Catatonic phase of schizophrenia and recent advancement in treatment

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THE CATATONIC PHASE OF SCHIZOPHRENIA

AND

RECENT ADVANCEMENT IN TREATMENT.

SENIOR THESIS

1933

R. DAVIS ROADRUCK.
ACKNOWLEDGEMENT

The case histories presented herein have been taken from the files of the Norfolk State Hospital with the permission of Juul C. Nielsen, M.D., and T. M. Barber, M.D. We also wish to express our appreciation for the co-operation of S. W. Shelton, M.D., in analyzing certain of these cases and in the introduction of treatment.
INTRODUCTION

The recognition of mental disorders dates back to antiquity, but it is only within the last half century that any serious study has been given to this important branch of medicine. With the gaining of knowledge there has been a gradual change in the method of treatment and management of psychotic patients.

The first step was taken by Pinel in 1792 when he freed some fifty patients, some of whom had been in chains for thirty years or more. His contention was that these patients would benefit by greater liberty, better hygienic surroundings, and improvement in the patients' behavior proved that he was correct. About this same time Fricke in Germany began to introduce humane medical treatment and reduce mechanical restraints. From this time on there was a gradual spread of reformation throughout the civilized world in an attempt to humanize the care of the mentally ill.

In the 1850's greater effort was made to abolish the mechanical restraints. One of the pioneers in this work was Dorothea Lynde Dix. In America she was responsible for the improvement in hygienic conditions and management of hospitals for the psychotic, as well as founded new institutions. In Europe there developed at about this same period the "colony system." Here groups of
patients would be gathered and supervised in some definite work that helped to support the colony as a whole. This plan has worked rather well in Europe and there has been some attempt to foster such a system in America, especially in the east where large institutions find no further room for building expansion.

The maintaining of hospitals closely approaching the general hospital as to standards, has developed during the last few decades. The operation of such institutions has demanded capable men, not only trained in psychiatry, but general medicine as well. There has been an increasing interest in the problems associated with the care of the psychotic, not only in their general welfare, but an attempt to work out a therapy for the elevation and cure of mental illnesses and more recently a firm trend toward prevention of their occurrence.

In this paper we will limit the discussion to one particular phase of the psychoses, namely, catatonia. The present concept of its etiology and interpretation of symptom complexes. Also a review of the literature with reference to institutional care, the value of occupational therapy and chemical therapy in the catatonic phase of schizophrenia.
The first description of the catatonic phase of schizophrenia was given by Hecker and Kahlbaum, as a variety of mental disturbance, with symptoms and a course peculiar to itself. Little attention was given to the work of these two men until Kraepelin's contributions had gained recognition. Then we see that Kraepelin had practically the same concept of catatonia as did Kahlbaum, however, the latter gave a better prognosis for catatonia than did Kraepelin. Kirby, (17), presents the two conflicting views when he states that Kahlbaum did not consider the prognosis of catatonia as particularly bad, in fact, he rather believed that the tendency was toward recovery from the attack and thought that only a few cases progressed to the stage of dementia. Under the influence of the later teaching of Kraepelin, however, catatonic symptoms came to be and are still regarded by many as an almost sure sign of deteriorating psychosis.

The etiological factor or factors concerning the catatonic syndrome is just as much of a mystery as it was fifty years ago, although numerous theories have been advanced. There still exists a conflict between the organist and the functionalist. So far the favor of opinion seems to lie with the functional theory. During the last few years a considerable amount of research work has been done in an attempt to find some
definite organic abnormality which will account for the
development of certain psychoses.

Dr. Henry A. Cotton,(6), is one of the group that is very firm in his assertions as to the organic factor in the development of a psychoses. He states that for years we have been content to consider mental disorders in two large groups, designated as "organic and functional". This division was based on the fact that in the first group pathological changes in the brain tissue, which would account for the "mental disease" was demonstrable, while in the so-called functional group, for a long time, investigations owing to inadequate methods, failed to reveal changes in the brain which could account for the mental symptoms. This led to the erroneous viewpoint that certain mental disorders could occur independently of any change in the brain. From this view he unhesitatingly dissents. He believes that there has been a too literal interpretation of Virchow's cellular hypothesis, this having led to a hasty and erroneous conclusion that because the cell looked normal in arrangement and outline it was necessarily normal in function. This erroneous hypothesis that the mind is independent of the brain, was further supported by the fact that no recognizable physical disease was formerly known to exist in these patients. By exclusion, there-
fore, mental factors came to be accepted as the sole cause operating in this group.

Bancroft and Rutzler, (1), agree with the dictum laid down by Dr. Cotton--that there can be no abnormal function without a corresponding abnormal structure; at least, they do not feel free to cast it aside until it is definitely proved wrong. Lang and Patterson, (19), have concluded that at least two abnormal conditions of the brain may exist; one when it is over-coagulated and one when it is over-peptized. They are of the opinion that the two types of catatonia--benign stupor--reacts to tests indicating that it is an agglomerated (over-coagulated) type, and the schizoid catatonia is a peptized state. Lurie and his associates (26), in light of the results obtained from a study of the blood colloids in catatonics, have concluded that the blood of the catatonic patient is in a state of hydration, and a correction of this condition produces an elevation of symptoms in the majority of cases. Loevenhart (24), and his co-workers, as a result of their experimental work, advanced the theory that in the catatonic there is a decreased irritability of the cerebral cells to the normal carbon-dioxide content of the blood. Golla, Mann and Marsh (10), bring forth evidence that tends to substantiate this theory of Loevenharts.
They have shown that in this type of mental disturbance there is a reduced sensitivity of the respiratory center to carbon-dioxide. The results of their research indicates that in the catatonic schizophrenic there exists a disturbance of the acid-base equilibrium consequent upon the primary depression of the respiratory center.

