

## RELATIONSHIPS BETWEEN EMOTIONAL STATES AND ORGANIC DISEASE.

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Every physician recognizes the existence of symptoms produced by emotional strain. The significance of these symptoms, however, is very differently interpreted by psychiatrist, internist and physiologist.

To the psychiatrist, functional symptoms represent an escape mechanism through which the patient finds justification for past failure or reason for withdrawal from future situations which hold for him an element of danger. For the psychiatrist the little boy's stomach-ache in the early school-morning represents a mechanism, unconsciously produced, which if successful eliminates the necessity of school for that day. Its purpose accomplished, the symptom disappears. From this point of view every emotionally produced symptom is an excuse. Although for secondary reasons the type of symptom presented would interest the psychiatrist, his essential emphasis would be laid on the possible advantage to the patient resulting from the symptom.

Until recently the physician has in his turn overemphasized the "organic" one might say the "anatomic" aspect of the picture. He has divided his cases into compartments according to the organ chiefly affected, labeling some "nervous stomach," others "nervous heart," etc. Although he has taken some interest in the physiology, and has studied his cases by X-ray, gastric analysis or electrocardiogram, gross defects disproven, his interest has often waned both in the organ under investigation, and, too often, in the patient himself. "There is nothing wrong," he has said; "go away and forget it" (parenthetically he has added "in any case, *go away!*").

For the past twenty years a few physiologists have been asking themselves whether anything happens to the organs of the body in the presence of emotional tension and have brought evidence to prove

that under emotional stress a change in organic function does take place.

I will refer very briefly to a few observations by Pavlov and Cannon and their collaborators, which prove that there exists a direct relationship between emotional states and the function of bodily organs.

Pavlov prepared dogs in such a way that the parotid secretion could be collected and measured. When such a dog was shown food, the parotid began to secrete, and the rate of secretion could be quantitatively determined. He then developed in these dogs what he called a conditional reflex. That is, on every occasion that food was presented to the dog, he rang a bell. After a certain number of repetitions of this maneuver, it was found that the dog secreted saliva whenever the bell was rung even though no food was shown. The response finally became invariable and could be elicited even after weeks of disuse. The mere ringing of the bell would cause a flow of saliva and this flow would take place always at a constant rate.

In 1924 there was a great flood in Petrograd, and the dogs were rescued from the laboratory with difficulty. Ten days later when these dogs were tested for their conditioned reflex, it was found to have completely disappeared. Before the flood they had invariably responded to the stimulus by the secretion of saliva; after the flood the reflex had ceased. Pavlov found that if an experimenter with whom the dogs were familiar stayed in the room with them, the conditioned reflex would to a limited extent return; the sound of a stream of running water outside, however, immediately inhibited the reflex.<sup>1</sup>

We have here evidence that an organ which responds under normal conditions to a certain stimulus, may be through fear entirely inhibited. Pavlov was able to show by another experiment that not only fear, but other emotional strains may act as inhibitory stimuli.

A certain tone was made a conditioned food stimulus by its repeated simultaneous application with food. The dog would now always respond to this tone by the secretion of saliva. At first other tones differing not greatly from the original would also call forth parotid secretion; but by repeatedly showing food while the original tone was sounded, and never accompanying the slightly different tone

with food, the dog could be trained so that there would always be a response to the original tone (1000 vibrations per second) and never any response to the second tone (1012 vibrations per second). It was found, however, that this second tone produced not only *no* response, but had an actual inhibitory effect. In the experiment with the dog Dogonyai<sup>2</sup> when the positive tone (1000 vibrations) was sounded the parotid secreted 4 drops of saliva per half minute. This response was repeated and invariable. Then the negative tone (1012 variations) was sounded. There was no response. Five minutes later the negative tone was repeated; again no response. Ten minutes later when the positive tone was again sounded only one drop of saliva per half minute was secreted, and 19 minutes later only 3 drops.

When a tone quite different from the positive conditioning tone was used as a control—no inhibition was observed. For example, in another experiment at 1:20 the positive tone resulted in 5 drops per half minute. A negative tone (differing by two whole tones from the original) at 1:40 gave no response; again at 1:44, no response; but at 1:54 the positive tone gave the normal response of 4 drops per half minute, and again a normal response at 2:10.

Pavlov says “thus we see that a fine differentiation (the negative differing by one eighth note) caused an intense inhibition, but a coarse differentiation (the negative tone differing by two notes) did not evoke any marked inhibitory effect.”

