In my opinion it will be necessary for general practitioners to specialize to some extent in the future, and then by team work, either in partnerships or some other way convenient to all, to enable mutual work to be done amongst and for ourselves, and to the great advantage of our patients. Cannot general practitioners do something themselves to promote this pooling of clinical work?

Before we can move to any advantage we must throw overboard one fetish—namely, the all-sufficiency of the individual practitioner. Such a claim might be set up for a Boerhaave, but it is frankly impossible in our day. This also leads to an intensely individualistic outlook.

My predecessor pointed out that the local hospital should be the highest unit, and from it should radiate all the energies devoted to the prevention and healing of disease, and with this I cordially agree. Such hospital should be thoroughly organized, with a full staff of specialists, all apparatus for examination and treatment, laboratories, clinical and pathological, so that all doubtful and difficult cases and those requiring special treatment should find all required for their successful healing. At the present time, however, all are not so equipped. The staff should do everything to encourage post-graduate study by lectures, demonstrations, etc., and to this end the out-patient department should be consultative, and every encouragement held out to practitioners to bring their patients, and so get the full advantage of the consultation.

The necessity of arranging some means by which the general practitioner should be able to dovetail in with his clinical work preventive medicine is urgent, and no great improvement in this branch will result until this is done.

Such an arrangement would make it clear beyond cavil that the real aim of medicine is to prevent disease, and that our clinical efforts must be infused with the full recognition that our duty is not done when we have prescribed medicine or treatment, as we are bound to explain that sickness is the outcome of breaches of hygienic laws; we must act as hygienic missionaries and so bring about a fruitful marriage between clinical and preventive medicine.

Men must also work together—team work as against individual—team work between consultant and general practitioner, nurse and doctor, qualified and unqualified persons. Much of a doctor's time could be saved by utilizing the services of assistants, such as dressers under qualified medical supervision, and between general practitioners themselves. A form of team work would be to encourage partnerships, each partner developing his own special line and attending those cases that fell within his sphere. For example, three men might easily join together, one a general practitioner taking ordinary work, a second doing nose, ear, and throat work, and a third eye work. Such partnerships would, I believe, be very successful, and would tend to keep in our own hands much work that now finds its way into the practice of the unqualified.

Before the Insurance Acts became law, it was my opinion that local clinics would tend to solve many of our problems, and now such clinics are the order of the day under the names of Poor Law, maternity and child welfare, and venereal.

These local clinics should be centrally situated so as easily to be reached—well adapted for their purpose, thoroughly hygienic, with a sufficiency of rooms so that several doctors might be seeing patients at the same time.

Special rooms for ophthalmic, microscopic, and x-ray work should be provided, and one or two beds, so that, for instance, a patient might be taken in at night, given a test meal, and in the morning the test duly applied. A nurse should also be in attendance whenever patients are being seen.

In this way men would be brought together in one building, and this would make it easier to develop mutual help and assistance. There ought to be no illusions. We may either lead the way of and by ourselves or we shall assuredly be forced into a way devised for us by those who do not understand the position, because they are united, whilst we present an unorganized mob, riddled with doubts and differences, the result being easy defeat because of the failure to grasp the emergency and deal with it properly.

This address is intended to be suggestive, to cause all practitioners to think and act so as to preserve their independence by agreeing upon a common course of action.

THE SYMPATHETIC NERVOUS SYSTEM AND THE "IRRITABLE HEART OF SOLDIERS."

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THE condition known as the "irritable heart of soldiers" is recognized by a symptom complex, consisting of increase of pulse-rate, shortness of breath, palpitation, precordial pain, and dizziness provoked by slight stimulation such as exertion or excitement. The cases that exhibit this complex of symptoms may be divided into two groups, in one of which signs of organic disease can be elicited. The cases in which the investigations to be reported were made belong to the other group, to which for purposes of convenience the term "soldier's heart" is usually confined. This group may be considered to include: (a) Cases with a history of acute rheumatism or allied infections, even if some years before the onset of the symptoms of irritable heart, but without signs of organic disease; (b) cases with a history of an acute infection, such as typhoid fever, dysentery, "influenza," trench fever, etc., or of "gassing" at a short period before the onset of the symptoms, and (c) cases with a history of shell shock or severe physical or mental stress immediately preceding the onset.

These patients appear to differ from healthy men only in that a stimulus, such as excitement or emotion, produces an unusually large response. The usual methods of clinical examination show them to be free from any other signs of disease. Investigations into their condition may be expected therefore to show quantitative but not qualitative divergences from the standards of healthy men.

