Papers and Originals

Personality Traits Associated with Different Chest Pains after Myocardial Infarction

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Most patients who have had an acute myocardial infarction later experience pain in the chest of one sort or another. Angina pectoris is the commonest pain, and one in or including the left anterior chest is the next commonest single entity. The factors which determine post-infarction pain are complex. Clinical observation suggests that they include mental ones. Angina pectoris is often induced by emotion, and left chest pain in patients with heart disease has long been associated with anxiety. If mental factors associated with pain after myocardial infarction could be defined, more might be learnt of the mechanisms causing the pains and it might be possible to prevent some of them.

The first difficulty faced in trying to relate mental factors to chest pains is that clinical judgements regarding the diagnostic category to which a pain belongs are often unreliable. This difficulty can be overcome if precise criteria are laid down for specified pain entities, and these criteria are sought by using standard questions which avoid the influence of the observer's bias. On this basis Rose (1962) proposed criteria for diagnosing angina pectoris in epidemiological studies. Extending this approach, we have recently classified pains occurring after myocardial infarction and have shown the reliability of the pain questionnaire on which the classification was based (Vergheze and Lovell, 1966).

The second difficulty arises from the fact that clinical judgements about mental traits are no more reliable than they are about the nature of chest pain, and similar problems of definitions exist (Carstairs, 1963). Cattell and Scheier (1961) have commented: "Theory and therapy are in a confused state essentially because one cannot be quite sure what another is talking about when he says 'anxiety' or 'neurosis,'" and they see as an answer to this the placing of instruments for meaningful and exact measurements in the hands of the clinician. Various attempts have been made to develop such instruments, including personality inventories and methods for measuring physiological and biochemical reactions to standard stressful situations. We have recently described the use of the latter method in a study in which catecholamine excretion and sympathetic nervous responses after a standard mental stimulus were compared in patients who, having had a myocardial infarction, had been classified according to their subsequent experience of chest pain (Nestel *et al.*, 1967). We now describe attempts to measure personality traits in these patients.

Methods

The patients studied were those whose pain experience we have described previously (Vergheze and Lovell, 1966). They

were Australian- or British-born men, with an average age of 56, who had been in hospital with acute myocardial infarction. On discharge from hospital they had been admitted to a controlled trial of long-term treatments with anticoagulants. The diagnostic criteria for admission to the trial and the clinical characteristics of patients admitted have been reported elsewhere (Lovell *et al.*, 1964).

The main group of 106 patients was derived from 121 admitted consecutively to the trial, of whom three died before they could be studied, one was too muddle-headed, and 11 were missed because their clinical attendances did not coincide with questionnaire sessions.

With the use of the questionnaire appended to the previous report (Vergheze and Lovell, 1966), all these patients were classified with regard to their pain experience after an interval of between six months and three years from their myocardial infarction and before other measurements were made. The pain categories defined were: angina pectoris, either as the only pain recognized or with additional pain; left chest pain; other pains; and no pain.

All these patients were designated for measurements of personality traits. For this purpose two questionnaires were used, the Eysenck Personality Inventory (E.P.I.) (Eysenck and Eysenck, 1964) and the Cornell Medical Index Health Questionnaire (C.M.I.) (Brodman *et al.*, 1949).

The E.P.I. consists of 57 questions and is intended to measure two dimensions of personality, neuroticism-stability and introversion-extroversion. According to Eysenck (1959) the dimension of neuroticism measures people's emotional stability. Neuroticism is the "general emotional lability of a person, his emotional over-responsiveness, and his liability to break down under stress." The dimension of introversion-extroversion measures people's sociability along a continuum from an extreme extrovert position reflecting a maximum degree of "outgoing, uninhibited social proclivities" of a person to an extreme introvert position reflecting a minimum of such proclivities. The inventory is designed so that neuroticism-stability and introversion-extroversion are measured as separate dimensions. This is confirmed in large-scale studies where the correlation coefficients between extroversion and neuroticism scores are found to be negligible.