The first experiment (performed immediately after the flood in Petrograd) demonstrates that during states of anxiety a stimulus which before caused a positive reaction (flow of saliva) ceases to be effective. The second (the experiment of the two almost identical musical tones) shows that such a state of inhibition may be induced not alone by danger, but by a situation of strain; in this case the result of the very great difficulty in differentiation. It is not necessary to emphasize the “organic” *i.e.* physiological change that has been produced. In the one case the parotid secretes; in the other there is no secretion.

As you all know, Cannon and his collaborators have shown other changes in bodily function to be the result of emotional states. Changes in gastric motility and secretion, in blood sugar, in adrenalin content of the blood, in blood pressure and other functions have been shown to follow or accompany states of fear, anger, etc.<sup>9</sup> Many of

these changes are apparently associated with an overstimulation of the sympathetic portion of the autonomic nervous system. May even more fundamental or more permanent changes, such as those which we physicians are accustomed to label "organic," also be the result of emotional states, acute or chronic? Cannon himself raises this question and quotes a number of cases of hyperthyroidism, reported by Maranon, which apparently followed immediately upon acute emotional episodes. Cannon feels it is quite possible that certain organic diseases may be the result of immediately preceding acute emotional trauma.

Draper,<sup>4</sup> in an interesting paper, reports a number of cases of gastric and duodenal ulcer in individuals evidently suffering from chronic states of emotional tension, and believes that in several instances not only did the patients show clinical improvement (without change of diet) following relief of the emotional stress, but in certain cases showed X-ray evidence of healing of the ulcer. He cited three cases of chronic ulcer, in which gastric hemorrhage occurred within a few hours following acute emotional storms; and Chester M. Jones<sup>5</sup> has seen a number of hemorrhages following acute emotional episodes in cases of chronic peptic ulcer.

The following two cases are illustrations of an apparently related mechanism.

During the fall of 1929 there was under my care a stockbroker 49 years old (Case 1824) who had had for 20 years symptoms of duodenal ulcer. The diagnosis was confirmed by X-ray. When first seen he was having typical hunger pains relieved by food or soda. Physical examination was negative—Wassermann negative. On frequent feedings the pain was only partially controlled and in September, 1929, he was hospitalized. With rest and control of nocturnal gastric acidity, he became symptom-free. On the afternoon of October 29th he was in bed symptomless. He was brought the evening newspaper. As he read the headlines describing the stock market panic, his ulcer pain suddenly reappeared, and was present when I visited him two hours later. The pain was so characteristic and appeared after so long a period of well being that some causal relationship between ulcer symptoms and emotional tension seemed evident. On further questioning, the patient stated that on several occasions after an evening of family tension, his nocturnal pain had been more severe.

This patient has had both psychiatric and physical treatment and for two years has been symptom-free.

A similar case (Case 2278) was first seen last fall. This was a man of 39, single. A diagnosis of duodenal ulcer had been made by another physician and confirmed by X-ray. The patient stated that the ulcer usually troubled him during the winter when his schedule became heavy; and also when he was under emotional strain. He complained of phobias, of feelings of panic and of feelings of guilt.

In brief his story was this: brought up by a domineering aunt, he had been early discouraged, and as a reaction to this discouragement had developed an exaggerated ambition with its accompanying fear of failure. He had become a perfectionist, and took his responsibilities and mistakes over seriously. He believed he wanted to marry, but in spite of numerous abortive attempts to make a real friendship with a woman, he had never "found the right girl." It was evident that marriage was one of the many things he feared, and he was unconsciously steering a course which would lead away from rather than towards marriage. His first attack of epigastric pain came on six years before, during a period of hurry and strain connected with a business trip. He would have pain for two hours after meals during periods of acute strain. But he told me that his ulcer symptoms had no close relation to food; that at certain times he could go for eight hours without food and experience no pain. If, however, he felt pressed by more work than he thought he could accomplish, or when annoyed by some even trivial occurrence, he might feel the ulcer pain within 60 seconds. The mere thought that he might not get his work done was sufficient to bring on gastric symptoms. During a period of real mental depression under my observation no ulcer symptoms occurred.

This man has been under observation seven months. He has much greater insight into his difficulties, and consequently far less sense of emotional strain. Although his diet has not been modified, at the present time if he gets enough exercise and keeps his work up to date he is symptom free.

