

## REPRINTS AND REFLECTIONS

# Coronary disease and modern stress\*

IMcDG Stewart

There has been a vast increase in coronary disease during the present century. The malady strikes predominantly men in middle life. It is common to all modern States, yet in some thickly populated parts of the world it is unknown. The immunity enjoyed by members of primitive races disappears if they subject themselves, in exile, to the rigours of civilised life. Two main influences are brought to them by civilisation—unfamiliar mental stress, and increased richness of diet. The first of these is considered here.

## The mind and disease

We are continually assured that the 20th century belongs to the Common Man. In medicine it is the Whole Man who has become the fashion. This is the age of the psychosomatic approach. An early question to be decided on first encountering a patient is: What sort of person is this? In the language of the initiate, assiduous efforts are now made to relate organic illness with basic personality type. It proves a considerable task, since personality not only creates its own endogenous stresses but also determines such factors as occupation, which further introduce the extraneous influences of environment.

In some diseases, however, the relation appears clear enough. Thus, few doctors could have much difficulty in agreeing with Avery Jones (1948) that sufferers from peptic ulceration tend to be 'tense, possess unusual drive, and are over-conscientious in their work. They ... worry unduly, but do not give way to their emotions.' In fact, they belong to what Ogilvie (1949) describes as the 'surgical registrar type', a category not so narrow, one ventures to think, as totally to exclude medical registrars.

A similar connection between disease and type of personality is sometimes claimed on grounds which appear less substantial. Wittkower (1938) studied 40 unselected cases of ulcerative colitis. According to him the illness was preceded by psychological abnormalities in 37 of them. He ascribed to these patients a fair selection of the traits of human temperament.

In particular he decided, like Hardy (1945), that colitis tends to occur in a 'mother's boy' sort of person, contrasting thus with the psychologically mature ulcer type. Paulley (1949) now suggests that the temperament of regional ileitis victims may be somewhere between the two. At this rate it appears that a precise mentality is shortly to be affixed to disorder in every foot of gut.

Inevitably there is also a 'coronary type' personality. Most physicians have their own ideas of it. The psychiatrists are explicit. Describing the temperaments he found in a group of

people who had suffered coronary infarction Arlow (1945), at a meeting in America, remarked that 'what disturbed these patients most was to fail in the role of their deeper identification, and to fail under circumstances which convinced both the outer world and themselves that they were not as good as they thought ...' Fear of failure, he observed, was always liable to turn to aggression, 'the kind of identification one sees in women ...' It was then associated with 'sexual fear and identification with the male ...' accompanied by 'a desire to oppose them in open competition'.

The trouble with this kind of speculation is that it is too comprehensive. There is something for everybody. 'I thought I recognised myself rather clearly' was Dock's comment after he had listened to these observations by Arlow. There remains always the fundamental question: How far does all this affect structure? 'Do you gentlemen mean', inquired Boas quizzically at the same distinguished gathering, 'that these mental mechanisms are the cause of arteriosclerosis?'

In truth the problem is not simple. Ogilvie (1949) accepts essential hypertension as 'a new disease, and a stress disease ... the price the millionaire pays for his directorship and the clerk for his failure.' But when asked how stress can cause this effect he replies: 'I do not know, and if anyone does he has not told me.' Any attempts to find a psychosomatic explanation for coronary atheroma and its syndromes must encounter much the same difficulty. Witts (1949) has pointed out that the role of the mind in the pathogenesis of organic illness is more difficult to assess than is popularly supposed, and that in those few maladies, such as thyrotoxicosis, in which its influence has been established, the demonstration has been achieved only as a result of elaborate laboratory research, never (according to Witts) from the recesses of an armchair. And seldom, I suggest, from within the curtained closets of the psychiatrists. Nevertheless, there are recognisable today many associations between conditions of life and specific illness. Always there is the hope that study of such links may produce a clue to aetiology. That the stress of modern times may contribute to the causation of coronary disease is a possibility that merits such examination.

The genesis of mental stress must depend on the nature of the predicament that causes it in relation to the character of the person involved. Heredity is the main factor in the determination of character. Admittedly it is responsible for much else besides. At this stage let us consider in all its aspects heredity as it bears on the aetiology of coronary disease. Later there will be examined the forms of mental stress which may be evoked by modern conditions of life in persons whose native temperament renders them susceptible. Finally there will remain to be answered the fundamental question whether sufferers from coronary disease can be identified as the particular victims of these new mental stresses.

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## Heredity

Boyd (1934) includes coronary disease among those conditions which may result from inherited constitutional 'weakness'. Coombs (1916) and Hadfield (1927) took much the same view. Indeed the contention is scarcely in dispute. It receives general assent from clinicians. Cassidy (1946) considered that half his cases showed a family history of the illness, and Levine (1929) holds that heredity is of 'considerable importance', adding 'it is amazing how frequently one finds various members of the same family suffering from early vascular hypertension or coronary disease'. Ryle (1948), too, accepted the fact that 'genetic factors' probably play a part, 'whether through physical or temperamental predispositions or both'. Dock (1946) points out that there is a hereditary variation in the thickness of the coronary intima which follows the sex difference in the incidence of coronary disease.

Controlled statistics have been provided by Yater *et al.* (1948) for myocardial infarctions in young American soldiers. They discovered a history of coronary or hypertensive disease in 41% of close relatives, a term which they define as including only father, mother, brother and sister. This percentage they compared with a group of hospital amputation patients. Of these only 13% admitted a similar family history. Hypertension and coronary disorder are, of course, by no means invariably associated. Nevertheless there exists a close relation between the two, particularly among women at all ages and in the older patients of both sexes. It is reasonable to conclude that heredity is an important factor in the pathogenesis of coronary affection. Further inquiry is thus suggested into the physical and mental components of diathesis.

The famous physicians of the recent past judged constitution to be of great significance. In assessing it they tended, perhaps, to rely more upon physical qualities than upon the temperament of their patients. Hurst, in the tradition of Addison, Bright, and Hodgkin, was wont to assume a whole chapter of information from the width of a costal angle. According to this school of thought coronary disease develops in the sthenic or Falstaffian type of man. Olser (1910), however, already took account of temperament in maintaining that he could recognise his angina patients as they entered the room. He described in detail 'a well-set man from 45 to 55 years of age, with military bearing, iron-grey, and florid complexion ...' He would be 'robust and vigorous in mind and body, the keen and ambitious man, the indicator of whose engines is always set at "Full Speed Ahead"'. Levine's (1929) phraseology is much the same: 'The typical patient is a well-set person, somewhat overweight ... physically strong ... with appearance of good health and capable of vigorous physical effort.' Many physicians today would agree with these impressions.

In Boston they deal with somatotypes. According to White and Ferrero (1949) they have been finding there that it is 'the mesomorphic young male who is particularly prone to early coronary thrombosis ...' whereas the ectomorphic type is happily spared. Even in America, however, statistics scarcely keep pace with clinical impressions. Yater *et al.* (1948) concluded that stature was irrelevant.

