

# “The Effort Syndrome”

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THE effort syndrome has been defined by Grant (1936) as “that condition of ill-health in which symptoms and signs produced in normal subjects by excessive exercise are called forth in the patients by lesser amounts and in which no definite physical signs of structural disease are anywhere discovered.” More briefly it may be described as a depressed capacity for exertion without distress in the absence of demonstrable disease.

## “THE SOLDIER’S HEART.”

It has elsewhere been wrongly described as having been “invented by the R.A.M.C.,” but it is not confined to soldiers, although it was first made the subject of careful clinical observation by Da Costa during the American Civil War. Da Costa’s name for it was “irritable heart” (1864 and 1871), an earlier term than “disordered action of the heart,” both of which were criticized by Lewis (1939) on the grounds that they “maintain for those who use them the presumption that there is a cardiac malady, and among patients they awaken serious apprehension.” His term, effort syndrome, might perhaps be regarded by some patients as the result of undue effort on their part. With transatlantic brevity the Americans have called it “neuro-circulatory asthenia” instead of D.A.H.

While the syndrome is not rare in civilians, as Da Costa himself observed, it is notoriously more common among soldiers. The reasons for this greater frequency are :

(1) In civilian life individuals usually gravitate sooner or later to the occupations for which they are physically suited. Even in manual labour a man can usually perform a given task in his own way and at his own speed. Again, in a gang of men the big fellow will ordinarily take the heavier burden. In the army, on the other hand, there must necessarily be uniformity of effort and equality of achievement : a man may carry his comrade’s rifle, but it is essential that the comrade should complete his march. In war, many diverse types, physical and psychological, are bound to a common task.

(2) Communal life in barracks, billets, and camps increases the spread, not only of major infections such as cerebro-spinal fever, but of so-called minor infections. Lewis estimates that “in at least fifty to sixty per cent. of the cases infectious diseases may be held to have played a chief part in promoting the syndrome.” Da Costa stressed the importance of insufficient convalescence as a cause. Men are returned to duty and strenuous exercise too soon. Sir Adolphe Abrahams has noted the adverse effect on athletic achievement of septic foci, as in the case of a distinguished athlete whose “times” varied with the adequate discharge of a fistula-in-ano, the radical cure of which restored his high level of performance. Apart from recent minor infections, the stresses of war may discover tendencies, hitherto latent, which have had their origins in some long-past infection. For example, Parkinson (1940) reported a history of rheumatic fever in twelve per cent. of effort-syndrome patients, as compared with five per cent. in one thousand

wounded soldiers. Grant (1925) found a history of rheumatism or chorea in 19.6 per cent of his 665 cases.

The importance of tuberculosis will be discussed in a later paragraph.

(3) "Emotion is motion, hence the name." More cases occur among men on active service than among men in training. Apart from hard labour, infection, and unsuitable food, the strain of waiting for active attack or determined defence makes the pulses of the boldest quicken. (A colleague told me that on 1st July, 1916, when the Ulster Division awaited the signal to go over the top, some of the officers amused themselves by counting pulse-rates; one only was found to be seventy-two. His steady heart still beats, I am glad to say.) Here, as in toxic goitre, age is important. Young hearts endure tachycardia better than the middle-aged.

Herman (1936) says that there are two psychological types of men particularly prone to neuro-circulatory asthenia. These are the very alert, and the subnormal. It is obvious that the former are of high potential value to the state and the latter of little value. By the perversity of war the former must be given an opportunity to serve in some useful category, while the latter are useless to the army, and are relegated to the comparative safety of civilian life and the propagation of their kind.

(4) The diet of troops is frequently very different from that of peace-time and likely to be very deficient in vitamins. For example, adequate vitamin C is necessary in fighting infection.

(5) It is probable that many soldiers smoke too much, although tobacco is not the cause of the syndrome. Indeed, Lewis found that only five per cent. of his cases smoked twenty or more cigarettes daily. "The heaviest smokers are those with the best exercise tolerance, for they are relatively undisturbed by smoking" (Lewis). This does not mean that a medical officer may accept a confession to forty cigarettes a day as a substitute for an exercise tolerance test. I think that tolerance of tobacco varies amongst smokers, and is not always directly proportional to their tolerance of exercise.

In any review of the causes which contribute to the ætiology of effort syndrome, one important but negative point must be made: the syndrome is *not* due to heart strain in the vast majority of cases, and it is extremely rare to find the symptoms arise and persist as the result of an unusual effort on the part of a hitherto healthy man.

