Summary

Practical points in the ordering, regulation, and measurement of feeds for bottle-fed babies are discussed, and methods of minimizing the risk of quantitative errors are indicated. The employment of feeds providing 20 calories per fluid ounce for all infants, unless there is some special contraindication, is strongly urged on the ground that thereby (*a*) there is a much-reduced risk of quantitative mistakes for the infant, (*b*) feeding is greatly simplified for doctors and nurses, and (*c*) labour is lessened in children's wards or day nurseries.

Tables are given for the instruction of nurses in infant feeding. These can be adapted and shortened by the doctor in accordance with the type of feeding he habitually uses. It is hoped that feeding standardized to the extent here suggested may be widely adopted at the present time, for it offers a way of coping with the difficulty of ordering feeds for large numbers of babies brought into reception areas on feeds of every description.

[The concluding part of this paper—giving practical points in the regulation of feeds during the neonatal period—will appear next week.]

AETIOLOGY OF DA COSTA'S SYNDROME *

BY

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We have seen that the symptoms and signs of Da Costa's syndrome are produced by central stimulation; that hyperventilation and hyperadrenalism, though they may be sometimes concerned with the mechanism of symptom production, are not aetiological diagnoses. There remains to be considered the real nature of the syndrome, the origin of the central stimulation. It must be emphasized that the condition is as common in civilians as in soldiers, as was known to Da Costa, and that even when it occurs in soldiers it was present before enlistment more often than not (Table XIII). This disposes of the idea that the essential cause of Da Costa's syndrome is specially related to war service or to Army life.

TABLE XIII.—*Onset in Relation to Army Life*

	Parkinson, 1916	Lewis, 1918	Hume, 1918	Barlow, 1920	Wood, 1941
No. of cases	40	558	1,000	382	225
New (since enlistment) ..					26.6%
Recurrent (relapse since enlistment)					6.6%
Lifelong					18.6%
Total pre-war	72.5%	43%	54%	51%	73.3%

Most authors agree that in any patient so many things have combined to produce the syndrome that it is very difficult to pick on one. For this reason the incidence of the various aetiological factors recorded in the literature is confusing (Table XIV). It is clear, however, that trauma, high explosive, wounds, and gas poisoning are relatively unimportant. The chief factors seem to be the family history, constitutional incapacity, infection, neurosis, and undue mental or physical strain. In order to assess their significance and to search for a common basis, I have made a detailed study of the histories of 100 unselected cases. At once two things were obvious. First, severe mental or physical strain was no more important than rough conditions, discipline, the change from an individual with private rights to a number on an index card, fear of having to kill or of being killed, and the everlasting anticipation of the worst—in short, fear of and dislike for Army life. This attitude was a factor in the majority. Secondly, a psychiatric diagnosis could nearly always be made—e.g., depressive state, anxiety neurosis, hysteria, hypochondriasis, etc. I am not competent to discuss this aspect, which is being ably handled by my colleagues Dr. Aubrey Lewis and Dr. Maxwell Jones, but I shall try to describe the more obvious emotions, misinterpretations, and psychological twists which lie behind the somatic manifestations of this syndrome. It is not enough to unearth psychopathology: it is necessary to explain the incapacity for effort.

TABLE XIV.—*Incidence % of Apparent Aetiological Factors*

	Da Costa, 1871	Parkinson, 1916	Lewis, 1918	Hume, 1918	Venning, 1919	Barlow, 1920	Krogh *et al.*, 1920	Craig and White, 1934
No. of cases ..	200	40	558	1,000	7,803	382		
Constitutional ..					9–12			
Infective	47.5	42.5	33 Factor 55	21.5	20–22	53	41.4	9 Factor 61
Neurotic					5–13.6	3.4	2.3	80 Factor
Severe mental or physical strain	38.5	10	11	11.3	19–36		Few	10 Factor 61
Trauma without injury	+			2.1				
Exposure to high explosive				3.6			2.5	
Wounds	Very few			1.1		2.5	.	
Gas				1.8	1–10.6	5	Very few	
Multiple	Usual				16–27			Usual
Unknown gradual onset			56	54.3				

Family History

Oppenheimer and Rothschild (1918a, 1918b) found a family history of nervousness, insanity, or epilepsy in 56% of 100 unselected cases. Swan (1921) recorded undue nervousness in the parents of 51.7% of 58 cases. The incidence of these traits in the family histories of patients with recognized psychoneurosis is a little higher—e.g., 74% (Wolfsohn, 1918a, 1918b), 57.7% (Salmon, 1929), 60% (Yaskin, 1936), and 75% (Kozol, 1940). In 100 controls reported by Wolfsohn there was a family history of nervousness in 15%, but insanity and epilepsy did not occur. Table XV shows my own findings in 210 militiamen and in 175 patients at the Emergency Hospital. The high incidence of nervousness and "cardiac neurosis" in the families of patients, compared with those of controls, is confirmed; of equal importance, perhaps, is the fact that the incidence of organic heart disease was the same in all groups, showing that nervousness is the important factor, not its disguise as heart disease. Either or both parents were afflicted. It was rare to find brothers or sisters with similar complaints unless these were also found in a parent. Whether the parental factor has a hereditary, congenital, or environmental influence has yet to be learned.