Cases such as these show that there can be a definite relationship between states of mind and ulcer pain. If freedom from symptoms denotes healing, or, if the converse at least be true, that the presence of symptoms denotes activity of an existing ulcer, then all

factors which tend to cause symptoms are detrimental and their elimination must be included in any plan of successful treatment. Just as in certain cases of angina where moderate exercise may well be tolerated, while emotional irritability may bring on an attack, so in some cases of peptic ulcer emotional tension may apparently be more harmful than neglect of dietary restrictions.

Possibly neither the psychiatrist on the one hand nor the clinician on the other has sufficient appreciation of the real changes in the function of organs that accompany emotional stress, and stress sometimes of apparently very minor degree. The amount of conscious anxiety in fact may be no indication of the degree to which bodily function may be disturbed. Whether peptic ulcer or other so-called "diseases" such as angina, epilepsy, migraine, Raynaud's or Graves disease may be actually caused by the changes in physiology brought about through emotional states, I do not know. I do believe, however, that in neglecting the emotional aspect in the treatment of many organic conditions, the clinician is overlooking an important, even a fundamental method of therapeutics.

#### REFERENCES.

1. PAVLOV, I. P.: Lectures on Conditioned Reflex, p. 363.
2. *Ibid.*, pp. 174-175.
3. CANNON, W. B.: Bodily Changes in Pain, Hunger, Fear and Rage. New York and London, 1929.
4. DRAPER, G., and TOURAINE, G. A.: *Arc. Int. Med.*, 49:4 (April 1932), 616.
5. Personal communication.

#### DISCUSSION.

DR. JAMES E. PAULLIN: Dr. Fremont-Smith has brought to our attention an extremely interesting group of individuals, and he has called to mind the aphorism of George Draper that it is not only necessary to know what kind of disease a man has, but to know what kind of demand the disease has got. The latter factor so many of us fail properly to evaluate.

There are so many determining factors in the progress of symptoms and disease that it behooves us, as physicians, to take into consideration first and foremost the type of fiber of which a given individual is made. They are like in many respects, to use an illustration that has been used before by Dr. McLester, an automobile tire. Many tires are made perfectly and can run under stress and strain over all kinds of roads thousands of miles, whereas a tire which looks similar to the perfect tire may blow out and give way under the stress and strain of existence in a very short race.

The constitutional side of an individual is of the greatest importance, and in a measure that can be determined by his reaction to various emotions. When we realize that practically all individuals have some abnormal reaction, either to the ego or to the sex instinct or to the herd complex, it is not difficult to understand how with various types of emotional stress and strain their manifestations of abnormal function can easily make their appearance.

As has been cited by Dr. Fremont-Smith, incidents of that kind at the present time are increasing with the greatest frequency.

As to just what part emotional strain plays in the development of organic disease, it is an extremely difficult thing to evaluate. Yet undoubtedly there are instances, as have been cited by the speaker, of individuals who under excessive emotional strain in short spaces of time have developed exophthalmic goiter, and there have been several instances under my own care of the rather sudden and acute onset of diabetes.

One would like to be able to pass these instances by as a coincident manifestation, yet in persons who are perfectly healthy this sudden disturbance of emotional life to the existence of organic, nutritional and metabolic disease must make one think that they play some part in their etiology. (Applause.)

DR. JOHN B. HAWES: Gentlemen, perhaps to me the most important remark I have heard made this morning was by Dr. Bortree when he said that none of us here is treating disease alone, but he is treating human beings who have disease.

This subject brought up by Dr. Fremont-Smith, and so well discussed by Dr. Paullin, is to me one of the most neglected factors in the whole sphere of medicine, as well as one of the most fascinating subjects, bringing one probably closer to human nature than almost any other subject of medicine. It is one which we have to constantly remind ourselves of.

In athletics particularly I think that you see some striking examples of the effects of emotional stress and strain. I am thinking of a boy of 21 who is rather a fast sprinter. He weighs 145 pounds. If you knew anything about track meets, you would know that the 100-yard dash, which takes about 10 seconds, comes first, and the 220, which takes about 22 seconds, comes last. I have seen that boy on a day which was not hot, lose six pounds after he had run the hundred, waiting until the end of the track meet two or three hours and then running the 220, and nobody can make me believe that 33 seconds of exercise were responsible for six pounds loss of weight in a boy who weighed 145 pounds.

Another man, a classmate in college, was on the varsity crew. He weighed perhaps 150 or 156 pounds roughly. The race was at New London and the varsity race was scheduled for ten o'clock. Owing to weather conditions he sat around until six for the race to be run. During those hours this man lost ten pounds.