#### ÆTIOLOGICAL GROUPS.

Sir Thomas Lewis classifies syndrome patients as follows:—

- (1) Patients with constitutional weakness, nervous or physical or both.
- (2) Those who may be regarded as played out by exposure, hard continuous work, and disturbed sleep.
- (3) Those who may be regarded as exhibiting delayed convalescence from acute illnesses.
- (4) A not inconsiderable group is that comprising actual though unrecognised infection, including incipient tuberculosis, local pus infections, infections of intestinal tract.

Bramwell's classification is similar :—

- (1) Those of subnormal physique and stamina.
- (2) Those who are convalescent from a recent acute infection.
- (3) Those who are suffering from an anxiety state.

Da Costa found in two hundred cases—

		per cent.
Fevers (typhoid, etc.) - - - - -	34	17.0
Diarrhœa - - - - -	61	30.5
Hard field service, particularly excessive marching -	69	38.5
Wounds, injuries, rheumatism, scurvy, ordinary duties of soldier life, and doubtful causes - -	36	18.0

Many observers agree the psychical factor is the most important. As a colleague has put it : “It is the only constant factor in causation, and therefore it is probable that the condition is really a psychic one, and treatment which takes no account of the psychical cause can only hurt a relative success.”

#### SYMPTOMS AND SIGNS.

The circulatory symptoms are in the main “those which are produced in normal subjects by excessive exercise,” and may resemble those of organic heart disease, but there are certain distinguishing features.

##### (1) TACHYCARDIA.

“Tachycardia is present all day long in all cases, but the pulse-rate drops to normal during sleep” (Fraser, 1940). The rate is often 100-120, and the rhythm may be broken by extra systoles. This persistently high pulse-rate is very easily augmented by emotion; after exercise the rate does not return to its former level for at least two minutes. The subjective sensation of palpitation is not directly related to the heart-rate, and extra systoles are often more distressing than the increased rate itself.

In paroxysmal tachycardia there are the characteristic bouts of rapid rate, with their sudden reversal to normal.

##### (2) DYSPNŒA.

“Breathlessness is always admitted, but seldom the primary complaint” (Parkinson, 1940). Its cause is imperfectly understood, as there is neither demonstrable heart-disease nor significant diminution of vital capacity. It is usually rapid and shallow, but differs from purely hysterical tachypnœa in that it is normal at complete rest. The “unsatisfied breath phenomenon” is common. This is the feeling that “if only one could take a deep breath one would be all right.” It is always strongly suggestive of neurosis. Breathlessness due to cardiac failure in young persons is almost invariably accompanied by easily detected signs of valvular disease or cardiac enlargement. There exist cases of myocarditis due to diphtheria or rheumatism, where only an electro-cardiographic and radiographic examination will detect the nature of the myocardial change; but the objective signs of congestive heart failure, distension of veins in the neck and engorgement of the liver, will be demonstrable. The breathlessness of lung disease is proportional to the rate of progress of the disease, rather than to its extent, at least until the disease has become very extensive and its associated toxæmia profound.

### (3) PRÆCORDIAL DISTRESS.

“Left inframammary pain is the commonest symptom volunteered by patients” (Fraser, 1940). Herman is right, I am sure, in saying there are two phases—dull rather persistent “heartache,” varied by sudden knife-like stabs. This pain is, as it were, loosely associated with exertion, and may occur at rest. It may occur on exercise one day and be completely absent on another. It may disappear during exercise or may last for hours afterwards. While there is scarcely the imperative halt of true angina, the patient may feel constrained to stop, but rest does not bring the exquisite respite of angina relieved.

In patients who complain of pain there is very commonly hyperæsthesia of skin or tenderness of the pectoral muscles of the left side. This sign is an important one, but one must remember that hypersensitive chest muscles may sometimes be found in organic heart disease.

### (4) EXHAUSTION.

It is this symptom which most clearly shows the psychological aspect of the syndrome. In milder cases it may amount only to the undue fatigue of a sedentary worker “out of training” for exercise, but in established cases “the tired, anxious look, the tremor, the headache, and the mental and physical weariness must be due to a psychological factor” (Fraser, 1940).