TABLE XV.—*Percentage with Family History*

	210 Militiamen			175 E.M.S. Patients
	50 Normal	75 Organic Heart Disease	85 Da Costa's Syndrome	
Probable organic heart disease	8	8	5	8
Probable "cardiac neurosis"	0	4	25	42
"Nerves"—heart not accused	4	4	23	19
Total with neurosis or "nerves"	4	8	48	61

* The last of three Goulstonian Lectures to the Royal College of Physicians of London, 1941. The first and second lectures appeared in our two preceding issues.

Constitutional Factor

It may be thought that this implies constitutional incapacity for effort, or, as Kerley (1920) puts it, "that it is impossible to get out of any piece of machinery work which the machine was not intended to accomplish." In the light of many careful histories I find it difficult to accept this view. In childhood these patients are timid and delicate; they cling too long to their mothers' skirts. On the approach of the evil day when they will have to attend school they are filled with apprehension; if the dire event is not delayed by some happy illness (rheumatic fever followed by an open-air school is especially welcomed) they spend the next few years as trembling spectators of the rough-and-tumble of the miniature world about them. They evade as much as possible, with the help of friendly coughs and colds; kindly doctors and soft mothers are at hand to protect them from the hazards of football, swimming, and the gymnasium. Phobias, tics, bed-wetting, nightmares, and stammering are common traits. But they may not develop effort intolerance until they are 10 or 11 years old, or not until much later.

The case histories suggest that parental influence causes timidity and character inferiority, but not effort intolerance; for out of 66 with a constitutional factor, only 11 were incapable of effort for as long as they could remember, the other 55 relating the onset of this disability to other factors. It is probable, but difficult to prove, that similar incidents operated in the 11 mentioned, but at a very early age.

I had hoped that studies of children with Da Costa's syndrome would yield more light on the matter, but such observations as have been made are not helpful. Martius (1899) and Fairbanks (1907) blamed the heart; Bass and Wessler (1913) absolved it. Kerley (1920) thought there was constitutional incapacity for effort. Halsey (1920) blamed parents and doctors. Lincoln (1928) showed how encouragement and proper management improved them. Many of these children had orthostatic albuminuria, and are described in the literature under that heading. Robey and Boas (1918) found it in 6 out of 27 adults with Da Costa's syndrome, and Dr. Archer has discovered it in a number of our patients at the Emergency Hospital.

The family history was positive in 60 out of the 66 patients with a constitutional factor and in all of those with lifelong effort intolerance. It was positive in 15 out of the 34 without a known constitutional factor.

Here is a typical case history illustrating apparent constitutional incapacity for effort:

Case 37.—Mother suffered from nervous breakdowns. As a child the patient was nervous and delicate. He was unable to walk far without fatigue, and even up to the age of 7 he was given "piggy-back rides" whenever he was tired. He suffered from frequent minor ailments, such as earache, toothache, and headache. His doctor blamed his heart, and said he would need a great deal of care and attention. He has had symptoms as long as he can remember. He avoided games at school, although not forbidden to play them, and has always lacked stamina and courage. At the age of 17 another doctor told him he must have more rest, and he took this advice. He was conscripted in April, 1940, and reported sick immediately.

The Direct Association of Effort with Fear

In its pure form this link is forged when effort is associated with circumstances which induce fear. Da Costa's syndrome was initiated in this way in 19 of the present series. Constitutional timidity and character inferiority without effort intolerance preceded the onset in 16 of them. In considering the constitutional factor one of the common errors arises out of the interpretation of symptoms provoked by games at school. Careful questioning revealed that initially only two games were involved—football and swimming; running, cricket, and other activities being tolerated. Football caused symptoms because the boy was afraid of being hurt; swimming, because he was afraid of drowning. The symptoms were those of panic, but the boy himself, his mother, or his doctor misinterpreted them as indicating heart disease, whereupon a new fear developed—the fear of sudden death on exertion. Any kind of effort then produced symptoms. This mechanism need only operate a few times in order to form a habit or conditioned response which maintains the symptoms when conscious fear is lost. Every time symptoms occur they are misinterpreted, and so by constant repetition a deep-seated conviction that the heart is diseased is welded into the mind.