Investigation by many authorities has, in fact, revealed that the physical element in constitution, so far as it is perceptible to clinical examination, is not very helpful. Little more can be

shown than the fact that obesity, particularly in men, predisposes somewhat to coronary atheroma. The hereditary variation in the thickness of the coronary intima may be of much greater importance.

Neither can there be any clear-cut standard of 'temperamental predisposition' to mental stress. The test of war proves that the resources of human nature are unpredictable. In time of peace a man's inherent temper guides him in his choice of employment. Any tension which his work may engender then plays back on his mind and personality. It is reasonable, therefore, before attempting to survey the problem of stress as a whole, to pass from the mental and physical sanctions exacted by heredity to those deriving from environment as presented by education, occupation, and class.

## Education, occupation, and class

It is well established that not all members of the community are equally menaced by coronary disease. Doctors are wont to complain with reason that they are worse hit than any. Much has recently been written on the subject in America. It has been shown that the death-rate among medical practitioners rises sharply, in comparison with the average, above the age of 45, this increase being largely due to cardiac maladies. Dublin *et al.* (1947) give as 1.18 the mortality ratio expressing the death-rate due to heart-disease among doctors compared with that affecting the general male population of parallel age. Others go further. Dickinson and Walker (1948) echo Olser and many of their own contemporaries in declaring roundly that 'heart disease is in reality an occupational hazard of the medical profession'. *The Journal of the American Medical Association* (1944) blamed it for 1 death in 5 among American physicians. During a clinical meeting in the same year Dock observed to his interested colleagues that coronary affliction might well be worthy of their interest, since 'a quarter of us in this room are going to die of it'.

How does this proportion compare with that in other professions? Cassidy (1946) maintained that there was 'an unquestionably heavier incidence of coronary disease in the non-hospital as opposed to the hospital population'. Although they refer to a period which includes some of the years before the war of 1939–45, the figures provided by the Registrar General's last Decennial Supplement afford information of great interest. The adult population is divided into five successive classes on grounds of occupation and income, two factors which a few years ago bore a closer relation to each other than in these days, when the charwoman is so much better off than the ward sister, and the income of a prolific docker exceeds that of a celibate university tutor. Class 1 contains the professional workers, and the grades then proceed to class 5, which is made up of unskilled labourers. It is seen that the proportion of deaths from coronary disease is well above the average in the first two classes, and well below it in the last three. Even more remarkable is a comparison of occupational groups in which the figure 100 is taken to represent the average death-rate from coronary disease for all males aged 20–65. The following significant figures are revealed:

Agricultural workers	32
Coalminers below ground	40
Banking and insurance officials	183

Anglican clergy	218
Physicians and surgeons	368

In the face of such evidence it is difficult to see how Master (1947) can justify his contention that 'no occupation has any priority in this disease', even if it be true that 'rich and poor, the labourer, the executive, the ordinary man at his desk are all possible victims'. His view sharply exemplifies the dissent at the highest professional level that so often enlivens discussion of aetiology of coronary heart-disease.

Less attention has been paid to physical stress. Levine (1929) is 'inclined to think that hard physical work is conducive to early disease of the coronary arteries'. He declares himself to have been 'impressed by the fact that athletes seem to succumb to vascular disease in surprisingly early years of adult life'. It is generally believed, however, that great exertion never initiates damage to the heart. The effect of physical labour was further investigated in America by Phipps (1936), who showed that the prognosis after a thrombotic attack was better in his labouring-class patients than in the white-collar workers.

It seems to be beyond dispute that the better educated, and those who work with their brains, are more liable than their fellows to coronary disease. Why this should be is not clear. Reasonably it may be postulated that these people are exposed to a particular form of stress. If it could be proved that such stress may lead to metabolic change, perhaps to increased blood-pressure, an important step might have been taken towards finding a cause for generalised atheroma. There would still require to be explained the strange predilection by which atheroma develops disproportionately in the coronary vessels, arising there not infrequently in the total absence of lesions elsewhere. According to Dock (1946) 'the chief cause of death of American men during their period of highest earning capacity is to be sought in the peculiar susceptibilities of a few tenths of a gramme, or at most in a few grammes, of coronary intima'. This selectivity of the pathological change is the kernel of the problem. The solution must await the results of further research conducted in the laboratory and requiring the assistance of expert biochemists and morbid histologists. From such recondite spheres mere speculation withdraws in modest confusion. In the meantime it is important that improved understanding by clinicians can already indicate the most likely victims. The appreciation is empirical but none the less valuable.

What is it, then, that in the lives of professional men predestines so many of them to death from coronary disease? Are they more harassed than their less educated contemporaries? Do their ranks contain a monopoly of 'worriers'?

Mental stress is elusive. It does not flaunt its dominion. Rather does it lurk within the shadows of life. The shapes which it assumes are infinite, and constantly changing, appearing to no two men alike. Trials which to some might be intolerable are by others not even perceived. Is there some form of stress which weighs upon the 'workers by brain' more heavily than upon the 'workers by hand'? It is necessary to go more closely into these questions.

## Origins of stress

Nowadays it is scarcely possible to open a newspaper without seeing a reference to the 'stress' of modern existence. It seems

to be held almost universally today that things are pretty tough—bad enough, in fact, to account for almost anything.

Most leading cardiologists regard this proposition with caution. There was a time when many of them seemed ready to welcome it as an explanation of the new forms of vascular disease. Paul White has admitted that in the first edition of his book *Diseases of the Heart* the element of stress as a factor in the pathogenesis of coronary disease was emphasised in italics; in the second edition the reference appeared in ordinary print; in the third it was deleted.

The trials of life have usually appeared exceptional to the generation called on to bear them. In 1910 Olser was already asking whether the 'high-pressure life' of the new century was making angina more common. To readers of Sackville-West the Edwardian period now suggests the tranquillity of a Golden Age. In the slums, at the turn of the century, things were less happy, but Olser was not referring to the troubles of the poor. Time, like distance, lends enchantment. The magnolia-scented South of America was perhaps never quite so gracious as reputed of the days that are gone with the wind, nor England ever so 'merrie' as she appears in retrospect. Mere survival during the Wars of Roses and the Rebellion must have provided ordeals no less trying than the modern fish-queue. It is tempting to agree with Master (1947) when he maintains that 'stress and strain today is not greater than that which existed in ancient times during periods of war, great fires, plagues, and famine'. Yet in those times coronary disease seems to have been rare.

Neither is it easy to trace evidence of particular stress in those who have developed heart-disease. Cassidy (1946) believed that most of his cardiac patients had lived 'remarkably placid and sheltered lives'. Levine (1929) has written: 'Concerning mental tension it is our impression that it is only of minor importance in coronary disease.' Despite such scepticism the Spens Committee accepted the suggestion that it is the 'strain of medical practice' that shortens the expectation of life in doctors—largely because of heart-disease.