Henry (15), following a series of experiments on the higher animals has offered the suggestion that toxicity may be an important factor in the development of catatonic man. He has concluded that although the factors in a mental illness prior to its onset are largely psychogenic, the presence of a psychosis means that physiological changes have already taken place, changes which tend to perpetuate the psychological manifestations. He believes that this is especially true of catatonia, and that in order to help these patients this vicious cycle must be interrupted.

Some authorities disagree as to whether catatonia is a clinical entity. Kirby (17), states that the catatonic syndrome is not in any sense a clinical entity; while Lorenz (25), believes that few others, if any mental states are as definite in their external manifestations as this condition. Pronounced cases are almost photographic of each other. Apparently previous personal experiences, racial origin, physical environment,
intellectual attainment, physical endowment, or any of the grosser differences commonly found among individuals, leave no impression upon the outward or evident manifestations of catatonia stupor. When one further considers the variety of conditions under which this state develops, one is led to conclude that it represents a complex reaction for which there exists a nervous mechanism not unlike a neuronic reflex. Under certain conditions this mechanism is energized into activity. This activity may vary in degree so that the onset is acute, a stage of excitement; insidious, stage of depression; subacute, stage of stupor. Kraepelin states that forty-one percent of such cases tend to develop acutely, thirty-one percent insidiously and the remaining per cent subacutely.

Henderson and Gillespie (13), say that there is no group of symptoms which can be looked upon as in any way premonitory. The usual history is a more or less general statement that there has been a falling off in interest, an apathy, a lack of concentration, a dreaminess and often episodes of an odd nature. Then a state of dull stupor develops, with mutism, refusal of food, and with such a diminution of all activities that the patient may sit idly in one position, with the hands stretched out on the knees, and the head bowed between the shoulders, the whole aspect being that of a mummy. The facial expression
is vacant, and no apparent interest is taken in the environment or in the people around. The muscles of the mouth become pursed up into the so-called "schnauzkampf." Patients in this condition have to be dressed and undressed, and have to be moved in bed. For months on end they may have to be tube fed. Urine and feces are often retained, or there is often incontinence. Mannerisms are common and often bizarre. The saliva may be retained, so that the cheeks become bulged out with it, or drooling occurs from the mouth. These patients are so insensitive that they do not react to painful stimuli, such as pin-pricks, thermal changes, nor do they even close their eyelids when told that a pin is going to be put into one of their eyes. In the majority of instances they understand and remember everything that is going on around them. This has been definitely proven in some of our work with patients after they had been aroused from their stupor. Not infrequently they are intensely negativistic, and an attempt to do anything for the patient is resisted with every ounce of his strength, or they may do just the opposite of the command. Certain cases show a willingness to obey everything without question. There are also stereotypes of thought and action; the patients ask the same questions over and over again, write words or letters in a stereotyped way, or walk in
a peculiar fashion, perhaps stopping for an instant after so many steps; or they assume strange attitudes, which are maintained unchanged for long periods of time. Flexibilitas cerea is common; they will allow their bodies and their limbs to be placed in awkward positions, which are maintained indefinitely. Echolalia and echopraxia are often common symptoms.

The behavior of the patient may suddenly change from stupor to extreme frenzy, during which he acts with extraordinary impulsiveness, and assaults whomever comes into contact with him. During this stage he may not only be homicidal, but impulsively suicidal. Such episodes of excitement usually come on out of a clear sky, and there are as a rule no premonitory symptoms. No satisfactory explanation has been found to account for the origin of these peculiar symptoms, and we know almost nothing of their deeper meaning and the mechanisms involved in their development. The most typical catatonic manifestation, the negativistic stupor, has the general characteristics of a defense reaction or of a protective mechanism whereby the individual practically shuts out the external world. Life they have found, is unhappy; and unable to adjust to an ever-changing civilization, they have reacted by regression to an infantile level. They attempt to exclude all
stimuli which tend to elicit painful memories of failure in a world whose contacts have been unpleasant and hateful. They concern themselves with wish-fulfilling fantasies and they exhibit antisocial habits calculated to repel. Attention has been drawn to the resemblance between the catatonic stupor and the philogenetically old reaction seen in animals that in time of danger lie motionless as if feigning death. Some of the reactions may be the result of delusions or hallucinations.

The following case histories present typical catatonic types:

Case No. 1683. A. L. Female. Age 37. Mutism, negativism, periods of excitement, resistive and mannerism.

Onset of Present Illness:

Patient's husband states that she has not talked to him since October 1931. Also about this time she rather suddenly became seclusive and did not care to talk nor visit with any of her friends or relatives. They would call on her and attempt to engage her in conversation but she would not respond to questions asked. She attempted suicide in the summer of 1930 by drinking lysol. She was noticeably depressed two or three days previous to the attempt. A doctor was called and her
stomach was washed out and she was up in a few days and resumed her household duties. The husband states that all this time she has carried on her housework, though her work was not up to par by any means, and she neglected things sorely. Shortly before entrance to the hospital she became stuporous and had to be cared for.

Personal History:

Patient was born May 23, 1896, St-, Sweden. She was always considered to have good health as a child. The only sickness she has suffered in her past life being an operation for appendicitis at the age of nine years, and two operations since that time for intestinal adhesions. No history of convulsions in childhood. No history of any serious accidents or injuries. The patient was always considered somewhat backward and never took an active part in childhood games; and it is said that she was considered definitely asocial. She had read the Bible a great deal since childhood and her particular hobby was attending church and prayer meetings. Patient's school age was given as six and thirteen years, only obtaining an eighth grade education. The only occupational career mentioned was housework. The patient has worked out but little and what time she did work, it is said that she changed jobs quite fre-
quenty. She came to the United States when she was twenty-one years of age, and settled at O, Nebraska. She was urged to come to this country by her girlhood sweetheart. After six months he left her. This was a sad experience in her life. At the age of thirty she married a farmer. There has never been any children. Menstruation, which began at age of fourteen was always regular. No history of autoeraticism. No marital conflicts.

Family History:

No history of nervous diseases in the parents. One sister said to have suffered a "nervous breakdown." Father died of cancer. Five brothers living and well.