Case 10.—This man's father had "effort syndrome" in the last war, and his mother was nervous and inclined to dizzy attacks. Up to the age of 9 he was able to run without distress, but after playing football during his tenth year palpitations and breathlessness occurred on any kind of exertion. He revealed that he was afraid of being hurt at football, and used to get upset when he was called a "funk." Similar symptoms on swimming were associated with considerable fear of drowning. He misinterpreted the effects of his emotion, and came to believe that he had heart disease. Fearing sudden death and assuming that effort would hasten his end, he avoided all games, and was glad to have the excuse. He has had "effort syndrome" ever since.

Case 6.—Positive family history. When an infant the patient was in his mother's arms when a bomb fell during a London air raid and blew them through a doorway. As a young child he had a morbid fear of fireworks; otherwise he was fit and strong. He was called up in September, 1939, and remained well until March, 1940, when he was told to unload an ammunition lorry. On handling the shells he became curiously panic-stricken, and developed somatic symptoms, including a sharp left-breast pain which made him think he had strained his heart. His condition was aggravated by his experiences at Dunkirk, which had a peculiar significance for him. Anxiety dreams followed. The theme running through this story is unmistakable. He accepted the explanation offered and was reassured. He improved remarkably, entirely lost his pain, and did our hardest-grade exercises and route marches without symptoms. However, as his fear of explosions was undiminished he was sent back for non-combatant duty.

Case 3.—Positive family history. A nervous and delicate child, but physically quite capable. He joined the police at the age of twenty-one, and remained well, although prone to palpitations on excitement. One day, at the beginning of September, 1939, he was suddenly roused from sleep by his brother, who told him war was declared and an air raid was in progress. He jumped up, dressed hurriedly, and was running down the street before the alarm had stopped. He said it was like a nightmare: his tongue felt like leather, his mouth was very dry, his heart was pounding, and then he was seized with a cramp-like pain in the left side of his chest. Believing it was coming from his heart, he thought he was going to die; sweat poured from him, and he collapsed. He has had "effort syndrome" ever since. However, excitement, noise, and especially gunfire are more effective than effort in bringing on his symptoms, and on one occasion when he was knocked down by the explosion of an incendiary bomb his initial attack was repeated in every detail.

Inframammary Pain associated with Effort

In 6 cases the onset of Da Costa's syndrome was clearly related to a particular incident in which left inframammary pain was provoked by specific effort. The pain was misinterpreted as arising in the heart; fear of sudden death induced palpitations, etc.; these added symptoms confirmed the misinterpretation and so completed the vicious circle. The mechanism operated in three other cases, but in them it was not responsible for the onset.

As the histories of these 6 patients were identical in principle, only 1 will be quoted.

Case 5.—Positive family history. The patient was a clerk studying accountancy in civil life, and was conscripted in

June, 1940. He had always been well, but was not robust. He trained satisfactorily, but one day, while walking up a hill, carrying a heavy sandbag he tripped, felt something snap in the left side of his chest, and experienced a severe left inframammary pain. He thought he had strained his heart; he became frightened, developed palpitations which confirmed his fears, and reported sick. The doctor supported his belief, and allowed the syndrome to become established. Since then the patient has been afraid of exerting himself lest he should fall down dead, and symptoms have occurred when he has undergone exertion.

Induced

Da Costa's syndrome may be induced by the doctor or by some other person in authority, or it may be self-induced. The doctor was responsible in 17 cases, and was an important factor in 16 others. The accidental finding of a systolic murmur or of tachycardia is usually the source of error. Evidence of predisposition is common.

Case 41.—The family history was positive, his father having "effort syndrome." The patient was always nervous, delicate, and sensitive, but was a good cricketer, and had no symptoms on effort. He became a clerk in civil life. In March, 1940, he had a sore throat, and was told by his doctor that his heart was affected and that he must take things very quietly. He became worried, feared sudden death, and thought that exertion would increase the likelihood of this. At his medical examination in May he was put down for light training, and he interpreted this as meaning that his heart was weak, confirming his doctor's view. After two weeks in the Army he broke down, and was told by his medical officer that his heart was enlarged. Two weeks later another medical officer told him that his heart had not grown to its proper size and was too small. He became more than ever anxious about it, and wondered what the truth of the matter really was. Symptoms on effort were now well established. He accepted our reassurance and explanation, whereupon he lost his fear of effort, and was able to undertake much, symptom-free; but his extreme nervousness of air raids, guns, and all military contrivances prevented his return to full health.

The importance of a predisposing factor was determined by a study of unselected recruits who have been told erroneously that they had heart disease (Table XVI).