What conclusion can be drawn from such varied opinions?

Mankind has always been subject to the constraints of human bondage. The question thus becomes: Has there developed during the last few decades, as a result of the increased 'pace' of life, any special stress bearing preponderantly upon the educated male section of the community? I believe that there has—and that its influence is becoming more widespread.

The essence of this stress is that it confronts its victim with an opposition which he feels himself driven to combat, and capable of surmounting, but only at the cost of extreme and long-continued effort. In the end he is as likely as not to fail, to have it forced upon him, in fact, as Arlow (1945) suggests, that he is not as good as he thought. 'Ambition minus reality equals neurosis', writes Beverley Nichols, quoting the words of a woman psychologist who thus identifies the source of many ills in modern America. Or it may be that a man's work is mentally distasteful to him. Experimentally such a situation has been investigated by Wolff (1946), who found that a healthy individual when 'asked to do a task he did not relish ... at which he was convinced he would fail, exhibited ... a striking increase in blood-pressure', which might persist for forty-eight hours.

The corroding effect of such endeavour is not usually revealed. The physician may miss it. Indeed he is seldom consulted and has little opportunity to discern it. Disasters such

as flood and famine, war, and pestilence are outside the control of the individual. They do not produce the same tension. They are accepted—since there is no alternative. The victim becomes *débrouillard*. He does what he can. If that should not suffice, he cannot blame himself. There is no element of competition. He need not feel that he has wasted half a lifetime, that if things had been a little different then he, and not Jones, would have won the promotion on which he had set his heart.

Not all temperaments are susceptible to this modern stress. Women are almost immune. It belongs to the office and the technician's bench, not to the kitchen or the Labour Exchange. For all sorts of women there is perhaps no greater anxiety than that of too often repeated pregnancies. The haunting possibility of what seems an almost intolerable further burden is seldom far from the thoughts of the average housewife. Yet should her fears be realised she is usually ready to accept what appears to be inevitable. No mental conflict develops. She is saved by her philosophy of acceptance. So also is the unskilled labourer—and for the same reason.

Today, more than ever before, the intuition of the manual labourer is to put his trust in collective action and wait for something to turn up. 'The worker has not got the individualistic ethic', wrote Giles Romilly recently in the *New Statesman*; 'his standards and values are cooperative, not competitive'. Individual providence he regards with contempt. Whatever the size of his pay-packet he makes a point of spending all that he earns. So long as things are going well for him, he takes inflated prices in his stride, scorning to limit his consumption of beer and tobacco, while continuing to invest an average of ten shillings a week on horses, dogs, and football pools. He is content, if not with his lot, at least with himself. No sentiment of self-reproach assails his peace of mind. Neither is he troubled by ambition. He does not plague himself to master new techniques. Indeed he is profoundly suspicious of all change unless it promises shorter hours or higher pay. One of his deepest instincts is his distrust of rivalry in any form. To him the faintest breath of competition carries with it the odour of past exploitation. He wants neither more nor less than his fellows. Loyalty to his 'own people' is his supreme concern. All his problems are laid upon the altar of this restricted solidarity. He knows it for his source of strength and he will have no truck with anything that might impair it. From time to time he is likely to decide, in conjunction with his mates, that it would best serve his interest to take a few days off. On these occasions it may well happen that a private soldier, being required briefly to take his place, will learn between breakfast and lunch to perform with equal efficiency the labour at which he has spent a life-time. He will observe the fact without a pang.

The same tendency is plain among adolescents. It remains the dearest wish of most of them to leave school at the earliest possible moment, thus qualifying without delay for the quick rewards available in industry. Neither do they later evince the slightest desire to learn more than will barely suffice for their employment. A recent inquiry conducted by the West Hill Training College revealed much about the habits of teen-agers in Birmingham. The general impression was judged to be 'depressing'. The lives of these boys and girls, it was thought, must be 'empty and barren'. The organisers of the inquiry professed themselves 'astonished' that the standard of writing and spelling should be so poor, and that the reading of a great

many should be limited to 'comics'. Such findings are unlikely to surprise anyone who has lived with troops or worked in the wards of a hospital. As might have been expected, the cinema was shown to be universally popular among these young people, the whole group averaging three visits a fortnight. Expense proved no handicap. They had plenty of pocket-money. Indeed about 13% of the boys were betting regularly each week. Of their newspapers the *Daily Mirror* easily topped the list. Not that they concerned themselves greatly with happenings of the day. With few exceptions the most that might be said of their study of affairs was that if their interest could be momentarily captured by a comic strip, or a picture of a half-naked girl, it might prove possible so far further to entice their recalcitrant attention as to bring them to figure out a line or two of black type.

It is surely undeniable, from a cursory study of contemporary life in England, that most people, both young and old, feel no inclination whatever towards individual self-betterment. No doubt it has always been so. Illiteracy 50 years ago was far more widespread even than it is now. Despite the temporary setback of war it will no doubt continue to decrease. Neither does absence of personal ambition imply any lack of manifold stalwart virtues, though perhaps it is to be feared that the changed economic and political trends of the modern world will threaten increasingly those whose philosophy is that of acceptance. Orwell (1949) saw the workers of 1949 as the 'proles' of 1984. They had undergone a subtle degeneration: 'heavy physical work, the care of home and children, petty quarrels with neighbours, films, football, beer, and, above all, gambling, filled up the horizon of their minds. To keep them in control was not difficult ...' But the proles, nevertheless, whatever their masters may have thought of them, were the only happy people in Oceania. One can be sure that, like their prototypes, they were little troubled by coronary disease.

How different is the attitude of the minority. During the last 50 years the progress of what Witts calls the Second Reformation has induced the stirrings of ambition in many young men who, in an earlier age, would have spent their lives in manual toil. No other possibility would have occurred to them. Today their newborn hopes have been fostered by increased facilities for secondary education. As a result these budding engineers, clerks, and craftsmen have found themselves entering into bitter competition with each other in an effort to secure scope for their new talents and consequent entry to the pathways of personal advancement. In this way new sections of the population have become exposed to the modern form of stress. The struggle which awaits them proves severe. Blacker (1949) points out that the aspirations so kindled are likely to become increasingly thwarted. There are not enough places to go round. To quote a university student: 'There is a sense of fighting all the time ...', with the consciousness that 'it is vital not to let anyone get ahead'. While the contest lasts poverty depresses the standard of living among these young men below that of the lowest paid manual worker. Of those that fail few can accept with equanimity the return to well-fed serfdom in factory, dock, or mine. They have lost their habit of acceptance. The memories of vanished hopes pursue them relentlessly in defeat. Nevermore can they escape their own attempt to strike out for themselves.