Mental Examination:

The patient on admission exhibited negativism and mutism, was extremely rigid and non-co-operative. Her condition remained the same for one week. The following information was obtained from the patient while under the influence of intravenous sodium amytal.

Q. When did you come here?
A. Ten years ago.

Q. What hospital are you in?
A. Norfolk Hospital.

Q. What day is this?
A. Friday, the 16th. (Correct.)

Q. How long have you been in this hospital?
A. Two weeks next Tuesday. Came here the 6th of July. (Correct)
Q. Have you been in any hospitals before?
A. Yes.

Q. What for?
A. Adhesions.

Q. Ever have your appendix removed?
A. Yes, when I was nine years of age, in Sweden.

Q. Who operated upon you for adhesion?
A. Dr. K , of Omaha, four years ago.

Q. How old are you?
A. Thirty-six.

Q. When were you born?
A. May 23, 1896. (Correct)

Q. How old were you when you came to the U. S.?
A. Twenty-years.

Q. How old is your mother?
A. Seventy-three years.

Q. Did she ever have any nervous trouble?
A. No. (Later she stated that one sister had a nervous upset)

Q. Did you ever have any nervous trouble before?
A. Yes. A couple of years ago.

Q. Did you refuse to talk during this attack?
Q. Well I just didn't want to talk.

This information was elicited within a period of about thirty minutes. Questioning was continued but the patient refused to answer and she became stuporous and mute. Her attitude has been entirely negativistic since her entrance and she has been confined to bed since the first day. It has been necessary to tube-feed her all the while, though she has taken fluids readily. On the
21st., she developed a temperature of 104°F. She offered no complaint other than placing her hand over her left breast when asked what ailed her. Examination revealed a breast abscess. On July 26th, she was urged to get up and was taken out for a short walk. No interest was taken in any of the surroundings. Two weeks later, sodium amytal was again administered. The reaction was very similar to that following the initial use of this drug. However, she responded to questions over a longer period of time and evidenced keen interest in every thing that took place in the examining room. After a period of two hours she again regressed to a catatonic stupor.

It is worthwhile to note certain salient features in this history. First, there is very little disturbance of the sensorium and the patient has been perfectly conscious of every thing that has been going on about her. Secondly, the reasons given in explanation of her reaction. "I have had so much trouble in this world and everyone has been against me, so I just shut myself up and think about pleasant things. When I am this way no one can cause me trouble." Just what the nature of this "trouble" might have been we were unable to determine.

Wolff (36), after reviewing a group of one-hundred cases of catatonic phase of schizophrenia concluded that
there was a prominence of ideas relative to perverse and tabooed sexuality, also frequent ideas of death and related ideas of rebirth and association of fear in connection with these ideas. Incestuous and homosexual wishes and their expression appears prominently in the catatonic group. Kempf (16), considers the chronic catatonic dissociation as an adaptation or adjustment to a cause of fear and sexual excitement. Amsden in discussing the personality of catatonic schizophrenics, noted that in half of them the most prominent feature is that of being fearful and easily frightened. Considered as a psycho-biological reaction, the attitude and manifestations of catatonia suggest a feigned death reaction to fear, an inferior type of response; and as the solution of difficulties, this accomplishing a blissful state of freedom from cares in which tabooed cravings are no longer a source of conflict. The catatonic excitement may be an abandonment to these cravings or a struggle against them, the cravings often being expressed by projection.

Helmer (12), determined that about half of the number of patients under his observation expressed hallucinations, ordinarily of the auditory type. He also mentioned the presence of incestuous phantasies and ideas of death associated therewith. Regression to an early infantile
attachment to the parents was not uncommon. Helmer was able to show that many of the so-called bizarre acts of the catatonic patients are understandable, that is, they are not bizarre when the patient is sufficiently communicative to explain the acts. He strongly recommends that patients be studied more in detail, if one wished to gain a clearer idea of the motivation of what is called bizarre behavior.

Faver (9), in an analysis of some 154 unselected cases concludes that seclusiveness, and seclusiveness with other traits considering seclusiveness the predominating characteristics, forms the bulk of cases, numbering 86, or 55.9 per cent of the total. Irritability considered alone appeared in 12, or 7.8 per cent of the cases. This irritability is most commonly described as fits of violent temper.

The following case history is representative of that group showing seclusiveness and irritability as a predominant factor.

Case No. 1683. E. S. Female. Age 32. Resistive, mutism, periods of violent temper tantrums, seclusiveness and occasional muscular rigidity.

Onset of Present Illness:

The patient was always considered quite nervous. She
was called home one and one-half years ago on account of her mother's illness. Her mother's condition grew worse and she finally "lost her mind", and was committed to an institution. Within seven months, the patient became mentally abnormal to such a degree that it was necessary to confine her to a sanitarium. She has shown no improvement up to the present time.

Personal History:

Very little information was obtained in regard to the personal history. The questionnaire states she was born February 16th, 1900, at California Junction, Iowa. She was of normal birth and never suffered any serious illness during childhood. She was considered to have about average intelligence, although she only advanced through the seventh grade. Her early life was uneventful, but it is mentioned that she was always considered slightly unruly, stubborn and antagonistic towards her parents. She was not a leader among her associates, never cared a great deal for the company of others. Her hobbies mentioned are reading books and doing fancy work. It is said that she never did appear to take any interest in the happenings of the outside world. She attended the Swedish Lutheran Church at regular intervals. In her occupational career the only thing mentioned is housework, and at
this she was quite adept. Menstruation began at the age of fourteen years. No history of pregnancies or miscarriages. No sexual aberrations are mentioned.

Family History:
Mother judged psychotic, type not known. Father, age sixty, good health. One brother and one sister, good health. No other history of nervous or mental diseases in the family.