The C.M.I. consists of 195 questions in 18 sections and was designed for use as an adjunct to the medical interview. The first 12 sections (A-L) are intended to reveal somatic symptoms, and the last six sections (M-R) are intended to reflect mood and feeling. A high M-R score is said to discriminate neurotic patients from normals (Culpan *et al.*, 1960).

The following scores were calculated: (1) the neuroticism score (N score) from the E.P.I., (2) the extroversion score (E score) from the E.P.I., and (3) the number of "yes" responses in sections M-R of the C.M.I. (M-R score).

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The patients were given the E.P.I. and C.M.I. forms together with a stamped addressed envelope when they paid a routine visit to the clinic. They were all aware that the clinic was concerned with research and they were told that their replies might help us to learn more about their diseases.

One of the designated patients died before he could be studied. From the remaining 105, 97 completed forms were received. Of the remaining eight, six were in the no pain group and two in the angina pectoris group.

Since physical constitution has been related from time immemorial to mental traits, some physical dimensions were measured in a subgroup of these patients. The subgroup was selected from among patients in the main group, on the basis that a comparison would be attempted between 10–15 patients in the angina pectoris only, the left chest pain, the other pains, and the no pain groups. All 10 patients in the left chest pain group agreed to participate in this extended study and four of the 12 in the other pains group refused. Of the first 15 patients in the angina pectoris group, designated by their consecutive attendances at the clinic, one refused and two were not used because they were thought to be too senile to take part in a mental-stress test associated with this part of the study (Nestel *et al.*, 1967). Of the first 14 patients similarly designated in the no pain group, one also refused and one was thought too senile. Thus there were 42 patients in the subgroup. The physical dimensions measured were: height, transverse chest diameter, weight, and the skinfold thickness at three sites. The transverse chest diameter was taken at the fourth intercostal space, midway between inspiration and expiration, by means of an obstetrics pelvimeter. From the chest diameter and the height the Rees-Eysenck body index was obtained, a nomogram (Hamilton, 1950) being used. The sites for the measurements of skinfold thickness were left subscapular, left triceps, and left umbilical, and from these the total body fat was calculated, the formula proposed by Edwards and Whyte (1962) being used.

Finally, in the subgroup of 42 patients, a clinical interview was conducted. Neither the pain categories to which the patients belonged nor their scores on the personality inventories were known by the interviewer at the time of the interview. The interview was of an ordinary psychiatric kind, the patients being encouraged to talk freely without much interruption. An item sheet was used, but only as a guide to direct the interview and to permit classification of the findings which emerged from it.

Results

Table I shows the number of patients in the different pain categories and their personality inventory scores.

TABLE I.—*Personality Inventory Scores*

Pain Category	No. of Patients	Scores (Standard Deviations)		
		E.P.I.		C.M.I.
		E	N	M-R
Angina pectoris only	28	9.6 (3.4)	10.7 (5.8)	8.9 (3.3)
Angina plus another type of pain	9	8.0 (4.3)	14.3 (4.6)	10.4 (8.3)
Left chest pain	10	11.6 (5.1)	14.2 (5.5)	11.3 (11.1)
Other pains	12	8.8 (3.9)	8.8 (4.6)	5.1 (4.3)
No pain	38	10.9 (4.1)	7.6 (4.2)	4.3 (4.5)

The mean E scores did not differ significantly between the groups. The N and M-R scores were highest in the patients with left chest pain and in those with angina who recognized more than one type of pain. The scores of those who recognized angina as their only type of pain, though not so high, were also greater than those of the other pains and no pain groups. Differences between means which were significant are given in Table II.

Scores reported for normal working-class and neurotic patient groups are shown for comparison in Table III. The mean N scores of the patients with left chest pain, of those with angina who recognized more than one type of pain, and of the neurotic patients were practically the same, while the mean N scores of the other pains, no pain, and normal groups were also very similar to each other. The same groups resembled each other in M-R scores also.