TABLE XVI.—*Influence of Doctor's Statement*

	No. of Cases	Developed Da Costa's Syndrome	Uninfluenced
Subjects informed that they had heart disease	59	33	26
Family history of "cardiac neurosis" or nervousness	30	27	3
		Obeyed	Disobeyed
Activity restricted by doctor ..	48	37	11
Positive family history	28	27	1

The influence of a positive family history is unquestionable, for it was present in 82% of those who developed Da Costa's syndrome, compared with 11% of those who did not, and it occurred in 73% of those who obeyed their doctor's instructions, compared with 9% of those who did not. Again, in the present series of 16 induced cases of Da Costa's syndrome the family history was tainted in 12 and the constitutional factor was found in 11. It requires more than a mistaken doctor to induce Da Costa's syndrome: it requires peculiar soil. Given the suggestible subject, however, the doctor often succeeds in linking emotional reactions to effort by grafting on to the mind of the patient the idea that his heart will not stand up to exertion. These patients really believe that they may die suddenly when they exert themselves. Their emotion may be compared to that of a blindfolded man who sets off towards a precipice to fetch something from its brink. The symptoms which ensue, especially the palpitation, seem to confirm the danger. It is possible that a conditioned reflex becomes established which maintains the reaction.

There were 4 cases in the series of 100 which were self-induced, the patient misinterpreting innocent palpitations or a minor attack of dizziness as an indication of heart disease, on the basis of his familiarity with similar symptoms in close relations who were supposed to have heart disease.

Case 1.—Bad family history. The patient was a nervous delicate child who became a farm labourer at the age of 14 and was able to do heavy work without any trouble. In 1930, when he was living with his uncle, he learned that his father had died of heart disease following the heaviest day's work of his life. His uncle often used to speak of this, and was said to have heart disease himself. One day the patient developed palpitations and immediately believed that his heart was diseased like his father's and uncle's. He feared that he would drop dead as his father had done before him at the age of 31. He therefore avoided effort, as he believed this would hasten his end, and he has done nothing but light work since. He was called up in August, 1940, and fell sick at once with the usual symptoms. He had a deep conviction that his heart was diseased, and nothing would alter his view. His fear of effort was very real and no doubt produced an emotional reaction.

The Infective Factor

Numerous observations in the literature that infection may be the direct cause of "effort syndrome" are singularly unimpressive. Slight leucocytosis (Grace Briscoe, 1917; Swan, 1921) no more favours a toxic focus than it does emotional stimulation (Menkin, 1928—quoted by Cannon, 1929; Wittkower, 1935). The erythrocyte sedimentation rate is almost invariably normal (personal observation). Removal of septic tonsils, cleaning up dental sepsis, and puncturing antra offer no encouragement. Nevertheless Da Costa's syndrome often follows rheumatic fever, influenza, pneumonia, and other fevers, and did so in 17 of the present series, and was aggravated by them in 29 others. Careful history-taking, however, revealed quite another source for the origin of the syndrome, infection playing the same part as bad conditions, gassing, high explosive, concussion, trauma without serious injury, etc., preparing the ground by causing confusion, increased suggestibility, and loss of morale and vitality. It is known that such conditions predispose to the development of a neurosis (Schwab, 1919; Salmon, 1929). In the 17 cases mentioned above, Da Costa's syndrome was traced to emotional causes in 14; proof was lacking in the other 3. The chief factor was the belief, induced by the doctor, that the heart had been injured by the infection—a factor whose power has already been weighed. It is therefore not surprising that rheumatic fever heads the list of these infections; influenza may come second because of the fallacious belief that it, too, injures the heart and because of its notorious influence on morale.

Case 70.—This man was admitted to the Emergency Hospital with a diagnosis of post-infective "effort syndrome," the symptoms occurring after an attack of meningococcal meningitis. The true history, however, reveals a different origin. He was born in 1916, when his mother was very nervous on account of air raids and because her husband had been killed on active service. He was wrapped in cotton-wool and olive oil for the first six months of his life, and was treated with cod-liver oil and malt for years on account of his supposed delicacy. At 11 he was seen by a doctor and was said to have V.D.H., for which he was treated with more cod-liver oil. He left school at 14 and has worked as a laundry clerk and carman ever since, avoiding heavy work on medical advice. He was called up in April, 1940, and was terrified at the idea of fighting. He used to lie awake at night with sweating hands and feet in anticipation of the

horrors of battle. He developed meningitis a month later, and dermatitis, influenza, and tonsillitis followed in quick succession. He became panic-stricken during air raids or even when planes passed overhead. His somatic symptoms gradually increased, and in view of his previous history he interpreted them as cardiac in origin. He has been unable to concentrate, has nightmares, and is very fatigued. After reassurance, explanation, and the promise that he would be discharged from the Army he has improved to such an extent that he is now capable of full physical effort, symptom-free.

It may be objected that this case had too strong a constitutional factor to provide a fair example: but the constitutional or parental factor was found in all but 3 of these cases; and emotional factors were shown to be equally powerful in these 3, details of which are given because I believe them to be important.