Mental Examination:
At the time of her entrance the patient was quite stuporous and was totally unresponsive, refusing to give any account of her trouble. Since this she has been practically unapproachable, talks little, unable to initiate conversation. She seems to prefer seclusion and is totally rapt up in her dream state of mind. She is resistive towards all care and it was impossible to make complete physical examination, due to her antagonistic attitude. She exhibited definite disharmony between mood and thought, for example: When an effort was extended on her part to recall her near relatives—Mother, Father, Brothers and Sister—she laughed in a silly manner and said that they were all right the last time she heard from them. When asked how long this had been, she said, "Don't know, don't remember." When trying to recall her past troubles she ex-
hibited the same hesitation or evasion. At one time during the examination she became very angry and excited, this mood continued until finally she developed violent tendencies. She remained in this state for about two days and then rather quickly became stuporous and non-responsive. When interviewed on several other occasions, she exhibited stereotypy, moving her right hand in circular motions, index finger extended, around her right ear. Throughout all the examinations she clicked her heels against the floor, and swung her legs in a repetitious movement.

Stream of Mental Activity:

The patient answered questions slowly when she did respond. Her answers were irrelevant and apparently colored by peculiar and fantastic ideas. She was evasive, very hesitant in response showed a tendency to counter every question by repeating same in an interrogatory manner. For instance, when asked how old she was, she responded by: "How old am I?"

Hallucinations and Delusions:

No frank delusions expressed, but she is said to have had the idea that her neighbors were working against her and interfering with her health and happiness. Judging from her actions at times one would conclude that auditor hallucinations were present. The patient constantly en-
deavored to shut out external stimuli, never requesting anything nor making her wishes known.

The sensorium showed no marked varience from the normal, that is, when contact could be established.

Physical examination revealed no gross evidences of pathology. The serological examination was normal in all fields.

This patient was given the sodium amytal treatment. Further discussion will be considered under recent advances in treatment.

There is that type of catatonic who makes a rather fair adjustment to his immediate surroundings provided he is allowed to carry out his own whims. The following case history concerns that type of patient.

Case No. 2214. Committed to the Norfolk State Hospital July, 1932.

Entrance Complaints:

For a period of the last year he has been very quiet. During the last two weeks his condition has become acute in that he refused to talk, was restless, and wandered about town. He sits or lies, looking into space, with his eyes partially closed. He is resistive when interfered with during his musings.

Onset of Present Illness:
For the past year his friends have thought his actions were peculiar at times. During these periods he was unresponsive, apt to remain silent for two or three days at a time, then he would suddenly "clear up" and appear normal. Two weeks ago his condition became acute. No contact could be made with him. He paid no attention to questions or commands. His actions and expression indicated that he was in deep thought. At times he would stand in one position for hours, looking up at the ceiling, with half closed eyes. On several occasions he wandered away from home and had to be returned by friends or relatives. He ate very little and would never ask for anything at the table. The patient continued in this non-responsive state until his entrance to the hospital.

Personal History:

Patient was born at A--, Nebraska, January 8th, 1903. Was of normal birth. Walked at one year, talked at two years. Had the usual childhood diseases. Adolescent development was said to have been normal. Began schooling at the age of five years, graduated from the eighth grade. Was an average student. Preferred boys as playmates, usually chumming with those older than himself. Home life was said to have been pleasant, with the exception that his father was an alcoholic and frequently caused considerable
amount of worry and anxiety on the part of his mother. Patient is said to have developed the "drinking habit" at home. He has worked at various occupations. Was a brake-man for two years, did common labor, and also engaged as a taxi-cab driver. He has changed jobs rather frequently. Commitment papers state that the patient is unmarried, and this is also brought out by the mother; but friends who knew the patient very well stated that he was married to a woman of very poor moral character. She died shortly after marriage as the result of a Gonorheal infection with peritonitis. Patient was said to have been promiscuous in his sexual life and contracted a leutic infection about four years ago. He was treated for this infection for a period of two years. Patient is a habitual user of alcoholic stimulants, excessively so during the past five years.

Family History:

None of the immediate members of the family, not the collaterals, have had any nervous diseases nor organic illnesses.

Mental Examination:

Mental examination could not be carried out, as the patient still continues to be absolutely unresponsive. Up until the day before this writing he had not uttered
a word. At this time he approached the attendant on the ward and asked for a cathartic. The patient has never been observed talking to any of the other patients. He is inclined to stand in one position until told to move. At times he will follow out commands to the letter, then at other times he simply ignores them. He will stare at the ceiling, occasionally smiling to himself, shaking his head. The only response to questions is a slow smile. He is very clean and tidy about his person. At no time has it been necessary to force feed him, although he is very slow in eating his meals. There are no mannerisms nor stereotypes of action:

Physical Examination:

Physical and neurological examination were essentially negative. Serological examination normal. Sodium amytal was given intravenously, but the patient made little response.

We had the opportunity of seeing this patient some eight months after his commitment and his condition remains about the same. He has made a rather good adjustment to the ward routine, assisting in the hydro-therapy department and in the diet kitchen. Since his commitment his younger brother has been committed. The brother is absolutely mute and very negativistic, also evi-
dences flexibilitas cerea and stereotypies of action.
The use of sodium amytal intravenously in the latter has produced gratifying results.

The previous histories present certain symptoms that are common to the catatonic group, but there are many patients who exhibit a more varied array of symptoms. It is our opinion that those patients who are less delusional and show fewer oddities of behavior offer a better prognosis; at least it has been our experience that they respond to treatment more readily than that group which are extremely delusional. Some authorities maintain that the patient evidencing hallucinations and delusions has deteriorated. If this be the case then there is little hope of helping such an individual to regain a normal station in life; but even so, this patient may be helped so that he will be less of a burden to those that are caring for him. In the past this type of patient was relegated to the most undesirable buildings of the entire institutional group, as secluded as possible from the critical eye of the public.