Repeated medical examinations directed particularly to the condition of the heart, and those verbal indiscretions in the hearing of the patient of which even senior physicians are too frequently capable, may well have reduced the patient to a state in which he is almost afraid of ordinary movement for fear of imposing further strain on his heart.

Associated symptoms are fainting (often for a mixed physical and psychical stimulus such as a hypodermic needle), dizziness (often of postural type, occasioned by sudden changes of position), headache, and profuse sweating. Like the pulse-rate, the blood-pressure is labile, usually normal at rest, but rising quickly, to fall more slowly, after exercise.

## DIAGNOSIS.

### (1) FROM ORGANIC HEART DISEASE.

The presence of an apical systolic murmur is insufficient evidence on which to condemn a heart. Sir Thomas Lewis allowed a climber who had such a murmur to take part in the Mount Everest expedition. On the other hand, the absence of recognized rheumatism does not exclude carditis. Crighton Bramwell confirmed my finding that twenty-five per cent. of cases of mitral stenosis in pregnancy had no such history, and mitral stenosis without rheumatic fever is not exclusive to the female sex. Again, coronary lesions reveal little to the stethoscope, and are not unknown under forty years of age.

The desire to serve or to avoid service tends to make an accurate history more than ordinarily difficult to elicit, and it is not always the volunteer who is the optimist and the conscript the pessimist about his own condition, but careful physical examination will usually decide the matter. I have in this Journal in 1933 emphasised the amazing freedom from symptoms in young persons with

rheumatic heart disease which leads them into unsuitable occupations. Of the instrumental methods, X-ray, to determine heart-size, and electro-cardiography are useful, but "a man's *observed* capacity to accomplish work is the only dependable test of such capacity" (Meakins, Parkinson *et al.*, 1916).

## (2) FROM TOXIC GOITRE.

This condition presents many symptoms found in the effort syndrome. It is well to remember that (a) goitre in male subjects is often larger than one at first suspects, because the swollen lobes tend to spread backwards on either side of the trachea and the full extent of the change may only be fully appreciated at operation; (b) in toxic goitre the sleeping pulse-rate is raised, whereas in effort syndrome it is little if at all above normal; (c) in toxic goitre the skin is uniformly warm, and in effort syndrome the extremities are often cold and even painful; (d) estimation of the basal metabolic rate is useful, but not always necessary.

## (3) FROM PULMONARY TUBERCULOSIS.

Percussion and auscultation of the lungs may be difficult in a recruiting board-room, but sometimes we forget the proper significance of the term medical inspection. Malar flush, a flattened apex, diminished respiratory movement—and the mercury in a thermometer, are all visible phenomena. X-ray examination is invaluable. Blood sedimentation rate is cheaply and easily observed; in the absence of other toxæmias such as those of rheumatism or rheumatoid arthritis, a raised blood sedimentation rate makes one suspect tuberculosis.

## PREVENTION.

(1) One of the most striking of R. T. Grant's (1926) observations on the after-histories of men suffering from the effort syndrome was, that five years after the war of 1914-1918 the incidence of pulmonary tuberculosis among them was eighty per cent. higher than in the general population of London. This surely means one or other of two possibilities: either that tuberculosis was the unrecognized cause of the syndrome, or that the patients had a lessened resistance to tuberculosis. If the former, it is an additional reason for the accurate diagnosis of tuberculosis in recruits and young soldiers.

The examination of all recruits by a board of five doctors is an improvement on the slipshod methods of 1914, when probably the only division to be adequately examined on enlistment by teams of volunteer-doctors was the 36th (Ulster) Division. Stethoscopes are not enough: X-ray examination should be available for every board. The cost to the state of one X-ray picture is less than that of a "less than twenty per cent." disability pension for twelve months, the difference being approximately twenty pounds.

Again, at least one tuberculosis medical officer in England notified the medical officer of any unit into which one of his tuberculous patients had been enlisted, but this obviously desirable practice was not universal, and many tuberculous patients "passed the doctor" and passed on their infection to their comrades. Now, after twelve months of war, and twenty years retrospect, it seems that the authorities are awaking to the danger.

If it is true that tuberculosis has a special relationship to the effort syndrome, and Grant's figures are in accord with other clinical opinion, steps to prevent the spread of the former will lessen the incidence of the latter.