That goes somewhere, and it was not exercise that did it. It was emotional strain. The question was asked me by Dr. Houston before this meeting was

started, "Do you believe that nervousness or other things can account for high temperatures of 99, 99.1 in your tuberculosis cases?" I didn't have a chance to answer it before we were summoned in here, but I feel that those of us who are dealing in tuberculosis must meet with that question frequently, the question of hemorrhages, the question of unexplainable rises or losses of weight, and of temperatures and pulses due to that unknown, most elusive factor, emotional stress and strain.

DR. PAUL H. RINGER: Dr. Fremont-Smith's very interesting presentation reminded me of an occurrence in Asheville. There was a nurse there who conducted a sanatorium and who had an exceedingly violent temper. If she chanced to start off in a tirade against anybody she could be heard for two or three miles. She kept that up for a while, and then instead of these violent tirades she became absolutely aphonic one day when she got upset. This became so marked and happened with such regularity that after the lapse of a few years she learned to control her temper in order that she would not become aphonic. (Laughter.)

DR. JOSEPH S. PRATT: Dr. Fremont-Smith has certainly presented a most important subject, and one that is very much neglected, in an admirable manner. He has treated the difficulties in a clear way.

Professor Wagner a great many years ago—fifty years ago it must have been—was one of the first to make the statement to which Dr. Hawes has just alluded, that we should remember that we are not treating disease but sick people. More recently Professor Graham, my old master, has written on this subject in an admirable fashion, and he brings out clearly that whenever we treat a patient, treat the disease as we say, what we are doing is we are studying the reactions of a personality to some irritant, which may be a micro-organism, a toxin, or it may even be an emotional disturbance. That is really the way, of course, in which we should study every case of disease, whether it is a systemic disturbance or an emotional disturbance, or whether we are dealing with actual organic disease.

One other thought: There are, it seems, the two different types of reaction, and I would like to ask Dr. Fremont-Smith if in his reading and study he found an answer to this question which I will put to him in a second: We can react to any emotional stimulus, a pleasant stimulus, in two different ways; there may be an increased response or excitation, or a diminished response or inhibition.

Ross, the English clinician, who has written a book called "The Common Neuroses," recognizes this, and he defines these responses as hysteric and as neuresthenic. Neuresthenic is when there is hyperactivity as a result of an emotional stimulus; hysteric is when there is an inhibition of some function.

A. Pavloff has done the same thing. He speaks of his neuresthenic dogs and his hysterical dogs. The neuresthenic dog has an increased secretion to the stimulus conditioned reflex, the hysterical dog has an inhibition.

The question is this: After this severe emotional shock caused by the

flood, when the dogs that had previously given a normal response and later, as I understand it, had a complete inhibition, did Pavloff consider that as a type of hysterical action or did he consider that came under neither of those groups but was an independent physiological process?

DR. GARVIN: I would like to have just a few clues on the treatment of the hyperactive sympathetic.

DR. CHARLES D. ALTON: Perhaps I may be indulged in a few remarks here on this question of emotion and its effects in conditions requiring treatment of pathological conditions. Of course for many years I have not been attending to clinical observation, but I am viewing this matter from the standpoint of the medical examiner, the medical man at the home office.

I find that throughout the country—of course there are only a certain number of doctors who come under my observation—the doctors in the large cities have to deal with blood pressure considerably, and there is a tendency there to discount these high blood pressures as being due to emotion when in fact the high blood pressure rises with the emotion. Now what is the relation between emotion and high blood pressure? We have there a manifestation of a pathological condition with only an emotion.

I recall one case in Richmond, Virginia. Returning from Florida I stopped off to see a medical man who is a man of high standing in Richmond, and he had reported to us on a woman forty years of age with a normal blood pressure of 132, I think, when we had information that in that case there had been findings of high blood pressure on several occasions. I questioned him about the case because he had made no report of these occasional high blood pressures. Whether he knew of them or not I do not know, but they were not revealed at the time of the examination. We called on another physician to examine that case. That physician examined the case in the afternoon and found 168, and on another occasion even 184 systolic. There was no disease in that woman that was discoverable at all by ordinary examination.

Now I brought up the question to that doctor in Richmond: "If this woman at 40 has emotional high blood pressure, will she at 60 have pathological blood pressure?"

DR. PINCOFFS: I would like to say this: that we have all assured each other that we should be interested in our patients, and I am not going to add to the lengthiness of the discussion to prove that the group as a whole are very much interested in this aspect of medicine, and that perhaps we don't fail because of any lack of interest in the importance of that side of our problem, but because after we have realized as far as we can the double aspect of the genesis of symptoms in the organic and in the emotional sphere, we don't know what to do about it.