Case 65.—This man was perfectly fit until January, 1940, when he had a bad attack of influenza. "Effort syndrome" followed, and was supposed to be of the post-infective type. However, a careful history revealed that after his influenza he became anxious about his business, which he had left in the care of his wife, who was not managing it satisfactorily. His affairs were disordered, and when his home town was bombed his anxiety became acute. While he was at our hospital I gave him a week's leave to put his affairs in order. He was able to move his wife to a place of safety, and he left his café in trustworthy hands. He made an immediate recovery, performed the hardest-grade exercises without the slightest distress, and was returned Category A1.

Case 8.—This man was perfectly well until he had a severe attack of rheumatic fever in February, 1940. He was put on the danger list, and thought he was going to die from acute inflammation of the heart. The usual symptoms developed during convalescence, and he became anxious as to his condition. Reassurance and encouragement combined with explanation resulted in cure; he was able to perform our hardest-grade exercises symptom-free, and was returned Category A1.

It will be noted that although this case illustrates as pure an example of post-infective "effort syndrome" as one could wish to see, the fear of death and the doubt whether his heart had really recovered were the important factors in the production of his symptoms.

Case 33.—This man was perfectly well until 1936, when he was off work for two months with pleurisy. He made a complete recovery, was called up in August, 1939, and remained fit for four months while driving 15-cwt. trucks in France. In January, 1940, however, he developed influenza accompanied by left chest pain. The medical officer discovered tachycardia, and the patient then interpreted the pain as due to heart trouble. This idea was confirmed when he found he was dizzy on resuming his driving occupation. He became anxious that he might have an accident resulting from his dizziness; his symptoms increased, and he became more than ever convinced that his heart was to blame. On account of the pain in the left chest we were unable to convince him that his heart was innocent.

Acute Emotional Reactions

There was a group of 13 cases in which the onset of Da Costa's syndrome was intimately connected with emotional reactions unrelated to effort or to any factor previously mentioned. In 8 of them the symptoms were misinterpreted and the heart was blamed, the development then following the lines of the induced or self-induced cases; the other 5 patients had full insight into their disability. An example of each type is given.

Case 9.—Positive family history. The patient was a nervous child, and one day during a geography lesson he had an attack of palpitations. It appears that geography was his worst subject, and he used to become very confused and anxious during these lessons. He seemed quite unable to master the subject; but, being conscientious, he struggled unsuccessfully to do so, and his attack was the result of emotion. He became very frightened; he was put outside, given sal volatile, and taken to the doctor, who told him he was anaemic. The boy, however, thought his heart was to blame, feared to exert himself, and developed palpitations, breathlessness, and choking sensations if he did so. One day he fell down some steps. He saw his doctor, thinking he might have injured himself. He was told he had tachycardia, and was kept under observation for eight months. He admits he was emotionally upset by his fall, and that his heart always raced in the presence of doctors. He was ordered light work. This he took to denote serious heart disease, and it appeared to confirm his earlier belief. The first time he did heavy work after this he felt ill, thinking he had strained his heart. Gradually, however, he undertook more, since having an interesting job he thought little about his condition, and as a result of experience he came to be reassured. But some time later, while climbing a steep hill, he became aware of palpitations, and his previous ideas were suddenly revived. He struggled on in great fear, and collapsed on the top of the hill, lying exhausted there for an hour. He was called up in September, 1939, and survived training for nine months. When his work became more strenuous he reported sick. He was convinced that his heart was responsible for his condition.

Case 92.—Born of a nervous mother, this man was always delicate and easily frightened, avoiding games at school because he was afraid of being hurt. He had a family love for horses, and at the age of 15 applied for a position in a racing stable at Newmarket. While standing on a platform previous to the interview, he had his first attack of palpitation, which he knew was due to emotion. Since then he has been prone to palpitations on excitement. He became a jockey, but was ashamed to find that he was afraid of accidents, and he began to dread riding. A variety of accidents increased this fear, and he finally gave up this work, so cutting himself off from the major interest of his life. During this period his symptoms occurred chiefly when riding, and he was fully aware of their cause. Later they developed on any exertion. He became a commercial traveller and improved in health. He joined the Army in May, 1940, and broke down at once, following inoculation; but he is well aware that the inoculation had little to do with his breakdown. He knew that he could not tolerate Army life, being terrified of anything associated with war.

Fear of War

This was an admitted factor in 40 cases, and probably occurred in many more. Patients do not readily admit what they believe to be cowardice. Fear was more often due to anticipation of battle than to experience of it, in the proportion of 34 to 6. It was the sole cause of Da Costa's syndrome in only 3.