There remain too, in England, the tattered survivors of the former 'middle classes', from whom it is now thought proper

that resentful and idle mediocrity should exact every conceivable tribute. From the first these were the chosen victims of coronary disease, whether or not as the result of their way of life. Recently the many modern troubles which assail their domestic security have become disproportionately aggravated. In the words of Mabane (1949) 'to all who pursue an independent life, and who by their ability and effort achieve a high earning capacity, the problem of provision for retirement and even more, provision for dependants on death, is a constant and gnawing anxiety'.

At this half-way stage of the twentieth century there are, in fact, two Englands; but they are not the Englands referred to by Disraeli when he wrote of the Chartists in his novel *Sybil*, not the England of power and privilege on the one hand and poverty and constraint on the other. Rather does the division lie today between the few who still regard independence as the ultimate goal, striving towards it in circumstances of unprecedented difficulty, and the many who are prepared to surrender it in return for the nebulous rewards offered by the Welfare State. Only upon the few does modern life exert its particular stress, and from among them exact its fatal tribute.

## Conclusion

Here then is a significant parallel. New conditions of stress, and a heavy preponderance of coronary disease, have in recent years arisen concurrently within the same small sections of civilised communities. These two developments have been present long enough for it to be possible that the first should be cause and the second effect. It is, in fact, reasonable to identify sufferers from coronary disease as the selected victims of modern stress. Little more can be said at present. Nothing is proved. Nevertheless, the coincidence is remarkable.

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Ian McDougall Guthrie Stewart (1914–1988) joined the Royal Army Medical Corps immediately after qualifying in medicine in 1939. He was a prisoner of war from 1941–1945, after getting captured during the battle for Crete. Surviving punishment for repeated incidents of insubordination, he returned to hospital medical posts in London, Bristol and Lytham. In parallel with his clinical work and research in hypertension, he had a career as a sports commentator on radio, notching up over 500 broadcasts. His 1966 military history *The Struggle for Crete* remains in print 36 years after publication.

# Commentary (1951): Coronary disease and modern stress

Robert Platt<sup>1</sup>

Sir—Recovering from an acute respiratory infection has given me more leisure than usual to peruse your issue of Dec. 23, and with it Dr. Stewart's article. This I much enjoyed, though more as an English essay than as a scientific paper. I suppose one can enjoy an essay and still question some of the premises and disagree with some of the conclusions of the essayist.

Dr. Stewart starts with a few dogmatic statements which are surely very controversial, and goes on to a cautious and fairly critical examination of the evidence as to whether 'modern stress' has caused an increase in coronary disease, and finds that much of this evidence is inconclusive or conflicting. He does, however, seem convinced that 'the better educated and those who work with their brains are more liable than their fellows to coronary disease'. The only statistical evidence for this which Dr. Stewart cites (and it is surely a question of statistics) is: (1) Dublin *et al.*,<sup>1</sup> that the mortality ratio of heart-disease amongst doctors is 1.18 of the general male population of parallel age—not a very striking figure compared with influenza, for instance (*vide infra*)—and (2) the Registrar-General's Decennial Supplement for 1931 (the last to be published) which shows that if the death-rate from coronary disease in the general male population is 100, it is for:

Agricultural workers	32
Coalminers below ground	40
Banking and insurance officials	183
Anglican clergy	218
Physicians and surgeons	368

Now I am very fond of the R-G's Decennial Supplement and happen to have it in bed with me; but its accuracy depends, as I have pointed out before<sup>2</sup> upon the accuracy of the material from which it is compiled—namely, death certificates. The majority of persons do not die in modern well-equipped hospitals, do not have post-mortem examinations, and are not seen by consulting physicians or cardiologists. The death certificates from which these figures were compiled were from the years 1930–32. Levine's classical article on coronary thrombosis was published in 1929, and although the condition had been recognised before, and the association between coronary-artery disease and angina pectoris had long been known, it is fair to say that coronary thrombosis as a cause of death was not commonly diagnosed even by experienced physicians until about 1930, amazing though it may seem. The

majority of such deaths would be certified as myocarditis and myocardial degeneration. Diagram 3 (p. 30) of the Decennial Supplement shows clearly that while 'angina pectoris' increases as we go up the social scale, myocardial disease does exactly the opposite; and the table on p. 162 shows that the figures for 'myocardial disease' are for banking officials, etc., 59, and for anglican clergy 57; whereas for cotton strippers and grinders (social class IV—surely not educated brain-workers) the figure is 213. Doctors show an excess in both categories.

As the R-G (or one of his henchman) points out on p. 60:

'degenerative disease in the heart affects all classes of males to much the same extent, but whereas amongst men whose social conditions are most favourable it tends to express itself as angina pectoris or coronary disease, at the other end of the scale it tends to take forms described on death certificates as myocarditis or myocardial or cardiovascular degeneration.'

This is surely a most important statement without which most of the figures quoted by Dr. Stewart are very nearly meaningless. (He probably had not the benefit of a respiratory infection when compiling his paper.)

I venture to suggest that the likelihood of persons dying in 1930–32 having seen a consulting physician or cardiologist might well be in the following order:

Physicians and surgeons
Anglican clergy
Banking and insurance officials
Coalminers below ground
Agricultural workers

and that the chief difference is not one of disease but of nomenclature. Perhaps the 1950–52 figures will show an equally nice social distinction between 'coronary thrombosis' and 'myocardial infarction.'

Despite this there is still a slight preponderance of deaths due to heart-disease in males of social class I, and probably a considerable preponderance in doctors. I am not trying to make out that it does not exist—merely that a great deal of it is illusory.

Incidentally, if my present illness should require entry on a death certificate I feel sure that it will be described (probably erroneously) as 'influenza' and I am sorry to note (Decennial Supplement, p. 256) that the standardised mortality ratio for doctors of my age-group is 133 (or 1.33 in the terminology of Dublin *et al.*); but the fact that the highest rate for influenza is amongst 'makers of non-metalliferous mine and quarry products' restores some of my hopes for the New Year. As a bedside author I can recommend the R-G very highly.

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<sup>1</sup> Dublin LI, Spiegelman M, Leland RG. *Post-Grad Med J* 1947;**2**:188.

<sup>2</sup> *BMJ* 1947;**ii**:77.

Robert Platt (1900–1978), latterly Lord Platt of Grindleford, was a major figure in 20th century British medicine. His research work was on diseases of the kidney, but he is perhaps now best remembered to epidemiologists as a participant in the “Platt versus Pickering” debate regarding the nature of essential hypertension.<sup>1</sup> Platt took the position that hypertension consisted of a distinct (largely genetic) condition, rather than reflecting the upper portion of a normal distribution. The competing articles of Platt and Sir George Pickering have been edited elegantly by the late John Swales,<sup>1</sup> and still make constructive reading. However, as Swales points out, at times it appeared that the debate was maintained for its own sake. When Platt misquoted Lewis Carroll’s “The Hunting of the Snark” by attributing the phrase “what I tell you three times is true” to the snark rather than the bellman, the following poem appeared in the correspondence column of the *Lancet*.

