral integrity, and Courage. Excessive aggressiveness in a doctor may cause irreparable damage, but too much caution may deprive patients of needed help. The surgical procedure of lobotomy was perhaps applied to many mental patients too quickly, before its dangers and limitations were understood; but pallidectomy and thalamotomy in the treatment of Parkinson's disease encountered formidable initial opposition before attaining their present recognition and respected status.

While pharmacological and surgical treatment of sufferers of mental illness is accepted as proper, people with other behavioral deviations pose a different type of ethical problem. They may be potentially dangerous to themselves and to society when their mental functions are maintained within normal limits and only one aspect of their personal conduct is socially unacceptable. The rights of an individual to obtain appropriate treatment must be weighed with a professional evaluation of his behavioral problems and their possible neurological basis-which necessitates a value judgment of the person's behavior in comparison

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with accepted norms. One example will illustrate these considerations.

In the early 1950s, a patient in a state mental hospital approached Dr. Hannibal Hamlin and me requesting help. She was an attractive 24-year-old woman of average intelligence and education who had a long record of arrests for disorderly conduct. She had been repeatedly involved in bar brawls in which she incited men to fight over her and had spent most of the preceding few years either in jail or in mental institutions. The patient expressed a strong desire as well as an inability to alter her conduct, and because psychiatric treatment had failed, she and her mother urgently requested that some kind of brain surgery be performed in order to control her disreputable, impulsive behavior. They asked specifically that electrodes be implanted to orient possible electrocoagulation of a limited cerebral area; and if that wasn't possible, they wanted lobotomy.

Medical knowledge and experience at that time could not ascertain whether ESB or the application of cerebral lesions could help to solve this patient's problem, and surgical intervention was therefore rejected. When this decision was explained, both the patient and her mother reacted with similar anxious comments, asking, "What is the future? Only jail or the hospital? Is there no hope?" This case revealed the limitations of therapy and the dilemma of possible behavioral control. Supposing that long-term stimulation of a determined brain structure could influence the tendencies of a patient to drink, flirt, and induce fights; would it be ethical to change her personal characteristics? People are changing their character by self-medication through hallucinogenic drugs, but do they have the right to demand that doctors administer treatment that will radically alter their behavior? What are the limits of individual rights and doctors' obligations?

As science seems to be approaching the possibility of controlling many aspects of behavior electronically and chemically, these questions must be answered. If, as in the case of this patient, the

deviation of behavior conflicts with society so seriously as

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to deprive her of her personal freedom, medical intervention could be justified. The case of habitual criminal conduct is another example of this type of problem. Therapeutic decisions related to psychic manipulation require moral integrity and ethical education. Scientific training concentrates mainly in natural sciences and often neglects the study and assimilation of ethical codes, considering them beyond the realm of science. Perhaps it is often forgotten that the investigator needs a set of convictions and principles, not only to administrate grant money, to give proper credit to the work of others, and to be civilized with his colleagues, but especially to direct his life and his research, and to foresee the implications of his own discoveries.

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