Case 49.—Born of a nervous mother, this patient as a child was timid, and suffered from frequent bilious attacks; otherwise he was well, and physically fit. When war broke out he was very frightened, and wondered how he could escape military service. He pleaded financial difficulties, but this did not succeed. His first anxiety attack then occurred when riding in a bus. He made a second application for exemption, and this was also rejected. Next he went to see his doctor in the hope that he might be turned down on medical grounds, although at that time he did not think there was anything the matter with him. To his great joy, however, he was told he had a "rough heart," and would not be accepted by the medical board. A fortnight later he was dismayed to be passed Grade I. He made a final attempt to escape by applying for a job as a bus-driver for workers in a munition factory, but this failed to eventuate, and he joined his regiment. By this time his symptoms were well established, and he reported sick immediately. He was put on light duty, but steadily deteriorated, and was at last sent to us. The somatic effects of his fear were considerable, both subjectively and objectively, and were not especially associated with effort. Despite the obvious cause of his illness he really seemed to believe that his heart was weak, and feared to exert himself. I need hardly say that this story was not divulged at first.

Trauma without Serious Injury

This was a factor in 8 cases, and was responsible for the onset of symptoms in 2. Both patients admitted that they had lost their nerve: emotional symptoms were taken

to represent heart trouble, and the development and maintenance of the syndrome followed the lines of the post-infective cases. Motor-cycle accidents, falls from heights, a thrashing in the boxing ring, were each noted more than once. More serious injury seems to give a peculiar satisfaction to the patient: he receives true sympathy and respect, even a certain amount of honour, and there is no injury to his pride. Such men rarely develop a neurosis.

Discussion

The groups described are summarized in Table XVII. The essential common factor was the emotional reaction. The special feature which distinguished the group from

TABLE XVII.—*Cause of Incapacity for Effort in 100 Cases*

	Factor		Initial Cause	
Positive family history	75			
Constitutional	66		11	
Coincidence of fear and effort	26		19	
Traumatic left inframammary pain	9		6	
Induced: by the doctor	33	39	17	21
Induced: by autosuggestion	6		4	
Infection: uncomplicated	21	46	3	17
Infection: complicated by influence of doctor	16		9	
Infection: complicated by autosuggestion	9		5	
Acute emotional reaction from causes not mentioned under other headings: misinterpreted	17	27	8	13
Acute emotional reaction from causes not mentioned under other headings: understood	10		5	
Fear of battle: anticipated	34	40	2	3
Fear of battle: experienced	6		1	
Trauma (without serious injury)	8		2	
Known psychiatric disorder, but link with effort not established			5	
Unknown			3	

other psychoneurotic physical patterns was the establishment of a link between the emotional reaction and effort. This link was usually forged when emotional symptoms were misinterpreted and the heart blamed, so that fear of effort followed. The two steps were telescoped when the initial emotional reaction happened to occur during effort, for effort was then blamed at the outset. In a few cases emotional reactions were so severe, frequent, or protracted as to incapacitate without being linked to effort, an extreme example of this mechanism being paralysis by fright: a person in extreme fear may fight, flee, or collapse, and in this group we seem to be dealing with the third of these alternatives.

A careful study of several hundred histories has convinced me that the subdivision of "effort syndrome" into constitutional, induced, post-infective, psychoneurotic, and physically fatigued types is misleading if not meaningless. The mechanism outlined above could be demonstrated in 55 out of 66 constitutional cases, in all 21 induced cases, and in 14 out of 17 post-infectives; while 94% of the series were psychoneurotic and none merely physically fatigued. The constitutional factor was timidity, and fear was usually linked to effort during football, swimming, or other relatively dangerous activity at school; induced types were established when the patient was led to believe that his heart was weak and that effort might provoke sudden death; post-infective cases were commonly induced by medical or parental suggestion, or by autosuggestion.

The emotional reaction produced by effort after the required link is established is immediately misinterpreted, the symptoms being put down to effort itself. In this way a vicious circle is set up, and the patient's ideas are confirmed. It is suggested that, by a process of conditioning, effort may henceforward cause an emotional reaction, whether conscious fear is retained or repressed. Such a reflex would be facilitated by frequent repetition, and every time the meaning of the symptoms was misconstrued another layer would be added to the depth of the patient's conviction that his heart was at fault and effort dangerous. Continued or repeated emotional experiences complicate the syndrome, and, as would be expected, there are numerous varieties and elaborations of this essential mechanism.

I believe the evidence demands that Da Costa's syndrome be regarded as an emotional reactive pattern peculiar to psychopathic personalities and to subjects of almost any form of psychoneurosis. If this conclusion is correct then "effort syndrome" cannot be accepted as an adequate diagnosis. In these lectures I have paid no attention to psychiatric labels, but it should be clear that one or another could nearly always be affixed. If it is thought expedient to draw attention to the incapacity for effort, an example of a proper diagnosis might be: anxiety neurosis (effort intolerance).