Sir—

Schoolmen contending, ego on high.  
Words without ending, truth’s never nigh.  
Facts may be lacking—argument’s free,  
Keep on attaching, P versus P  
“Your curve’s biphasic”. “Single bell mine”.  
“Your brain’s dysplastic, weak in design”.  
Readers are tiring, editors bored,  
Spare us more firing, spare us, O Lord!

Peace be to Pickering, silence on Platt  
Truce to their bickering, leave it at that.  
Candles are flickering, Platt’s in the dark,  
“Goodnight, dear Pickering; wrong about Snark”.

Birmingham

DOUGLAS HUBBLE

<sup>1</sup> Swales JD (editor) *Platt versus Pickering: An episode in recent medical history*. Cambridge: The Keynes Press, 1985.

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# Commentary: Modern stress and coronary heart disease: still problematic

S Leonard Syme

It is easy to dismiss this paper.<sup>1</sup> Stewart poses an interesting question and then suggests an answer based on clinical speculation, anecdotes, and selective citations from the literature. The paper was published in 1950 and while it is true that there was not a lot of good data available at that time, there was some, and it was not used. Why, then, pay attention to this paper now?

The problem Stewart deals with is the observation of a major increase in coronary heart disease (CHD) during the first half of the 20th century among middle-aged men living in ‘civilized’ countries. He points out, however, that this explosion of CHD is unknown in members of ‘primitive races’. Importantly, he notes that this immunity in primitive peoples disappears when they become exposed to ‘civilized life’. What is it, he asks, about civilized life that could account for this amazing phenomenon?

One would think, even in 1950, that the obvious first-choice candidates to explain this ‘vast’ increase would be such things as changes in diet, blood pressure, obesity, cigarette smoking, or physical activity. These are hardly mentioned in the paper. Instead, Stewart focuses his explanation on emotional stress,

‘modern stress’. The evidence he develops in support of his view is not at all convincing but, in developing his thesis, he makes five important points that are of interest today:

1. Stewart began with a population fact: the increase of disease in certain population groups. He then sought an explanation for this finding at the population level. He noted that the increase in CHD was primarily evident in professional workers and especially in physicians and surgeons. Those in the lower occupational grades had much lower rates. Explanations of this type of population difference in disease usually are reductionistic: they attempt to explain group data by referring to data on individuals. Stewart more appropriately explores for explanation such ecologic phenomena as changes in the work force, in educational policies, in ‘modern life’. This is an important and innovative departure from the usual practice.
2. Stewart reviews the evidence for a genetic explanation but concludes that genetic factors are most often predispositions that become important when environmental forces impinge upon them. This was a useful way of thinking about this issue in 1950 and, in this time of the genome, it still needs

to be emphasized today. His suggestion for studying the environment is to consider the role of 'education, occupation, and class'. We are only now beginning to appreciate the importance of these factors.

3. Stewart considers the role of personality in the aetiology of disease. He notes that investigation of this issue 'proves a considerable task, since personality not only creates its own endogenous stresses but also determines such factors as occupation, which further introduce the influences of environment'. These comments reflect a thoughtful insight into the role of the unmeasured confounder. Today, we still struggle to understand the role of occupational status in the aetiology of disease; it is useful to remember that people do not sort themselves into occupational categories at random. The role of a variety of unmeasured variables (including psychological factors) in influencing choice of occupation and choice of remaining in or leaving a job is still not well understood, and it needs to be.
4. This paper is about stress. I had always thought of John Cassel's 1976 paper on host susceptibility to have been the first careful analysis of the misuse and overuse of this concept. In that paper, Cassel noted 'the simple-minded invocation of the word stress ... has done as much to retard research in this area as did the concepts of the miasmas at the time of the discovery of microorganisms'.<sup>2</sup> I had forgotten that Stewart made essentially the same point 26 years earlier. He said 'Nowadays it is scarcely possible to open a newspaper without seeing a reference to the "stress" of modern existence. It seems to be held almost universally today that things are pretty tough—bad enough, in fact, to account for almost nothing.' Stewart then describes a very particular and specific type of stress (competition to succeed) as being of aetiological significance. Whether or not one agrees with his formulation, it is of importance that he attempted the development of this more focussed hypothesis.
5. There are in this paper many concepts that seem antiquated and hurtful, even considering that the paper was written over 50 years ago. Mention has already been made to the description of people living in England as being civilized, compared to members of the 'primitive races'. With regard to manual workers, he notes that 'whatever the size of his pay-packet, he makes a point of spending all that he earns ... scorning to limit his consumption of beer and tobacco ... and investing

what little he has on horses, dogs, and football pools. He is content with his lot'. But Stewart also introduces some concepts that are of great significance today. For example, he describes the circumstances of people confronted with disasters such as 'flood and famine, war and pestilence'. He suggests that these terrible events do not have the same impact on health as other modern problems because they are outside the control of the individual. They are accepted because there is no alternative. People do what they can but they cannot blame themselves for their difficulties. Stewart contrasts this situation to the situation often faced today: a situation where there are many life options and substantial competition and where failure can directly be traced back to one's self. The consequence of this is to feel a lack of control in shaping one's destiny and, over time, to lose hope. These failings, he suggests, may have serious implications for health.

While it is easy to find fault with this paper, it is important that we remain humble. Stewart tries to explain the massive increase in CHD in the first half of the 20th century and does not do a very good job. On the other hand, there has been in Britain a massive reversal in the relationship between CHD and socioeconomic status in the second half of the 20th century<sup>3</sup> and no one, to my knowledge, has been able to satisfactorily explain that. Nor was anyone able to predict the decline of CHD in the last 50 years of the century. Some argue that these shifts are the result of changes in values, perceptions, behaviour, and stress levels of individuals; others think they are a consequence of shifts in social structures and the environment. Both groups make interesting and important points but we are far from understanding these issues. It is good to re-read Stewart's paper if only to stimulate us to try to do better.

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# Commentary: Stress and the heart, 50 years of progress?

John Macleod<sup>a</sup> and George Davey Smith<sup>b</sup>

Ian Stewart's essay in the 1950 Christmas edition of the *Lancet*, on the possible psychosocial origins of coronary heart disease (CHD),<sup>1</sup> preceded the publication of Hans Selye's *The Stress of Life* by 6 years.<sup>2</sup> Selye is still widely credited with inventing (or discovering) 'modern stress', although clearly the construct, and a reasonably sophisticated conception of its possible relation to cardiovascular health, already had widespread currency in 1950. Indeed a causal association between heightened 'stress' and heart disease was suggested at least as long ago as the 18th century.<sup>3</sup>

Whether in its observations on medical registrars, Birmingham teenagers, charwomen or other blue-collar workers, Stewart's essay belongs to an era when doctors were not shy of displaying the assumptions and prejudices of their class. However, it is not epidemiologically naïve. The need for any aetiological explanation of CHD to be congruent with epidemiological understanding is explicitly recognized. In 1950 the epidemiology of CHD was understood in fairly simple terms. Coronary heart disease was increasing, this increase appeared to follow increases in industrialization and urbanization and appeared particularly to affect more industrialized and urbanized populations. Middle class men (particularly 'professionals') appeared to be the most affected social group within these populations. In terms of physiological risk factors, hypertension seemed a good candidate and in terms of behaviour, diet was implicated. Hereditary factors were recognized as important, but were also seen to provide an incomplete explanation.