TABLE II.—*Difference in Scores Between Groups Which Were Significant*

Scores	Comparison	Difference Between Means	Significance
N	Left chest pain v. no pain	6.6	P < 0.01
	" " v. other pains	5.4	P < 0.05
	Angina only v. no pain	3.1	P < 0.05
	" plus another type of pain v. no pain	6.7	P < 0.001
M-R	" " v. other pains	5.5	P < 0.02
	Left chest pain v. no pain	7.0	P = 0.05
	Angina plus another type of pain v. no pain	6.1	P < 0.05

TABLE III.—*Personality Inventory Scores of British Normal Working class and Neurotic Patient Groups**

Group	Scores (Standard Deviations)				
	E.P.I.			C.M.I.	
	No.	E	N	No.	M-R
British normal working-class	85	11.2 (4.4)	7.8 (4.8)	48	2.8 (3.4)
British neurotic patient	61	10.0 (4.3)	14.4 (5.5)	46	14.1 (10.0)

* The British normal working-class and neurotic patient groups were ones whose N and E scores were reported by Eysenck and Eysenck (1964) and others whose M-R scores were reported by Culpin *et al.* (1960).

Table IV shows the Rees-Eysenck index, the total body fat, and the ratio weight:height for the different pain categories. Differences between means which were significant are given in Table V. The left chest pain group had the highest and the angina group had the lowest Rees-Eysenck body index: that is to say, the former tended to be relatively narrow-chested in relation to their height. For total body fat and weight:height ratio the angina group had the highest and the left chest pain group had the lowest means.

TABLE IV.—*Body-build Indices*

Pain Category	No.	Means (Standard Deviations)		
		Rees-Eysenck Body Index	Total Body Fat in kg.	Weight (lb.)
				Height (in.)
Angina pectoris*	12	94.8 (4.0)	21.0 (5.7)	2.56 (0.35)
Left chest pain	10	99.7 (5.5)	14.2 (4.1)	2.12 (0.27)
Other pains	8	95.7 (5.2)	19.8 (2.9)	2.40 (0.20)
No pain	12	94.7 (5.2)	19.1 (3.8)	2.37 (0.20)

* Recognizing only one type of pain.

TABLE V.—*Difference in Body-build Indices Between Groups Which Were Significant**

Indices	Comparison	Difference Between Means	Significance
Rees-Eysenck body index	Left chest pain v. angina pectoris	4.9	P < 0.05
	" " v. no pain	5.0	P < 0.05
	" " v. angina pectoris	6.8	P < 0.01
Total body fat	" " v. no pain	4.9	P < 0.01
	" " v. other pains	5.6	P < 0.01
Weight	" " v. angina pectoris	0.44	P < 0.01
Height	" " v. no pain	0.25	P < 0.05
	" " v. other pains	0.28	P < 0.02

* The angina patients are those recognizing only one type of pain.

Table VI compares the indications of neurosis extracted from clinical interview data for each of the groups. A history of items such as marital disharmony, psychiatric illness in the family, unsatisfactory parent-child relations, and frequent change of jobs was found most commonly in the left chest pain group. Patients in this group also more commonly exhibited behaviour traits found in neurotic subjects. The

total number of these indicators recorded in the left chest pain group was found to be significantly higher than in each of the other groups.

TABLE VI.—*Clinical Interview: Number of Patients in Each Pain Group Showing the Item Listed*

Items	Pain Category			
	Angina Pectoris	Left Chest Pain	Other Pains	No Pain
Parental lack*	4	5	1	5
Unsatisfactory parental relationship†	1	4	1	2
Psychiatric illness in the family	1	3	2	1
Marital disharmony	1	4	3	1
Position in school (studies) below average	2	3	1	1
Frequent change of jobs	1	3	0	1
Not satisfied with work	2	4	2	1
Perfectionistic	4	6	2	2
Cannot sit down and relax when there is no work	5	7	2	2
Fussy about tidiness and discipline	3	5	1	1
Not easy-going in everyday life	2	7	1	1
Clinical impression of being tense	2	4	0	1
Total items	28	55	16	19
No. of patients in each group	12	10	8	12

* Dead, separated for more than one year, or habitually absent from home.