Treatment

The treatment of Da Costa's syndrome depends upon our understanding of the mechanisms involved in its development, and must be largely prophylactic. Parents, child welfare clinics, and family and school doctors may prevent or provoke the condition. The failure to diagnose rheumatic carditis may be a bad mistake, but its diagnosis where none exists is worse. Militia medical boards must learn to recognize personalities that will not stand up to military service: a few intelligent questions are worth ten effort-tolerance tests. The medical officers in the Services must learn to diagnose neurosis on positive grounds: no greater blame can be attached to a psychiatrist who fails to make a physical examination than to a physician who fails to probe the mind. A few pertinent questions and the ability to listen to the replies are all that is required: lengthy details are not needed for diagnosis.

When the condition is discovered the patient should be handled firmly but with understanding by the medical officer of the unit. It is usually possible to decide at once whether the man is capable of adjustment and worth encouraging, or whether he is better discharged from the Army. Only the doubtful cases and those in which a little more time is needed should be sent to hospital.

Patients should be informed of the nature of their illness and be treated as psychoneurotics; their distaste for this label may prove quite helpful. The psychotherapy required is simple in its object and extremely difficult in practice. The patient must be induced to believe that he is suffering from the effects of emotional disturbance and not from any disease or alteration of visceral function. No more is gained by telling him that he has a nervous heart than by saying there is nothing wrong with him or that he has a weak heart. Reassurance can only be coupled with adequate explanation in terms that he can understand, the object being to discover the truth and then to expound it. If emotional stimuli are due to false fears —e.g., to misinterpretation of innocent symptoms—they can be removed; if to real fears, the patient must be encouraged to overcome them, and if he cannot he may at least learn to adjust himself to their presence. If the agitating stimuli are too much for him he is best removed from their presence after reasonable trial. It is most important that these measures should be adopted quickly, to prevent the establishment of a habit. As Cannon (1928) says: "Every time the nerve impulses traverse a given course they make easier the passage of later impulses. Thus habitual emotional expressions, both in the facies and in the viscera, may become fixed and deep-set in the neural organization, just as the complicated adjustments of swimming, skating, or bicycle-riding become inwrought during our later years by repeated practice."

If these men are to be of service to the nation they must receive individual consideration. If they are expert in some particular line they should be given employment in that line; if their civil work is of national importance it may be wise to discharge them from the Army; if anticipa-

tion of active service is the root of the trouble, give them non-combatant duty. We must not let our own emotions govern our treatment of these men, many of whom suffer more than we are aware. We should endeavour to make the most of material which is not suited to warfare: a man working is an asset; a man broken, a liability.

Physical rehabilitation helps normal subjects who are convalescent from infectious fevers or those who are simply out of training; but as a treatment for Da Costa's syndrome it evades the issue, and is about as effective as psychotherapy for cancer. The matter is discussed by Sir Adolphe Abrahams (1941). Occupational therapy prevents introspection and adds interest to the day, but it has little bearing on the outcome, according to Dr. MacIntyre, who has looked into its effect at our hospital. There is evidence, however, that with nothing to do patients tend to get worse.

Drugs are rarely indicated. Bromide or luminal may be of occasional value. Benzedrine on rising has been used with success to produce temporary improvement as an aid to psychotherapy (Myerson, 1936; Wilbur, MacLean, and Allen, 1937), and I have sometimes found it useful.

Prognosis

In considering the results of treatment recorded by different authors it is wise to compare only the percentage returned to full duty, for whether a soldier is put on light duty or whether he is discharged may depend upon the importance of his civil occupation. The figures rest to a great extent upon the nature of the material: thus Oppenheimer and Rothschild (1918b, 1918c) sent back to full duty 85% of 39 cases with a good background, compared with 9% of 46 constitutional cases; Krogh's 60% figure refers to men who were simply untrained to physical effort —a type which should hardly be included, for such men show no evidence of autonomic disturbance; the high returns of Hume (1918) and of Venning (1919)—58% and 48% respectively—were reported from the same centre in France, and depend upon a low incidence of constitutional cases and upon a correspondingly high incidence of types with recent onset. The average percentage returned to full duty by other authors is about 30—e.g., Da Costa (1871), 38%; Lewis (1918), 20%; Friedlander and Freyhof (1918), 30%. In my own series of 182 cases 31.3% were sent back to full duty and 36.3% to light duty; 32.3% were discharged. A recent follow-up shows that 25% are still on full duty.

The only reliable method of assessing the immediate prognosis is to consider the history—providing it is adequate. Table XVIII, which compares the accuracy of predictions based on the effort-tolerance test, the breath-holding test, the number of physical signs, and the history, shows this clearly. Full duty was predicted on a one-minute deceleration time, on a breath-holding time of at least thirty seconds, on the presence of not more than four of the physical signs, or on an encouraging history which involves consideration of too many points to enumerate; light duty, on a two-minute to three-minute deceleration time, on a ten-second to thirty-second breath-holding time, on the presence of five to eight physical signs, or on an indifferent history; discharge on a deceleration time over three minutes, on a breath-holding time under ten seconds, on more than eight physical signs, or on a bad history.