In other words then, as now, psychosocial explanations for heart disease appeared to arise for two principal reasons. First, they accorded with popular assumptions; second, they filled an apparent explanatory gap.

Stewart's explanations of why middle class professional men experienced more 'modern stress' than any other section of society may now seem slightly patronising. However, it reflects a general conceptual problem that has yet to be resolved in psychosocial epidemiology (a problem that, to be fair, Stewart appeared aware of himself). Psychological 'stress' is conceptualized as the physiological or behavioural response to any threat to emotional homeostasis. In physiological terms this is indistinguishable from 'excitement'—the negative connotations put on particular types of 'stress' are socially constructed. Positive constructions of excitement appear to have broadly the same physiological consequences (and neurophysiology is still only understood in broad terms) as negative ones. The excitement of watching football matches appears to have similar cardiovascular consequences to the stress of a missile bombardment.<sup>4,5</sup> Thus anybody with the capacity to get excited (about

anything) also has the capacity to be 'stressed'. This universal nature of 'stress' does not fit well with the candidature of stress as an explanation for the disease experience of particular social groups. For such explanations to be viable, stress, or particular sub-types of stress, must be constructed and associated with particular kinds of people. The general construct stress is too general to usefully explain any social patterns of disease.<sup>6,7</sup>

So Stewart argued that 'modern stress', a form of middle class, male angst (not dissimilar to what Rosenman and Friedman subsequently operationalized as Type A behaviour<sup>8</sup>) experienced amongst 'workers by brain' rather than 'workers by hand' was the toxic component of stress. He further argued that although manual workers experienced greater material deprivation than non-manual workers, the latter experienced more 'modern stress'. It is interesting to contrast this viewpoint with current assertions that the material deprivation experienced by manual workers is essentially irrelevant in developed societies, while 'manual worker stress'—lack of control over work—is an important determinant of health inequalities.<sup>9</sup> As Elianne Riska points out, there 'is a certain irony involved in the stress literature of the past 30 years. During the heyday of the research on Type A men, the Type A factor was a marker of men who tried to control everything, while today work-related stress considered to have lethal effects is found in men and women who have no control over work'.<sup>10</sup>

Some categorizations of 'stress' are perhaps social, rather than biological. Contemporary examples are the (generally data-driven) shifts in conceptualizations of work stress and Type A behaviour, towards more 'specific' constructs such as job control and hostility.<sup>11,12</sup> There is no apparent neurophysiological or endocrinological basis to assume a different effect of these types of 'stress' (they are not equivalent to different sub-types of lipids, although some researchers talk about them as though they were), but perhaps because they fit more closely with the social distribution of heart disease they appear better candidates for an aetiological role.

Stewart only briefly touched on the mechanisms linking stress and coronary disease, and did not discuss the influential work of the likes of Cannon and Selye who had already elaborated the principal neurophysiological pathways (the sympatho-adrenal and hypothalamic-pituitary-adrenal axes, respectively) through which psychological stress could plausibly lead to disease (if not to social patterns of disease).<sup>1,13–16</sup> Although stress was already popularly linked to smoking, the further link between smoking and CHD had not yet been well established.<sup>17</sup>

Two weeks after the publication of Stewart's essay an equally entertaining response from Robert Platt appeared in the correspondence columns of the *Lancet*<sup>18</sup> (as reprinted in this issue of the *International Journal of Epidemiology*). Platt wondered to what

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extent the social distribution of diagnosed CHD was a diagnostic artefact. He pointed out that an occupational group's standardized mortality ratio for CHD appeared directly proportional to the likelihood of a member of that group seeing a consultant cardiologist prior to their death. Coronary heart disease was a relatively new diagnosis in 1931 and therefore one only likely to be made by a specialist. Platt's suspicion appeared to be borne out by subsequent data. By the 1961 decennial supplement, CHD (along with cardiovascular disease generally) was clearly associated with social disadvantage.<sup>19</sup> As a consequence, plausible psychosocial explanations of social variations in CHD have, from the 1970s onwards, of necessity been couched in terms of working class, rather than middle class, psychological attributes.<sup>20,21</sup> Intriguingly, however, the proposed mediating mechanisms remain, essentially, the same.

Other than the conceptual problems discussed above, the strength of the empirical evidence linking psychological 'stress' to CHD appears questionable to some.<sup>22</sup> Confounding, particularly by socioeconomic factors, is an issue that many studies have been unable to resolve.<sup>23</sup> Further the typical discrepancy between associations of heightened 'stress' with subjective disease outcomes and those with objective disease outcomes, apparent in virtually every observational study where both are available for comparison, is highly suggestive of reporting bias.<sup>24,25</sup>

Some of these interpretational problems are further illustrated in the current issue of the *International Journal of Epidemiology*.<sup>26</sup> Earlier publications from the GLOBE study (a large, Dutch, prospective, observational study looking at various stress subtypes and social patterns of disease) suggested that psychosocial factors were important determinants of social patterns of subjective health.<sup>21,27</sup> Since the same factors now appear to have no relation to objective health, a role of reporting bias must be considered. Similarly, the GLOBE investigators previously reported that 'perceived control' was an important determinant of mortality amongst a subset of the cohort followed for 6 years. Control now appears unrelated to mortality amongst the whole cohort followed for 7 years. This inconsistency is intriguing, and perhaps suggests that confounding produced the former results.

Stewart wrote about 'the "stress" of modern existence', that had increased to such a degree that the newspapers were full of references to it. His largely medical readership would have appreciated the fact that a recent committee had concluded that the 'strain of medical practice' shortened the life expectancy of doctors—largely through heart disease. However, he was clearly sceptical of any real increase in stress, pointing out that the 'trials of life have usually appeared exceptional to the generation called upon to bear them'. However, the perception that stress had increased, together with the rise in CHD, would have encouraged a link between the two. Similar links were drawn at the time between stress and peptic ulcer, which was also a disease that had increased in incidence, and indeed a veritable research industry mined the stress and peptic ulcer field, to no great benefit to either individual or population health, until *Helicobacter pylori* was identified and both treatment and prevention became effective.<sup>28,29</sup>