One of the purposes of this investigation was to find out the mechanism by which certain of the symptoms are produced; the result required was a therapeutic measure of relief. The symptoms by which the condition may be recognized are associated with the organs of circulation and respiration, organs the mechanism of which are related to the involuntary nervous system.¹ Bearing this in mind four drugs have been considered by us to promise means of modifying the innervation of the heart in patients in whom this system is considered disturbed—namely, adrenalin, apocodeine, acetyl-choline, and atropine; the first two affect the sympathetic system, adrenalin by stimulating it, apocodeine by inhibiting it; and the second two affect the vago-sacral system, acetyl-choline by stimulating it, atropine by inhibiting it. We have had opportunities of testing reactions of the first two only.

In all cases the intravenous method of administration was employed as being the most accurate and as imitating the physiological and pharmacological methods by which the actions of the drugs were originally ascertained. Since the patients differ from healthy men in that the "threshold" of reaction to normal stimulus is lower, it has been convenient to determine, if possible, a dose of each drug that would give a reaction in the patients, but not in healthy men, or in healthy men and not in the patients. Such a dose would be the minimal dose producing a reaction in the more susceptible group, but would not necessarily produce all the possible reactions of the drug in question, since different doses are required to produce all the possible reactions. Excitement and emotion produce to a varying degree the symptoms and signs of "irritable heart" and also the symptoms and signs to be expected from stimulation or inhibition of the involuntary nervous system, and since in some of the patients the effect of excitement is great, precautions had to be taken to avoid this reaction interfering with the effect of the drug.

Records of pulse-rate and respiration were made with a Mackenzie ink polygraph, and of the systolic blood pressure by means of the Riva-Rocci type of sphygmomanometer and the auscultatory method of reading. The patient was allowed to lie flat on the bed for ten minutes or more to avoid any disturbances due to exertion, and observations and records were then begun, and continued for a further ten minutes before the arm was cleaned for the injection. The records were continued

without a break through the process of preparation and the introduction of the needle of the hypodermic syringe into the vein of the arm. The needle was allowed to remain there for several minutes until the pulse-rate and blood pressure had reached a constant level, the level of rest, and until the patient was himself resting placidly; the injection was then made without the patient being aware of it. The patient was instructed to mention any discomfort or other sensation as it occurred. The amount of the drug used was contained in 1 c.cm. of solution and the injection occupied half a minute.

The control cases were carefully chosen, only men who had undergone the exertions of military service without developing symptoms of "irritable heart" being selected.

Adrenalin.

The 1 in 1,000 solution of adrenalin hydrochloride prepared by Parke, Davis, and Co. was used, and a minimal dose was found to be 0.01 gram. The reaction was observed in fourteen cases, ten of whom had "irritable heart," while four were free from such symptoms. In those with "irritable heart" the usual response was that a few seconds after the injection the skin of the face became momentarily pale, and this paleness was followed by more or less flushing of the face, and a feeling of warmth all over the body. The flushing was never very intense, and gradually passed off in the course of three to five minutes. With the onset of the flushing the patient would speak of a certain degree of throbbing in the chest or head and neck, or both, of a constrictive feeling in the chest and of a feeling as of sinking through the bed. An increased pulsation was visible in the vessels of the neck or of the precordial region, and in one instance in all the larger superficial arteries. As with the flushing, these phenomena were transient, gradually passing off in three to five minutes. In the four cases which did not suffer from irritable heart the momentary pallor appeared, but this was not followed by flushing, throbbing, or discomfort of any kind.

From the polygraphic records the pulse-rate for each six seconds' period was estimated, and the rise of pulse-rate in each patient calculated. In the case of the pulse-rate before the administration of the drug the rate during the eighth minute before the injection was taken, since at this time it had become constant and was at the level of rest. As the pulse-rate after the injection, the highest rate for a six seconds' period was taken, and this always occurred within the first minute after the injection. The rise in rate is given in the first column of Table I, and the figures show a wide variation, from 7 to 52 beats a minute, and the average rise (31.1) for the ten cases (1 to 10) of "irritable heart" is practically the same as the rise (28.0) for the four (11 to 14) control cases.

In calculating the change of systolic pressure, the level at which the pressure remained for a few minutes before the preparations for injection was taken as the pressure before injection, and the highest reading immediately after the injection was taken as the pressure resulting from the injection. In Case 5 a fall resulted, but in the other thirteen cases the injection was followed by a rise, and the figures representing the change in millimetres of Hg are recorded in the second column. The average change for the ten cases of "irritable heart" is practically the same as for the four control cases; but, while the four controls show an almost constant rise of 21 to 25, the figures for the "irritable heart" cases show a variation from a rise of 50 to a fall of 10.

The momentary pallor was not observed in two cases, one of whom was a case of "irritable heart," and the other a control. The flushing of the face was seen in seven of the ten heart cases, and in one of the four controls. Respiratory disturbances of various kinds were seen in seven of the ten heart cases, but not in any of the controls, and while all but one of the heart cases were visibly affected this was not observed in any of the controls. Subjective throbbing of the head or chest or both occurred in all the heart cases but one. It was not mentioned by any of the controls. Table I shows that while no distinction could be drawn between the cases of "irritable heart" and the controls by means of change in pulse-rate or in systolic blood pressure, the other phenomena of the reaction observed in the cases of "irritable heart" with the drug employed were entirely absent in the controls.