† Relationship with one or both parents not happy.

Significant differences between numbers of items among patients in each group, tested by χ^2 :

Left chest pain v. no pain ($P < 0.001$).

" " v. other pains ($P < 0.001$).

" " v. angina pectoris ($P < 0.001$).

Discussion

In interpreting these findings, the possibility that factors associated with the original acute episode of myocardial infarction may have varied between the groups, and perhaps have influenced the indices subsequently measured, merits consideration. There is no evident variation in such factors in this study. All the patients were men admitted to the same hospital with an acute illness fulfilling strict criteria of myocardial infarction, and subsequently supervised by the same small group of doctors in the same clinic. Furthermore, the severity of the acute myocardial infarction, as measured by laboratory indices and by the number of days spent in hospital (average 20), did not differ between the groups.

The inferences to be drawn from the findings must depend on the meaning of N and M-R scores in the situations in which they were measured and especially on the extent to which they may be influenced by physical illness. The E scores raise no problem in interpretation, since the groups did not differ in this trait.

The E.P.I. was developed from results of studies in clinically normal population groups. The N score has been conceived as an index of constitutional neuroticism, and a high score is found in neurotic patients (Eysenck and Eysenck, 1964). In normal subjects the N score appears relatively stable, the correlation coefficient of scores tested and then retested after 8 to 12 months being over 0.8 (Eysenck and Eysenck, 1964). However, the finding of Knowles and Kreitman (1965) that in neurotic patients the high N scores fell somewhat after treatment suggests that they may be influenced by environmental factors. The finding of McGuire *et al.* (1963), using the Maudsley Personality Inventory (M.P.I.) from which the E.P.I. was developed, that N scores did not differentiate neurotic from psychotic patients also suggests that the N score cannot be regarded simply as an index of constitutional neuroticism.

The possibility that N scores may be modified by physical illness has not been critically tested. Sainsbury (1960) found that patients attending a general hospital with a variety of physical illnesses had raised N scores as measured by the M.P.I. He interpreted the findings as showing an association between neuroticism and certain so-called psychosomatic conditions. Among these, coronary disease was listed as psychosomatic and herniated disc as possibly psychosomatic. He did not discuss

the possibility, with which his findings are consistent, that certain sorts of physical diseases may themselves cause the N scores to rise. This possibility cannot be ignored in interpreting N scores in ill people.

Unlike the E.P.I., the M-R section of the C.M.I. was designed to reveal mood and feeling patterns in people attending for a medical interview. Its use in clinics dealing with organic diseases has been more extensively reported (Brodman *et al.*, 1949; Leigh and Marley, 1956; Culpan *et al.*, 1960), and the possibility that the emotional disturbances due to the nature of some physical symptoms may account for high M-R scores has been mentioned (Culpan *et al.*, 1960). Using a modified C.M.I., Rawnsley (1966) found that in physical disorders both physical and psychological mean symptom frequencies are raised.

High Neuroticism Scores

Our results show that after myocardial infarction patients who have left chest pain and also those who experience angina with some additional type of pain which is not necessarily in the left chest have, on two independent ratings, the highest scores for neuroticism. Their N scores are as high as those which have been found in neurotic patients (Eysenck and Eysenck, 1964; Knowles and Kreitman, 1965). Comparably high M-R scores are also found in neurotics (Leigh and Marley, 1956; Culpan *et al.*, 1960; McDonald and Mowbray, 1967). The finding of these high scores in the left chest pain group accorded with the finding in them on clinical interview of the frequent occurrence of features commonly found in neurotic patients. It also accords with the widely held clinical impression that patients who consult doctors complaining of this sort of pain are neurotic (Conner, 1930; Bourne, 1937; Wittkower, 1937; Schnur, 1939; White, 1951; Wood, 1956). The fact that the left chest pain group had features of body build which have been shown to be associated with the trait of neuroticism (Rees, 1944; Eysenck, 1947; Parnell, 1957) suggests that in them the trait is constitutional and was already present when they had their myocardial infarction. We lack information on body build in the patients with angina plus some other sort of pain, but their very high N or M-R scores suggest that they may fall in this same category.