Given that the evidence on stress and CHD is still far from secure—in particular with respect to the disappointing outcomes of psychosocial interventions<sup>30</sup>—why does it generate such interest and sometimes passionate advocacy?<sup>31–33</sup> Some factors identified by Stewart are probably relevant: the general

public consider that it is important; researchers feel it has relevance for their (stressful) lives, and it offers to explain currently mysterious aspects of disease distribution. In addition, as the anthropologist Allan Young has convincingly argued,<sup>34</sup> the discourse regarding stress and health fits conveniently with 'conventional knowledge'—in that it tends to voluntarist and individualizing strategies that do not threaten fundamental exploitative economic relations. As Viner has described, stress research has historically received some of its strongest support from the North American military-industrial complex with its preoccupation with predicting and optimizing human performance, particularly under difficult and unpleasant environmental conditions.<sup>35</sup>

Our reflections on Stewart's essay should not suggest that psychosocial epidemiologists call it a day.<sup>36</sup> Even if stress is not an important aetiological factor in somatic disease it certainly contributes to feelings of dissatisfaction, distress and misery—which are no less real, nor deligitimized, if found to be unimportant as contributors to other forms of pathology. Indeed, in many wealthy countries with long—and lengthening—life expectancies, the burden of such distress may be of more importance than much somatic disease. There are many questions remaining that may yet prove to have important answers. And evidence for the basic plausibility of a causal connection between the psyche and physical disease has considerably strengthened in the past 50 years.<sup>37</sup> 'Stress' may be a poor candidate for explaining social inequalities in health but that does not mean it has no causal relevance to health *per se*.

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## Commentary: The problem with stress: minds, hearts and disease

Stephen A Stansfeld

The problem with stress as a cause of illness is that it has too much face validity. Most people experience stress responses, where their resources are exceeded by environmental demands, at some time. Under these circumstances they may feel anything from annoyance, disappointment and frustration to severe anxiety, panic, fear, anger or depression. This is unpleasant and it is easy to extrapolate from this a belief that such emotional stress responses may give rise to illness;

everyone has a personal hypothesis about this. As such, stress is a conveniently amorphous notion conjured up to explain anomalous findings that has both societal and personal resonance for a scientific readership and a medical author. It is in this light that Stewart, writing in 1949, invokes stress, together with eating fatty foods, as the major explanation of the social gradient in heart disease at the time where those, largely men, in non-manual social class groups had higher rates of coronary heart disease (CHD) than men working in manual occupations.<sup>1</sup>

The shift in the social distribution of CHD in the middle of last century has only partly been explained. In the first half of the 20th century, as Stewart reports, CHD was more prevalent in non-manual than manual occupational groups, while in the

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second half of the century a social gradient emerged in which CHD was more prevalent in manual groups. Moreover, in an occupational cohort, the Whitehall Study<sup>2</sup> set up in the late 1960s, there was a gradient of increasing mortality risk with decreasing occupational status. Stewart's contention that there was more stress among people in professional, middle class occupations than in working class occupations does not seem plausible. Perhaps working class solidarity and a priority given to satisfactions outside work, rather than focussing on competitive striving at work (which rather crudely sums up his argument), might be considered protective of the heart. On the other hand this is to discount the effects of poverty (or lesser degrees of material disadvantage), job insecurity, unemployment, inadequate nutrition, poor housing, and monotonous and repetitive work then, and now, current in working class populations, that would be likely to have far more negative effects on health and be more stressful than the occupational concerns of professional men.<sup>3</sup> Explanations for this gradient must be sought elsewhere. Differential diagnostic practice by social class, with an increased tendency to diagnose CHD in middle class groups as opposed to working class groups, may provide part of the explanation. Additionally, the gradient may relate to differences in health behaviours as Stewart hints in his article. Middle class people may have had a diet higher in sugar and lower in cereal fibre, and to have smoked more cigarettes than working class people in the early years of the last century when the risk for CHD manifesting itself in the 1940s was laid down.<sup>4</sup> Later on in the century, the working class population adopted the same dietary preferences as the middle classes had earlier espoused and hence the increased coronary risk. At the same time the middle class groups were tending to give up smoking and lead healthier lives in terms of exercise and diet, thus reducing their coronary risk and contributing to the reversal of the gradient.<sup>4</sup>

One problem with research on stress and health which tends to discredit the whole area, is the very non-specific nature of much of the research, the lack of clear specification of hypotheses, and in some areas the clinging to stress-related beliefs of causation despite little evidence to support them. Stewart, to his credit, does seem to support medical knowledge based on evidence, citing Witts<sup>5</sup> 'the role of the mind in the pathogenesis of organic illness is more difficult to assess than is popularly supposed, and that in those few maladies, such as thyrotoxicosis, in which its influence has been established the demonstration has been achieved only as a result of elaborate laboratory research, never (according to Witts) from the recesses of an armchair.' And he goes on to suggest somewhat unkindly, but memorably, 'And seldom, I suggest, from within the curtained closets of the psychiatrists'. In contrast to 1949, academic psychiatry has changed enormously and psychiatrists have pulled back the curtains and are more active in basic aetiological research themselves, both in the laboratory and in epidemiological field studies.

What evidence can be cited today that stress causes CHD? There are many aetiological conundrums that require explanation: the decline in CHD in Western Europe coupled with the increase in Eastern Europe, the strong social gradient in coronary disease and the tendency for the decline in incidence to be greater in groups with a higher rather than lower socioeconomic position.<sup>6</sup> Can personality type be entirely

discounted in the aetiology of CHD? Type 'A' behaviour pattern has been largely discredited as a coronary risk factor, despite great initial excitement, as later studies have not confirmed earlier findings.<sup>7,8</sup> The story of this rise and fall of a risk factor is in itself interesting. In the 1960s and 1970s was there an association between Type 'A' behaviour and other risk factors for CHD that conferred risk at the time but that has now been lost as society has changed? Alternatively, did Type 'A' behaviour relate more pathogenically to certain aspects of society at the time, and these conditions no longer pertain? This is not clear but one element of Type 'A' behaviour has remained as a risk factor, namely hostility measured by instruments such as the Minnesota Multiphasic Personality Inventory, that has predicted incident CHD in several studies.<sup>9,10</sup> Recently Type 'A' behaviour has also been shown to be associated with the precipitation of coronary events in those with existing CHD; so rather than having a primary aetiological association with CHD it may be associated with progression of disease.<sup>11</sup>