Curves showing the changes in pulse-rate, respiration rate, and blood pressure demonstrate great variation in the respiring rate, including a slowing that occurred immediately after the injection in five of the cases, and was followed by a rise in rate, but fail to demonstrate any essential difference in the two groups of cases.

Injections of 1 c.cm. of normal salt solution were carried out in cases 1, 5, 8, and 9, with the same method of procedure as was used with the adrenalin, with an entire absence of objective or subjective reaction.

TABLE I.—Results of Injection of 0.01 gram of Adrenalin.
(Cases 1-10 "irritable heart"; 11-14 control.)

Case No.	Rise of Pulse-rate.	Rise of Systolic Blood Pressure in mm. of Hg.	Pallor.	Flushing.	Deeper Respirations.	Objective Discomfort.	Subjective Throbbing in Head and Chest.
1	52	23	+	—	+	+	+
2	41	20	+	+	+	+	+
3	20	10	—	+	+	+	+
4	7	10	+	—	+	+	+
5	32	10	+	—	+	+	+
6	25	50	+	+	—	—	—
7	30	22	+	+	—	+	+
8	22	16	+	+	+	+	+
9	39	17	+	+	+	+	+
10	43	26	+	+	—	+	+
11	37	25	—	+	—	—	—
12	27	21	+	—	—	—	—
13	30	22	+	—	—	—	—
14	18	22	+	—	—	—	—

The evidence derived from the large number of investigations by physiologists on the action of adrenalin shows that its action on organs supplied by fibres from the sympathetic nervous system is the same as that obtained by stimulation of the sympathetic fibres.² On intravenous injection it constricts the arterioles of the skin, raises the blood pressure, and accelerates and augments the heart-beat. With the minimal dose used in this investigation the pallor, rise of pulse-rate, and rise of systolic blood pressure were present both in the cases of "irritable heart" and in the controls, and to the same extent in the two groups of cases. Augmentation, however, as shown by the throbbing, which was both objective and subjective, was greater in the heart cases than in the controls. The restlessness and the dull flushing may be the result of this increased action, and possibly also the deepened respiration. That one function, augmentation, may be dissociated from another, acceleration, is a phenomenon that has been observed by physiologists in the action of adrenalin, and it is not impossible that with doses other than that employed other functions of the sympathetic system would also show quantitative differences in the reactions of the two groups of cases. Whatever the full explanation of the observed phenomena may be, it would appear that the heart in the cases of "irritable heart" is in some ways more susceptible to the action of adrenalin, and from this it may be deduced that it is in some ways more susceptible to stimulation of its sympathetic nerve supply.

Another explanation is that the action on the heart may be the same in the two groups of cases, but that the mechanism for reception and recognition of sensations is more sensitive in the heart cases, so that they show the effects of the action to a greater extent. This cannot, however, explain the phenomena of the observed increased throbbing of chest and neck.

Apocodeine.

A solution of apocodeine chloride in distilled water was used, and a dose of 0.02 gram of the salt was found to give a reaction in cases of "irritable heart," but not in the

other cases investigated. The reaction was observed in ten cases, of whom six had symptoms of "irritable heart" and four had not.

In the heart cases at half to one minute after the injection a bright red blush appeared on the face and neck and spread to a greater or less extent over the trunk as an intense erythema, passing off in the course of four or five minutes and leaving a blotchy erythema on the shoulders that faded more slowly. This was accompanied by a feeling of heat in the head and to a less extent in all parts of the body. In some instances the patient's breathing deepened or quickened, and he spoke of a sensation of dizziness. In the four cases without symptoms of irritable heart no comparable reaction was observed. In two instances a slight flushing of the face was seen, one of the cases speaking of a sensation of heat in all parts of the body and the other of slight warmth of face, while in the remaining two no objective or subjective phenomena of any kind occurred.

The rise of pulse-rate and of systolic blood pressure were calculated as in Table I. The rise of pulse-rate varied from 0 to 60, and was almost consistently greater in the heart cases than in the controls, averaging 25.5 in the first group and 10 in the second. The rise of 60 in Case No. 18 was exceptionally high, and in this case the erythema was exceptionally intense and widespread. The patient was very nervous and changed colour readily under ordinary conditions of emotion and exertion.

The rise of blood pressure varied from 22 to 5 mm. of Hg, and no distinction between the two groups could be ascertained in this direction.