If these stuporous, non-cooperative patients are not to be neglected, they must be classified, as to the degree of deterioration, segregated, and assigned to an unflexible routine of duties and recreations. In many
of the more modern institutions a definite schedule has been devised for the catatonic patients. Other institutions have farms and gardens where a small group of patients, under the constant supervision of an attendant, carry on most of the work. This method not only helps to develop the physique of the patients, but tends to utilize the energy that would otherwise be spent in psychopathic conduct.

The value of occupational therapy for the mentally ill is very definite. Few institutions that care for this type of patient are without a department of occupational therapy, because experience has shown that many patients are improved mentally and stimulated to gain a new interest in life. We are reminded of one patient (catatonic) who had been taken to the occupational ward shortly after her entrance. She took no part in any of the work, merely looked on for a few hours. Some three weeks later after she had aroused from her stupor and mutism, she asked one of the attendants why it was that she had never been taken back to the occupational ward. She expressed the desire to go back again as the work being done there interested her. Those patients who prior to the development of their mental illness, came from pleasant surroundings, are stimulated by memory impulses;
while those who have had a rather drab existence in their everyday life, are stimulated by an inherent desire to affiliate themselves with work that is interesting.

The modern occupational therapy department should be under the supervision of an individual who has complete training in occupational therapy and some training in psychology and psychiatry. The assistants in this department should become familiar with the various mental states in order to accomplish the greatest good. (8).

To treat a case of catatonia, one need to have a sympathetic understanding of mental mechanisms, both normal and abnormal. The problem of treatment may very widely, not only among different patients, but also in the same case during different stages of the disease. One must endeavor to assist the patient in focusing his interest, his mental energy, upon the practical affairs of every day life and his environment. When the infantile and archaic mechanisms have once been thoroughly re-animated, and the patient has found happiness and contentment in his world of phantasy, satisfaction is no longer to be had in the world of reality with its struggle, failure and painful experiences. (31).

Occupational therapy is one of the most valuable methods of substituting objective reality for phantasy,
in as much as the patient often has no interest in any useful occupation.

The type of occupation best suited for the catatonic is that of a stimulative nature, and at the same time requiring a certain degree of concentration.

As has been stated before, little hope for recovery can be held for the catatonic schizophrenic who has suffered deterioration. However, recent advances in therapeutic measures have led us to believe that a more hopeful outlook may be had in regard to the catatonic who shows a clear sensorium with no deterioration. The difficulty in treating catatonia, as with any of the other functional psychoses, is due to our not knowing the etiology.

Since the latter part of the preceding century no less than forty drugs have been used in an attempt to alleviate or bring about an amelioration of symptoms in the psychotic patients. Most of these drugs have been used with the idea of producing a prolonged narcosis whereby the psychotic mechanisms would be broken up. Greisinger, (11), in 1882 described several complete cures and many partial recoveries from psychotic states following narcotization by means of opium and certain of its derivatives. Rigg and Mc Leod, (32)(27), in 1900 introduced
a "new departure" in the treatment of mental diseases by the use of massive doses of bromides. Moser (28), treated twenty-six schizophrenics by prolonged narcosis, but obtained no satisfactory results. It was his opinion that the patients benefited from this treatment only in that they procured prolonged periods of rest and relaxation.

Probably the most comprehensive study that has appeared in the literature is that contributed by Oberholzer(29), who treated ninety-two cases at the Zurich clinic between 1922 and 1925. He dealt with a wide variety of psychotic reaction in all states of regression. Out of fifteen catatonic patients, treated, three improved sufficient enough to warrant their discharge; three maintained in a state of improvement; three were temporarily improved for a period of one to fourteen days; five were unchanged. Somnifene, luminal and sodium luminal were the drugs employed in this series of cases. A number of the patients received more than one period of narcosis so that a total of 186 stuporous phases were induced. All medication was given intravenously. Somnifene (diethyl-dially-barbiturate of diethlamin) has been the drug employed with the greatest frequency by the European investigators.

Since the experimentation of Loevenhart, Lorenz and others (23)(25), with schizophrenic subjects, there has been an increasing interest in chemotherapy, and its application in
the various psychoses. At this time they were seeking to apply clinically the relation between oxygen fixation by the respiratory center and its functional activity. While working with respiratory stimulation they observed a transient change in the mental state of a catatonic patient. This patient had been mute and negativistic for about a year. After receiving an injecting of 102 cc. of 50th Normal sodium cyanide solution, the patient conversed, answered questions and reacted normally to sensory stimuli. Although this reaction was interesting, it was not further investigated until 1928, when Loevenhart, Lorenz and Waters (24), attempted psychic stimulation by using sodium cyanide. However, the results obtained were unsatisfactory because of the difficulty in gaging the exact dose of sodium cyanide to produce cerebral stimulation; not only the amount given but the time required to administer and also the unknown variable of the individual patient. Owing to this fact, another means was tried. Admixtures of carbon dioxide and oxygen seemed to be best adapted to this purpose.

The same type of inhalant apparatus used by anesthetists for general anesthesia, by means of which the concentration of the gaseous mixture could be controlled, was employed by Loevenhart. They suggested that beginning inhalations of the gaseous mixture should range between 10 to 15 per cent carbon dioxide and 85 to 90 per cent oxygen. After this mixture was
breathed for one minute the carbon-dioxide was increased at the rate of 5 per cent per minute until a concentration of 35 to 40 per cent was being given. The rate of increase and the final concentration was governed in accordance with the reaction of the patient.

The response after 3 to 10 minutes inhalation of carbon-dioxide and oxygen usually began with a gradual relaxation and some spontaneous movement of the extremities. Complete flaccidity of the extremities soon followed unless there were contractures. During this time the pallor, which most patients exhibited, passed off and there was a flushing of the face and hands. The skin as a rule became moist. The eyes, usually held in a fixed stare, began to move and the lids were raised. The ocular movements were purposeful; that is, directed as if in an effort to visualize surroundings. The expression of the face changed, there being movement of the facial muscles which destroyed the "mask like" expression. From this stage, in most cases, it was possible to carry on an intelligent conversation. Many varied reactions were shown as well as thought content after the patient had been "aroused." One patient who had been mute and negativistic for more than six years carried on conversation for thirty minutes. It was interesting to note his thought content, gathered from his chief complaint concerning his situation at that time. He stated that he regretted
more than anything his inability to carry on with his trade as an automobile mechanic. Thus we again see the importance of occupational therapy.