The psychiatrists have an elaborate technique for discovering the mechanism of these mental states, and we physicians have tried any number of physical and drug methods of therapy, and I contend and I hope the future will look back on us as both groping around for something that is far from obvious today.

I think the results of both the psychiatrists and internists, and those mid-line people who are both psychiatrists and internists, are notoriously unsatisfactory with this group of cases.

DR. ALVAH H. GORDON: I don't know when I have listened to such an interesting paper as that presented by Dr. Fremont-Smith. It sounds a note with which we are all more than familiar.

I think, when we consider this matter carefully which Dr. Fremont-Smith has so very ably brought before us, we must never get away from the idea that even people who are susceptible to severe emotional strains may also be susceptible to, and perhaps are the possessors of, actual coronary disease. Two examples of this come immediately to my mind: One is a woman who had for years been subject to emotional strain and was of a neurotic or a neuropathic constitution. She complained bitterly for a long time of difficulty and frequency in urination. The ordinary methods of examination were carried out without result, and finally it was proposed to her that her abdomen be opened with the idea on the part of the physician and surgeon that this would show her and prove to her that there was not any organic disease. The abdomen was opened and that woman was found to have a chronic tuberculous peritonitis with marked adhesions to the bladder.

One other girl, who was suspected of having tuberculosis and who ran a temperature of 99, 99.1, developed a marked degree of what we call nervous symptoms which were put down after long and tedious examinations to the reasons of which Dr. Fremont-Smith has spoken. Later detailed examination of the pelvis showed that this girl had an adenocarcinoma with adhesions in the pelvis, which was sufficient to account for all her symptoms.

While I think every one of us should be wide awake, and all the time awake to the possibilities of these methods of production of symptoms which have been spoken of by Dr. Fremont-Smith, I don't think any of us can ever leave such a patient without somewhat of an uneasy feeling that that patient may have something up her sleeve.

PRESIDENT HAMMAN: I take exception to the statement that physicians neglect this field. As a matter of fact, I think they are extraordinarily sensitive to it. The difficulty is there are no sure methods of collecting evidences as there are in other domains of medical examination, and the therapeutic technique is extremely difficult and also uncertain; but the interest is certainly there, and I think no one neglects it. When we consider the tremendous advance that has been made not only in the conception of the rôle that emotional tension may play in producing symptoms of organic disease, but in our methods of examination, and in such methods as we have discovered for treating this subject in the past twenty years, it holds out the greatest hope of a more systematic arrangement of the matter so that it can be used more simply and more generally in the next twenty or twenty-five years.

I venture to say that such a paper as Dr. Fremont-Smith has read this

morning could not have been read twenty years ago, and certainly one would not have heard such an interesting discussion.

I shall take this opportunity of simply mentioning that this afternoon this matter will be still more fully discussed in connection with cardiac symptoms at the Round Table conference at which Dr. Pratt will preside, and that conference will meet here in this room at two-thirty o'clock.

Dr. Fremont-Smith, do you care to close the discussion on this paper?

DR. FREMONT-SMITH: I am not going to prolong the discussion, which was very interesting, and for which I am most grateful, except to say how glad I am that the point was brought up of the danger of neglecting possible organic disease in such patients that we believe to be emotionally stressed. Maybe this is one reason why we, as physicians, should have more understanding of the emotional factors, because if we leave that to the psychiatrists we are not in a position to see the whole picture and to recognize the occurrence of organic disease, as well as, and in the presence of emotional tension.

I wish I could answer Dr. Alton's question as to blood pressure. I cannot.

As to treatment, if one could take an hour one might barely touch on it. Perhaps I can say one more word, which is this: As I see it, and I see it very imperfectly, fear, either recognized or unrecognized, is at the basis of these emotional disturbances. It was in those dogs—or let me leave it that way, fear.

We are all relieving fear, and in so far as we are relieving it we are relieving the emotional tension which we have been talking about. If a patient comes to us fearing cancer, and we can prove to her she has no cancer, that may be all that is necessary in that patient. If a patient comes to us with a type of fear of which she is unconscious, and particularly the type of fear which she is not willing to recognize because it is something the existence of which runs counter to her ideals and her esteem, then it may take a long time to uncover and resolve that fear, and that of course is the province of the psychiatrist. (Applause.)