Erythema was absent in one of the six heart cases and but slight in a second, while it was absent in two of the four controls and slight in the other two. The sensation of heat was absent in two of the heart cases but marked in the others, while it was marked in one of the controls, slight in another, and absent in the remaining two. Respiratory hurry and a sense of dizziness was experienced by three of the six heart cases and by none of the controls.

The observations on the ten cases investigated have been tabulated in Table II, Cases 15-20 being cases of "irritable heart." It will be seen that the distinction between the two groups of cases is interfered with by Case 19. This patient was habitually nervous and excited, but immediately following the drug his breathing became easier and he became quite calm. The breathing remained quite easy during the remainder of the forty minutes during which he was under observation, but the nervousness returned ten minutes after the injection.

TABLE II.—Results of Injection of 0.02 gram of Apocodeine.
(Cases 15-20 "irritable heart"; 21-24 control.)

Case No.	Rise of Pulse-rate.	Rise of Systolic Blood Pressure in mm. of Hg.	Erythema.	Sensation of Heat.	Respiratory Discomfort.	Dizziness.
15	14	5	+	+	+	+
16	16	10	+	—	+	+
17	19	10	+	+	—	—
18	60	21	++	++	—	—
19	27	22	—	—	—	—
20	17	14	Sl.	+	+	+
21	12	8	—	—	—	—
22	16	14	Sl.	+	—	—
23	12	15	Sl.	Sl.	—	—
24	0	7	—	—	—	—

According to Dixon,³ apocodeine affects the ganglionic junctions of the involuntary nervous system, causing inhibition without preliminary stimulation. A rise in pulse-rate with small doses he considers due to inhibition of the vagus at its ganglionic junctions, while larger doses cause slowing of the heart and an intense redness of the skin from inhibition and paralysis of the sympathetic ganglionic junctions, and later of the nerve endings. The intense

erythema observed in the cases of irritable heart was quite out of proportion to the rise of pulse-rate, and it is difficult to explain it as a result of this rise, but it is reasonable to suppose that it resulted from inhibition of the sympathetic nervous system, causing dilatation of skin vessels. The feeling of warmth may be regarded as arising in the same way.

In dealing with a condition that appears to differ chiefly from that of healthy men in that the threshold for normal reactions is lower, it is difficult to obtain definite and indisputable proof of specific abnormalities, and conclusions not warranted by the methods of investigation must be avoided, but the differences in the reactions of the two groups of cases justify a conclusion that in some respects the sympathetic nervous system is more susceptible to depressing influences in cases of "irritable heart" than in healthy men.

Summary.

Cases of "irritable heart" and healthy subjects have been compared in respect to their reaction to adrenalin and apocodeine. In the case of each drug minute doses produced a greater action in the patients than in the controls. It is concluded, therefore, that the sympathetic system of nerve fibres, using the term in its physiological rather than in its anatomical sense, is relatively unstable in that it appears to be more susceptible to the stimulating and depressing influences respectively of these drugs.

REFERENCES.

¹ Gaskell: *The Involuntary Nervous System*. ² Gaskell: *Ibid.*; also work of Langley and others. ³ *Journal of Physiology*, 1904, xxx, 97.

THE PSYCHONEUROTIC FACTOR IN THE "IRRITABLE HEART" OF SOLDIERS.

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In 1871 Da Costa published his observations "on the irritable heart" as seen among soldiers invalided for this malady during the Civil War. During the present war this condition has again become prominent, and names such as "Disordered action of the heart" (D.A.H.), "Effort syndrome," "Debility," "Neuro-circulatory asthenia," etc., are employed to describe the affection or the group of chief symptoms. The class includes all cases which present a well-defined syndrome in which certain nervous and circulatory symptoms are associated with increased susceptibility to fatigue, and in which no definite pathological condition can be found to which to ascribe the clinical symptoms. The underlying pathogenetic process is still unknown; and when we speak of the psychoneurotic factor in the "irritable heart" of soldiers, we do not imply an immediate causal relation between the two, or that the symptoms of the two originate in the same way, but rather that possibly both groups may result from some common but as yet unknown cause.

It is probable that at present under the term "irritable heart" are included types of cases which are fundamentally quite different. The prominence of the nervous symptoms in many instances is so striking that one naturally considers the relation to the psychoneuroses, just as the circulatory phenomena among certain cases of war psychoneuroses must have led neurologists to wonder where the dividing line is to be drawn; in truth there is a borderland where the two dominions overlap. Some even believe that the "irritable heart" represents merely the cardiac difficulties of soldiers suffering from war neuroses. Again, it is evident that a certain number of cases of "irritable heart" have suffered from symptoms of the condition long before enlisting, some dating the onset to the formative period or even to childhood. The question whether some cases are not congenital or even hereditary in character also occurs, particularly when dealing with soldiers who belong to the group called constitutionally asthenic. Then there is the serious and, in the American army, immediate problem of dealing with recruits with such histories who break down in training.