After a period of two to thirty minutes the effects of the cerebral stimulation began to wane, provided no more gaseous mixture was given. Gradually the patient's attention could no longer be held; he ceased to respond to questions; muscular tensions reoccurred and in a short time he had returned to his former stuporous condition. Some patients in this series, during the period of stimulated mental function, expressed many bizarre delusions, senseless talk and sensorium defects.

Loevenhart regarded the mechanism of the stimulation as being a true stimulation of parts of the cortex and not due to the removal or paralysis of an inhibitory mechanism. He gives two reasons for regarding it as such.

First, it would be more difficult to explain how this simple chemical procedure produced a paralysis of an inhibitory mechanism. No evidence of such an inhibitory mechanism has been produced.

Second, in assuming a true stimulation, they bring the cerebral cortex in a line with responses of the medulla, in which case it is known that the centers are directly stimulated by the same substances as are used to produce the cerebral reaction. Thus, they assume by analogy, that the mechanism of stimulation
is the same in the two cases.

Previous work by Loevenhart has brought forth considerable evidence that decreased oxygen absorption by the cells of the medullary center per se causes stimulation, provided that the decreased oxygen fixation is of the proper grade, and that it is produced with sufficient suddenness. It is the belief that oxygen-want is not responsible for the reaction in these cases, because the cerebral reaction can be produced by sodium cyanide, in which case there is an abundance of oxygen present. However, oxygen-want is one method of producing reduced oxygen fixation, and thus bring about the reaction. They have concluded that a given type of cell, each of which is characterized by a state of functional activity, has a variable level of oxygen fixation, thus:

1. Increase of oxygen fixation: Depression.
3. Decreased oxygen fixation: Increased psychic activity.
4. Further decreased oxygen fixation: Stimulation, principally of the motor cortex often with manic-like stimulation of psychotic activity.
5. Greater Decreased oxygen fixation: Depression, anesthesia, paralysis (reversible).

From the practical aspect the psychic stimulation may be produced in either of two ways:

First, by stopping the administration of carbon-dioxide when the stage of psychic stimulation is reached (level 3); secondly, by continuing until the stage of motor stimulation
(level 4) is reached; or even to depression (level 5), and after removing the inhalator, reach the stage of psychic stimulation as the oxygen fixation increases toward the normal.

In the first method the gases should be given slowly so as not to pass the desired level; while in the second, the purpose is to go beyond the desired level arriving at the stage on the return toward the normal as the carbon-dioxide is excreted.

Loevenhart made no claims for this method of psychic stimulation of catatonics other than it is a procedure which causes profound changes in an existing mental state and permits accessibility at will and offers a means of investigation that has been lacking heretofore.

Lasche (21), administered carbon-dioxide and oxygen to a group of catatonic schizophrenic, following the technique outlined by Loevenhart, with the exception that a higher percentage of carbon-dioxide concentration was used. The following description concerns the reactions of a patient in this series.

Case 1. Male, age 32; diagnosis, catatonic dementia praecox. This patient had been mute since admission. He showed typical flexibilitas cerea, and was tube and spoon fed. When examined before beginning the inhalation, the patient was rigid in bed; a pulse of 90 respiratory rate of 20 and blood pressure of 110. The gas admixture, in proportions of 30 per cent carbon-dioxide and 70 per cent oxygen, was administered at
2:46 P.M., with the blood pressure at 152, a pulse of 100 and respiratory rate of 26, the patient looked around with a bewildered but alert expression; the rigidity had disappeared and the muscles were relaxed. He smiled cheerfully and intelligently. Questioned at 2:47 P.M. when the pulse was 96, the patient showed himself oriented for persons and place, correctly gave the date and place of his birth, and stated that he had come to the hospital at Palo Alto from the Army Hospital at Fort Letterman. He was asked if he had been afraid to talk, he replied: "Just can't seem to ---- just can't make myself." He stated that he had no fears, had heard no voices, and felt good.

At 2:55 P.M., eight minutes after questioning began, and 10 minutes after discontinuance of the gas the pulse rate being 90 and blood pressure 120, catatonia and contrary responsiveness returned. The patient seemed to fight against this, and when he relaxed he smiled broadly, as if soliciting sympathy. But replies to further questions were not so coherent, and within another minute typical catatonic rigidity and his usual condition had wholly returned.

The mechanism of carbon-dioxide stimulation of cortical cells is still an unresolved question, but Lasche offers the following possible theories:

1. Carbon-dioxide depresses the oxygen dissociation curve, making the oxygen in the blood more readily available for tissues.
2. The cells use more oxygen in the presence of carbon-dioxide.

3. The cortical cells in catatonia may be depressed by a relative asphyxia.

4. Carbon-dioxide temporarily facilitates the restoration of functional oxidation in cortical cells (resting process), leading to anesthesia, so that when it is withdrawn and relative asphyxia returns there is temporary stimulation of these cells due to oxygen-want (active process), which returns presently to the characteristic depression (secondary effect of oxygen-want), of catatonia.

It has been the experience of Solomon (34), that patients with long-standing catatonic symptoms show less response to the carbon-dioxide and oxygen than do those in the more acute attacks. Likewise, it is his impression that those patients with definitely psychological retractions from the environment do not react at all satisfactorily to this method. The experimental work of other authorities does not bear out this statement, as we have shown.

It is his contention that by changing the mental activity and conduct of the catatonic patients, he may rightly form the hypothesis that it has been done upon a physiological level and that there has been a change in the physiology of the brain. He further assumes that the abnormal conduct of the patient is
due to some interference with the normal physiology of the brain.