TABLE XVIII.—*Comparison of Factors influencing Prognosis*

Basis for Prognosis	Percentage of Correct Predictions			
	For Full Duty	For Light Duty	For Discharge	Average for all Groups
Effort-tolerance test	33.3	32.0	33.3	33.0
Breath-holding test	42.0	38.0	53.0	44.3
The number of signs ..	58.5	49.5	58.0	55.3
History	79.0	62.5	94.4	78.6

These predictions were made at the first examination of the patient. The history is seen to be by far the most important guide; the number of physical signs comes next; the breath-holding time is better than nothing; while the effort-tolerance test is valueless, for the prognosis based on a knowledge of the total results obtained would be about 33% for each category anyway. The final disposal of the cases upon which these figures are based depended chiefly upon the sorting obtained by means of graduated exercises and route marches—at any rate in respect of those sent back to full duty.

The ultimate prognosis was investigated by Grant (1925). Of 601 cases studied over a five-year period following the last war 15.3% recovered, 17.8% improved, 56.2% were unchanged, and 3.2% were worse; the remainder developed serious disease of one kind or another. The age of the patient was important, for the percentage of cures fell from 25 in the group aged 17-20 to 2.1 in the group aged 41-50.

Summary and Conclusions

The symptoms and signs of Da Costa's syndrome more closely resemble those of emotion, especially fear, than those of effort in the normal subject.

The mechanism of the somatic manifestations depends upon central stimulation, not upon hypersensitivity of the peripheral autonomic gear.

This central stimulus is emotional, and is commonly the result of fear.

The reaction becomes linked to effort by a variety of devices, which include misinterpretation of emotional symptoms, certain vicious circular patterns, the growth of a conviction that the heart is to blame, consequent fear of sudden death on exertion, conditioning, and hysteria.

Incapacity tends to be exaggerated consciously or subconsciously in order to protect the individual from further painful emotional experience.

Treatment in the Army is shackled by inability to remove the distressing environmental factors which have caused or have aggravated the breakdown; by the difficulty in establishing intimate contact with a patient who did not choose his medical confidant; by the duty of having to serve the State first, the patient second.

It is urged that the diagnosis of "effort syndrome" be dropped. A proper psychiatric diagnosis is nearly always available: if attention is to be called to the presence of effort intolerance, let effort intolerance be added (in brackets).

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SYPHILITIC THORACIC ANEURYSM IN YOUNG ADULTS

BY

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Syphilitic thoracic aneurysm rarely occurs in patients under the age of 30; only two of the 840 admitted to the London Hospital during the past forty-six years were below this age. These two, with a third which was recently under my care, are here described.

Case I

A man aged 29 was admitted to the London Hospital on January 16, 1899. Seven years previously he had contracted a penile chancre, and was treated with potassium iodide for seven months. For three months before admission he had complained of cough, increasing hoarseness, pain in both arms, and, later, of great difficulty in breathing.

On examination he was orthopnoeic, and inspiratory and expiratory stridor was present. His voice was hoarse, and he had a persistent croupy cough; both the vocal cords were completely paralysed. The right pupil was smaller than the left. There were "tissue paper" scars on both legs. The left pulse was stronger than the right. There were pulsation and dullness to percussion just below the right clavicle. The apex beat was in its normal position. The second sound in the aortic area was accentuated. A loud systolic murmur was heard near the right clavicle, but there was no mention of a diastolic murmur. Scattered rhonchi were heard in the lungs. The day after admission tracheotomy was performed without relief, and the patient died after four days. A clinical diagnosis of tracheal obstruction due to diffuse aneurysm of the aortic arch was made.

At necropsy the aorta was dilated from its origin, producing relative incompetence of the aortic valve, and it reached extreme dilatation two and a half inches above the valve, converting the whole of the arch into a large irregular aneurysm, with a thin wall in parts, and filled with laminated blood clot. Projecting from the main aneurysm were daughter aneurysms with small irregular openings of various sizes up to three-quarters of an inch in diameter. The right subclavian artery, right carotid artery, and both recurrent laryngeal nerves were pressed upon. The aneurysm compressed the trachea on the right side one and a half inches below the tracheotomy wound. There was diffuse bronchopneumonia of the lower lobes of both lungs. The heart weighed 22 oz. (625 grammes).

The macroscopic description of the aorta suggests an aneurysm due to aortitis rather than to mucous degeneration of the media, or to severe medial degeneration associated with atheroma.

Case II

A man aged 28 was admitted to the London Hospital on August 8, 1913. Eight years previously he had contracted syphilis and been treated for three months with injections. For six weeks before admission he had complained of shortness of breath on exertion, periodic attacks of severe coughing without expectoration, and a dull aching pain behind the sternum and in the left axilla that sometimes radiated down