(2) When a nation with a small peace-time army adopts conscription there seems to be a plethora of soldiers. This may subconsciously influence medical boards to a line of least resistance, and to the exclusion of every candidate who presents the slightest departure from a "normal" heart—systolic murmurs, extra systoles, even sinus arrhythmia may find their way to the discard. By this means men capable of rendering valuable service are turned away and are liable to regard themselves as invalids because they have been "rejected by five doctors." The most experienced and careful board must often find cases which are difficult; even with the excellent advice of the confidential instructions (1938), I suggest that there should be a special category for such cases as these: the alert, eager, patriotic type recruited from a sedentary occupation, with a systolic bruit, or subnormal exercise tolerance, or tachycardia or extra-systoles; or the less admirable individual whom one suspects of a desire to avoid military service. These should be classed in grade I (m), the bracketed letter to imply that they will be on probation and under the special observation of the medical officers of their units for at least three months. If a large number of grade I (m) recruits is enlisted they should be posted to command depots on the lines of those created at the suggestion of Colonel Sims Woodhead in the last war, where graduated exercises under medical supervision brought thousands of men convalescent from wounds and sickness back to physical fitness.

"To discharge the large number of cases of functional disorder of the heart which must exist in every army during war, would, I believe, deplete it as much as an engagement, and have on many a soldier, seeing the ease with which a discharge can be obtained, a demoralizing effect" (Da Costa).

(3) When a member of the service develops even a minor infection he should not be returned to duty or training without an adequate period of convalescence.

#### TREATMENT.

When the syndrome presents itself, every necessary step must be taken to exclude organic disease *before* the patient is reassured. It destroys confidence to tell a man that his heart is all right one week and to send him to be electro-cardiographed the next week. During this diagnostic period a few days in bed may be necessary, to be followed by a few days during which the patient is encouraged to move about out of doors. Then graduated exercises should be commenced, on the lines laid down by Meakins, Parkinson (1916), and their colleagues at Hampstead in 1916. They evolved seven sets of graduated exercises, which proceeded from fifteen minutes very light exertion to thirty minutes of quite strenuous exercise. At the Command Depot, Tipperary, these exercises were followed by "route marches" at first without rifle or pack, at an easy pace for a mile or so, and increasing, until our best cases could march twelve miles with full equipment. The depot band "played them in" for the last two miles.

A great deal depends on the personalities of the physician and the P.T. instructor, and on the "atmosphere" of the depot. Games and simple recreations must be

provided for those hours when the patient is not actively engaged. In Tipperary the cases were not segregated, but were mixed with the larger number of men recovering from wounds who were receiving massage, electrical treatment, and graduated exercises and marches after many weeks of hospital treatment. These men by their courage, cheerfulness, and determination to get fit, contributed largely to the success of the place.

I have no knowledge of specialised psychological methods of investigation of treatment, but many cases suggest that this is a promising field. There is no drug of any specific value in the treatment of the effort syndrome.

### PROGNOSIS.

Prognosis depends on the origin, duration, and severity of symptoms. As might be expected, the best results are to be found in cases following a transient infection, and in the last war men who broke down overseas had a higher recovery-rate than those who did so under military training at home.

The longer the symptoms have lasted the harder they are to eradicate. Parkinson regards long-standing submammary pain and hyperæsthesia as a symptom of poor prognosis. Grant found age to be important in prognosis. Between the ages of 17 and 20 the recovery-rate was twenty-five per cent., between 41 and 60 years it was 2.1 per cent. (The incidence in these two age-groups was 2.9 per cent. and 16.7 per cent. respectively.) The fact that he found that 56.2 per cent. of his cases had remained stationary, and 3.2 per cent. had become worse five years afterwards, proves how severe and intractable the syndrome may be, but "from the fact that the incidence of definite cardiac disease for the whole group during the period of five years is no more than one per cent., it is felt that incipient cardiac disease cannot be regarded as the underlying cause of the effort syndrome in anything but a negligible proportion of the cases" (Grant, 1926).

Whishaw reviewed the physical condition of 130 returned soldiers suffering from the effort syndrome in 1939. These were men who had taken part in the war of twenty years ago. His findings confirmed Grant's conclusions, and in particular that the effort syndrome does not predispose to organic heart disease. Cardiovascular disease was discovered in thirteen cases (ten per cent.); of these, coronary disease accounted for six, hypertensive heart disease two, chronic nephritis with hypertension one, chronic rheumatic heart disease one, and specific aortitis three. This incidence does not seem remarkably high, considering that the average age of the men was forty-six years.

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