In the stuporous patients there is a reduced activity of the cerebral neurones, assuming that this possibly is dependent upon an interference with the normal metabolic activity of the cell, either in an anabolic or catabolic phase. When carbon-dioxide is inhaled there is possibly a further lessening of this metabolic activity resulting in the lessened activity of the neurones and in the clinical manifestations of a loss of consciousness. With the cessation of the administration of carbon-dioxide the processes referred to are relieved from interference, with the result that they seek the point of equilibrium maintained previous to carbon-dioxide inhalation. In so doing they are necessarily speeded up and may over-step the previous point of equilibrium; that is, approximately, a more normal degree of metabolic activity with a consequent more normal degree of nervous activity shown by normal contact with their environment.

Longenstrass (20), followed a different course in the treatment of a small group of catatonic patients with rather good results. The treatment consisted of a course of pyretotherapy, raising the temperature, on alternate days, to 104° F. or slightly more, by the intravenous injection of typhoid vaccine. Fifteen injections were given, beginning with 1 cc. of the vaccine and doubling the dose at each subsequent injection if satisfactory reactions were produced. Following this, the inhalation
of carbon-dioxide and oxygen was given, beginning with 5 per cent carbon-dioxide and 95 per cent oxygen and increasing the former by 5 per cent while decreasing the latter the same amount every 2 minutes, until the carbon-dioxide reached 25 per cent, at which point it was continued for thirty minutes. During the inhalation, psychotherapy was constantly applied, in the form of reassuring helpful suggestions, and when the patient became aroused, this treatment was continued and combined with a course of psychic re-education.

We are of the opinion that the value of this particular type of therapy lies in the utilization of that period of psychic normalacy following the stimulation. If a contact can once be made with the patient when he is in this stage, a greater insight will be gained as to the possible extent of mental deterioration, the episodes in his life which have caused psychic trauma and his attitude towards his situation. Such a rapport having once been established, every effort should be made to carry on psychotherapy that has been adapted to that particular patient.

The use of carbon-dioxide stimulation in the catatonic patient, producing the results that it did, lead the attention of psychiatrists to the possibility of employing some other agent, which would bring about a similar psychic stimulation. Although many drugs had been used to produce narcosis in psy-
chotic patients, none had been found that would bring about a psychic stimulation.

It was in 1930 that Bleckwenn (2), while working with some barbituric acid derivatives in an effort to produce deep narcosis in various conditions of excitement, found that the sodium salt of iso-anyl-ethyl barbituric acid (sodium amyntal), was very effective in bringing about the desired state. Because of the complete muscular relaxation and the rapid development of deep narcosis, he became interested in seeing what effect such a powerful and rapidly acting narcotic might have upon the catatonic patient.

The chemical constitution and pharmacological properties of sodium amyntal had been rather thoroughly considered prior to this time by various authorities. In general consideration we may say that most of these authorities agree that the drug exerts essentially the same type of action whether administered orally, rectally, intramuscularly, or intravenously, however, there are those that do not agree with this statement. Lorenz (25), has concluded that the administration of the drug intravenously gives a better reaction in the catatonic patients. In the normal individual the drug, when given intravenously has its onset of action within 3 to 5 minutes. Physical and mental quietude supervene and drowsiness, indicated by drooping of the eyelids, yawning, slurring of speech, and sluggish response to
questions and other stimuli, comes on after the administration of 3 to 9 grains. Drowsiness increases and the patient usually falls asleep within five minutes after the injection is started. The pupils are usually slightly constricted or normal in size. The gag reflex is practically never absent in an adult individual, unless too large a dose has been given. Subsequently, the patients remain drowsy and sleep at intervals, but their cooperation in taking food and fluids is readily obtained.

The respirations, following the loss of consciousness, are usually decreased in amplitude, are regular, and are more apt to be slightly increased in rate, though frequently they remain normal. There is little change in the color of the skin, although occasionally a slight degree of cyanosis is present. In a few patients blanching of the skin occurs. Usually, however, the color remains unchanged.

The pulse rate during and shortly after completion of the intravenous injection varies somewhat. Usually the rate is increased; it is very seldom decreased and often is unchanged from normal. With few exceptions there is a transient fall in blood pressure during the intravenous injection. Marked decreases in blood pressure have been observed in patients with hypertension, generalized arteriosclerosis, and those who have unstable cardiovascular systems.
Unlike barbital and phenobarbital, sodium amytal is not excreted as such in the urine even when comparatively large doses have been administered experimentally (34). From experiments conducted by Kopanyi and Lieberson (18), it appears that 40 to 50 per cent of the fatal dose is destroyed or eliminated in twenty-four hours.

Emge and Hoffman (7), have shown that following the administration of sodium amytal the urinary output is to some extent actually and relatively decreased. It is the conclusion of Bourne and his associates (4), that the drug has little or no effect upon the liver. They observed a restriction in urinary output and a reduction in the quantities of urea and chlorine excreted but stated that active kidney function was implied by a percentage increase in these substances. They concluded that little or no damage of the kidneys occur.

It is well to bear in mind that there are certain precautions and contra-indications in administering sodium amytal. Those patients with hypertension, hypotension, generalized arteriosclerosis or edema, elderly persons, and those who have become weak and emaciated from chronic illnesses are poor subjects. In the presence of certain pulmonary affections, such as bronchiectasis and lung abscess that are associated with copious expectoration it is better to use small amounts of the drug so as to prevent a total loss of consciousness and possi-
ble interference with the cough reflex. Further than this there is little danger in continuing the use of the drug over relatively long periods of time.

Zerfas (37), concluded that the twenty-five milligrams per kilogram of weight (up to a total amount of twenty-five grains) was the maximum dose to be given intravenously.

Bleckwenn (2), found that from seven to fifteen grains was sufficient to produce a response from most catatonic patients. He treated the patients over a series of days ranging from eight to ten days. Subsequent doses were gaged by the previous reaction of the patient. He established a rule for the initial dose in all cases, it being based on the loss of the corneal reflex. Three grains more were given than was necessary to produce corneal anesthesia; this procedure was found to work satisfactorily.