The interpretation of the findings in the group whose only recognized pain was angina pectoris is more difficult. Their scores for neuroticism, while not as high as those of patients with left chest pain and angina plus some other sort of pain, were nevertheless above those of the no pain group. However, they did not differ significantly from the no pain group in features of neuroticism detected on clinical interview and they lacked somatic features associated with constitutional neuroticism, tending to be fat and heavy in proportion to their height.

The fact that the N and M-R scores of the other pains group did not differ from those of the no pain group shows that experience of chest pain is not inevitably associated with rises in these scores. However, some findings are consistent with the possibility that the scores may be influenced by the duration and frequency of pain experience. In the angina pectoris only group we found that the N and M-R scores of the patients whose pain had started before their infarct tended to be above those of the patients whose angina followed it, though the differences between the means of 1.5 and 2.5 respectively could have occurred by chance. The average frequency of the experience of pain was greater in the angina pectoris group (5 times a week) than in the other pains (1.9 times a week) and left chest pain (1.8 times a week) groups. The angina pectoris group were also apparently "iller" in the sense that a greater proportion of them had been prescribed drugs for treatment of cardiac failure or hypertension. The possibility is not therefore ex-

cluded that the raised N and M-R scores in the angina pectoris only group are consequences of the type, severity, and duration of the particular symptoms which they experienced.

An alternative possibility is that the angina pectoris only group had a higher than average degree of constitutional neuroticism before their infarcts and that the expected accompanying features of body build, evident in the left chest pain group, were absent perhaps because of a strong association between angina and mesomorphism. This possibility gains support from the finding of Ostfeld *et al.* (1964), in a prospective study, that indices of personality in men who later developed angina differed from those of men whose coronary disease presented as myocardial infarction. Ostfeld *et al.* found that the men developing angina had shown relatively high scores for traits of emotional lability and suggestibility.

Difficulties in Interpretation

The difficulties in interpreting the findings in the angina group reflect the need for further evaluation in ill people of methods currently used for measuring personality traits. But in whatever way the results of these attempts to study personality traits associated with chest pains are interpreted, it is clear from them that studies of mental factors in coronary disease must take account of the different pain experience of different patients. Coronary disease is not to be regarded as a single entity.

From the practical point of view we have been impressed with the frequency with which unnecessary invalidism after myocardial infarction tends to be associated with experience of left chest pain and of multiple chest pains. By the time patients actually complain of these pains they are often depressed. The findings reported here suggest that it might be worth while trying, early in convalescence, to identify patients with the high degrees of neuroticism which are associated with these particular pains. If the doctor responsible for guiding the patient's return to active life were forewarned, some of the disabling features of these pains might be prevented or at least recognized early and mitigated.

Summary

Ninety-seven men who had had a myocardial infarction were classified according to their subsequent experience of chest pain, in the following groups: angina pectoris, left chest pain, other pains, and no pain. Personality traits were measured in them by means of the Eysenck Personality Inventory for extroversion and neuroticism, and the M-R section of the Cornell Medical Index for neurotic symptoms. Indices of body build were measured in 42 of the patients who were also examined in an ordinary psychiatric interview.

Patients in the left chest pain group and those who experienced angina together with some additional type of chest pain

had the highest neuroticism scores. The left chest pain group tended to be long and narrow in body build and to be the least fat. Patients recognizing angina as their only pain also had higher neuroticism scores than did the other pains and no pain groups, but in body build they tended to be fatter and relatively heavy for their heights. The other pains and no pain groups did not differ in any indices measured.

Because the left chest pain group had physical features recognized as being associated with constitutional neuroticism, this trait is regarded as constitutional in them, and its early recognition in the hope of preventing unnecessary invalidism is advocated.

The significance of the raised scores in patients with angina is discussed.

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