There is evidence from an increasing number of studies that psychological factors play a part in the aetiology of CHD. Depressive illness and depressive symptoms have been associated with increased risk of incident CHD morbidity and mortality.<sup>12-15</sup> Part of this association may be explained by health behaviours, as depressed people may smoke more, take less exercise, and eat an unhealthier diet than people who are not depressed.<sup>16</sup> However, this can only be a partial explanation as adjustment for health behaviours does not account for the association between depression and CHD.<sup>17</sup> Depression, independent of other mediating factors, may induce biochemical and physiological changes that may be long-lasting. These include sympathoadrenal hyperactivity, hypothalamic-pituitary-adrenal axis hyperactivity, diminished heart rate variability, ventricular instability, and alterations in platelet receptors.<sup>18</sup> Separately, three prospective studies have shown an association between measures of phobic anxiety and increased risk of sudden death.<sup>19-21</sup> The mechanism for this could be that a tendency to severe anxiety in some specific circumstances could be associated with increased susceptibility to ventricular arrhythmias. There is also evidence that depression post-myocardial infarction is a risk factor for mortality. This risk is maintained even after adjustment for the severity of the damage to the myocardium and impaired cardiac function.<sup>22</sup> Part of this increased risk may be because depressed cardiac patients find more difficulty in giving up smoking or in adhering to dietary or exercise programmes than non-depressed patients.<sup>23</sup> Also depression may confer an increased susceptibility to ventricular arrhythmias that may be potentially more serious in an already damaged heart.<sup>24</sup>

Other psychosocial factors, that is stressors with both a psychological and a social component, that are important in CHD aetiology are social relations and work characteristics. Small social networks and social isolation predict higher levels of mortality, especially from cardiac causes<sup>25-27</sup> and also an increased risk of CHD incidence.<sup>28</sup> In different cohort studies, different types of social relations are associated with mortality, but this may be as much to do with variation in the age structure and cultural mores of different populations for whom the salience of particular social relations may vary.<sup>29</sup> Social integration and social participation are linked to healthy behaviours, particularly being involved in physical activity, and

this may contribute to the protective effect against CHD. Nevertheless, social relations are likely to precede healthy behaviours in the causal chain. Social support from close others may be viewed partly as a form of social control.<sup>30</sup> Nowadays this may encourage a healthier diet and more moderate alcohol intake—this may be part of the explanation for the protective effects of marital status on men's mortality risk.<sup>31</sup> However, this social control can work both ways, in certain subcultures heavy alcohol intake and smoking may be reinforced.

Low control at work and Karasek's job strain, a combination of low decision latitude and high psychological demands, has been found to predict self-reported CHD morbidity and CHD mortality.<sup>32,33</sup> High levels of imbalance between efforts applied at work and rewards received also predicts increased risk of CHD morbidity that seems to be independent of the effects of low control.<sup>34,35</sup> These findings have been criticized as being confounded by socioeconomic position, where low control is merely an indicator of low social status.<sup>36</sup> Low control at work is indeed strongly associated with low social position. However, although much of the CHD risk associated with low social status may be the result of the cumulative experience of material disadvantage in childhood and adulthood, it may also be the case that, for working populations, who spend much of their adult life at work, the effects of low social status on CHD risk are mediated through low control at work. It seems unrealistic to expect that all the effects of material disadvantage on health are directly on physiological systems and none is mediated through psychological perceptions coloured by feelings of hopelessness, unfairness, anxiety, insecurity, stigma, and lack of equality. Such perceptions of the workplace and the feelings they engender may be on the pathway between reports of low control and health.

Increased psychological demands alone do not always seem to be associated with increased CHD risk. For instance, in the first longitudinal reports from the Whitehall II Study, psychological demands were not related to self-reported CHD although they were related prospectively to increased risk of psychological distress.<sup>37,38</sup> This is interesting in relation to Stewart's paper, where in essence he is suggesting the excess of coronary risk in professional as opposed to manual occupations is related to the psychological demands and expectations found in these groups. Psychological demands at work are multifarious. Although they are made up of work pace and being asked to undertake conflicting tasks which might be expected to be risky for health, they may also indicate jobs that mean you are 'in demand' and hence an important part of the organization, aspects of work that are likely to increase self esteem rather than impair health (these are 'active jobs' in Karasek's characterization<sup>32</sup>). Thus teasing out pathogenic aspects of psychological demands at work may be difficult—they may relate to poorer mental health—but their association with poorer cardiac health is problematic.

It was an interesting time for Stewart to be writing, World War II had recently finished and the National Health Service had just started. It was a time of both hope but also world weariness, and this is reflected in the article. He is somewhat dismissive of the links made between both detailed descriptions of personality type and behaviour and subsequent disease, and the association between certain physical 'somatypes' and predisposition to disease.<sup>1</sup> Nowadays these associations have

been almost entirely discredited, although there have been studies that link behavioural styles with disease; for instance, goal frustration has been linked to organic bowel disease.<sup>39</sup>

We may be apt to look scornfully on his assertion that few can doubt the link between personality and peptic ulcer in the light of studies that suggest that *Helicobacter pylori* is the cause of peptic ulceration—but should we be so ready to throw the baby out with the bathwater?<sup>40</sup> It may be that personality characteristics, rather than being related to the aetiology of the disorder, are associated with the tendency to perceive, report, and act on symptoms. The tendency to report 'physical' symptoms does differ across people and may relate to neuroticism and negative affectivity.<sup>41</sup> In this way they may be important in the presentation of an illness like peptic ulceration but not in its aetiology—this can be confusing when the assumption is made that psychological factors are involved in the causation of the condition. A similar mechanism may be involved in angina pectoris, although here it may be more complex. Angina pectoris is a symptom of CHD and a predictor of CHD mortality. Psychological distress and symptoms of anxiety predict angina pectoris measured by self-completion questionnaire.<sup>42,43</sup> Is this sufficient further evidence that in this case psychological distress is a predictor of CHD? Probably not. Rather, in CHD, a condition with a high prevalence rate, psychological distress may influence those who notice and remember chest pain and who then go on to report chest pain on a questionnaire. This influence is likely to be more obvious in those with milder grade 1 angina because in severe CHD, chest pain on exertion may be impossible to ignore and psychological factors influencing reporting will be less important. A complicating factor is that in more severe chest pain associated with functional impairment of activities of everyday living, psychological distress, especially depression, may develop as a consequence of the pain and restriction of activities.<sup>43</sup>

A recent study from the West of Scotland using the Reeder scale<sup>44</sup> to measure stress, found that high scores were related to higher socioeconomic position, and predicted angina pectoris, non-specific cardiac hospital admissions, smoking, and alcohol intake, but were inversely associated with incidence of ischaemia.<sup>45</sup> The authors interpret the association with angina pectoris as probably being due to negative affectivity but then appear to dismiss all associations between psychosocial factors and health as being spurious on the basis of the inverse association between the Reeder scale and ischaemia and mortality.<sup>36</sup> The Reeder Scale bears closer examination. It is a short scale that appears to measure generalized anxiety and self-descriptions of being stressed. This old fashioned view of stress is curiously reminiscent of Stewart, a diffuse, self-defined condition expected to predict illness and mortality. But as the evidence above has shown, such a non-specific view of stress is out of date, rather the focus has shifted to more specific psychosocial factors, such as lack of social support or depression where there are both plausible biological mechanisms linking these psychosocial factors and CHD, and supportive evidence from animal studies. However, the implication of these authors' work is right, and I think Stewart would support this,—that the field of stress and health research needs to be pursued with the utmost research rigour to discover the truth in a subtle, complex and seductive field.

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