In Bleckwenn's series of cases, regardless of the degree of psychic abnormality, they became drowsy after 3 cc., or $4\frac{1}{2}$ grains had been injected. After from $7\frac{1}{2}$ to 10 grains had been administered, the patients usually were in a profound sleep. The deep and superficial reflexes disappeared, the pupils dilated, and the corneal reflex was abolished. At this time, the respiratory excursions became shallow, and the rate was slightly increased. This continued for about three or four minutes. There was no pallor, cyanosis, or collapse.

The blood pressure changed from the time of administration.
The corneal reflex usually reappeared after from twenty to forty minutes, and the deep reflexes followed. After about an hour, the patient responded to painful stimuli, but with a marked delay in the reaction time. The profound sleep lasted from two to eight hours and seemed in a measure to be determined by the type of cases rather than by the size of the dose. This period was usually followed by several hours of normal sleep without any more drug. It is Bleckwenn's belief that this period of normal sleep is the most desirable effect obtained. He does not offer any suggestions as to the use of psychotherapy in that period when the patient responds to external stimuli. Although he admits that all of the patients in this series came out of the initial period of sleep, calm and collected, and were emotionally stable.

We are inclined to agree with Lindermann (22), who found that the smaller doses of sodium amytal, ranging from 1½ to 5 grains, produced results apparently as worthwhile as those brought about by the prolonged narcosis. This is shown by the fact that the patients aroused from their mutism and carried on normally for a period ranging from two to fourteen hours.

In a group of sixteen catatonic patients treated at the Norfolk State Hospital, we found the smaller doses to be just as effective as the larger dose continued over a period of five to six days. The total amount given at one time never exceeded
four grains dissolved in 10 cc. of triple distilled water. This was given at the rate of one cubic centimeter per minute. With the exception of three patients all showed psychic stimulation within a period of five to ten minutes. The duration of normal reaction varied with each individual patient. The average time for the entire group was three and a half hours. The duration of the illness in all of these patients was under one year.

It was our policy to apply psychotherapy with each patient, as soon as the psychic reactions seemed normal. Questions pertaining to the patients' past life were asked and helpful suggestions were made. Each succeeding time that a patient was aroused he was presented with a new group of questions and at times some problem that would require concentration of his mental facilities. If after a course of three to four treatments, the patient showed progress towards improvement, as indicated by an increasing interest in what was being done for him, he was assigned to some light task. It is essential to adapt the occupational therapy to the individual patient. We found that each patient that responded at all had some particular preference as to the type of work that he or she did. The value of this treatment lies in the fact that the peculiarities of the catatonic are prevented from becoming fixed and also gives the patient the chance and the motive for a new and better adaptation. The patient is made to depend upon his immediate envi-
ronment and bring him at once into contact with others.

Palmer and his associates (30), are of the opinion that the deep narcosis as produced by sodium amytal is the only method that will produce worthwhile results. But a comparison of their results obtained by the prolonged deep narcosis and those of Lindermann (22), will show that the actual time of normal psychic function does not vary a great deal. And after all, it is during this period that the patient can be helped. It appears, therefore, that each method produces practically the same end results.

It is interesting to note the results obtained by Lang and Paterson (19), in their treatment of a series of catatonic patients. Their method was to administer sodium amytal orally. The usual dose was 0.4 grams in twenty-four hours. The cases were tested for a period of five days. Forty-eight hours were allowed to elapse in order to insure complete elimination. The duration of illness extended over a much longer time than in any of the cases treated by Bleckwenn (2), Lindermann (22), or our own. Their results are tabulated as follows:

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Duration</th>
<th>Behavior</th>
<th>After Na Amytal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>M.</td>
<td>36</td>
<td>6 yrs.</td>
<td>Excited</td>
<td>Sedation.</td>
</tr>
<tr>
<td>3.</td>
<td>M.</td>
<td>22</td>
<td>2 mos.</td>
<td>Mute</td>
<td>Stimulated</td>
</tr>
</tbody>
</table>
Although this is probably too small a group of cases to draw any conclusions from, it at least suggests that one considers the oral use of sodium amytal in producing psychic stimulation. Its action is slower when given by this route and there is less danger of producing shock than when given intravenously.

So far we have seen that the use of sodium amytal, whether given orally or intravenously, has produced reaction on the part of the catatonic patient which are favorable in that they allow a contact to be established which has heretofore been impossible. If, by means of this contact, a further psychological and physiological investigation into the genesis of catatonia can be carried on, then the treatment is well justified.

Just what effect the use of sodium amytal will have on the prognosis of catatonia, is at the present time, not determinable. It is not a specific therapeutic measure, therefore, like most non-specific therapy it is open to a good deal of criticism, and probably justly so. However, we believe that its use in this particular type of mental disorder should be tried as a means to an end.

In our series of sixteen cases, five were improved sufficiently following two months treatment to be paroled. All of these patients responded readily to psychotherapy. Prior to the use of the sodium amytal no psychic contact could be made with them. Perhaps they would have progressed just as well without having
undergone this treatment. There is no way of determining the outcome on a scientific basis, because so far the etiology of catatonia has not been determined. It has been considered a functional disease, but some of the information obtained as a result of the experimentation with carbon-dioxide has given rise to the thought that possibly there is some cellular alteration either of a chemical or structural nature.

In the final analysis the treatment of catatonia resolves itself into three definite approaches:

First, essential physical and medical care in order to build up the general health of the patient.

Second, the administration of carbon-dioxide and oxygen or sodium amytal in sufficient quantity to produce a normal psychic reaction.

Third, the introduction of psychotherapy during the interval of normal response to external stimuli and the rehabilitation through the aid of occupational therapy.

We are of the opinion that every catatonic patient is worthy of this therapy, even though a "cure" does not result, there exists the possibility of compensating the individual so that he can carry on to a better advantage in a more restricted environment.
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