Some behavioural changes in 493 patients after an acute myocardial infarction

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SUMMARY A retrospective study of behavioural changes in 493 consecutive patients who had survived a first acute myocardial infarction was carried out. The changes in behaviour that were studied related to smoking, physical activity, and weight loss. The personalities of the patients were also studied by means of the Eysenck personality inventory to find out if there was any relationship between the personality factors, extroversion and neuroticism, and the changes in behaviour. Sixty-six per cent of the men and 59% of the women reduced or stopped smoking, 60% of the men and 81% of the women reduced their physical activity, and 67% of the men and 56% of the women lost weight. Some significant associations were found between these changes and the medical advice given, the patients' views of the value of the change in behaviour, and the severity of the illness. Personality factors as assessed were not associated with any of the observed changes, except in the case of physical activity. Those who increased or decreased their physical activity had a significantly higher mean neuroticism score than those who did not change their behaviour in this respect.

Introduction and aims

It now seems probable that prevention of recurrences of ischaemic heart disease, will depend increasingly on changes in behaviour of the population at risk. It is therefore important to find out what changes in behaviour occur in patients who have had a myocardial infarction and how changes which are believed to be beneficial can be encouraged.

The extent to which patients modify their behaviour after a myocardial infarction is likely to be related to their own personality and beliefs, the advice which they are given by their doctors, and the severity of the attack.

The aims of this study were to find out what changes occurred in patients' smoking habits, physical activity, and weight after a first myocardial infarction and what was the relationship, if any, between these changes and the medical advice which they said they had been given, the patients' views on the value of these behavioural changes, and on the severity of the illness.

The relationship of certain aspects of the patients' personality to the changes in behaviour was also studied.

Population studied

The sample of patients was drawn from the daily admission lists of the Coronary Care Units of the Royal Victoria and Belfast City Hospitals. It comprised all the men and women who were discharged from these two hospitals during the period 11 June 1967 to 27 June 1969 and who had been diagnosed as having a first acute myocardial infarction. The sample was limited to those who lived in Belfast and its contiguous areas so that they could conveniently be visited at home after discharge from hospital. It was not possible to locate and interview all patients within the stipulated period—that is, 12 to 18 months after discharge—but when the patient was interviewed later than planned, all data recorded were related to behaviour one year after discharge. Table 1 shows the total study population and Table 2 the age-sex distribution of those interviewed.

Methods

Hospital records were used to obtain data pertaining to the time of the attack for the following variables

Table 1 *Population studied*

<i>Patients with first acute myocardial infarction</i>	<i>No.</i>	<i>%</i>
Discharged from hospital between 11 June 1967 and 27 June 1969	571	100
Died (between discharge and interview)	48	8.4
Left Belfast area	13	2.3
Refused	10	1.8
Too ill to be interviewed	7	1.2
Not included	78	13.7
Interviewed and included in the analysis	493	86.3

Table 2 *Distribution of patients by age and sex*

<i>Age group</i>	<i>Men</i>	<i>Women</i>	<i>Total</i>
20-29	3	0	3
30-39	19	1	20
40-49	78	8	86
50-59	143	33	176
60-69	112	62	174
70-79	16	17	33
80+	1	0	1
Total	372	121	493

smoking, weight, civil status, employment, and social class. Approximately one year after discharge from hospital, patients were interviewed in their homes (by MM) and information was obtained on their weight, physical activity during leisure, angina, and smoking. They were also asked about the advice given to them by hospital doctors or their general practitioners with regard to smoking, physical activity, and weight. Levels of smoking, amount of physical activity, and weight at one year after discharge were then compared with those at the time of the coronary to see if changes had taken place.

Patients' weights, taken from the hospital records, were classified as being overweight or underweight according to the scales of the Metropolitan Life Insurance Company (1959). There were 156 patients in the overweight category and their weights at the time of the coronary were compared with weights taken at the time of interview. When weighed patients wore indoor clothes and no shoes to make the measurements comparable with hospital weights.

For cigarette smoking it was assumed that

patients' recall of smoking habits one year previously could be accepted and these statements were preferred to the hospital records which did not give the exact number of cigarettes smoked. When information in the hospital records about smoking was compared with that obtained during interviews it was found that there was close agreement between the two sources. In 1% of cases the interview data showed that patients' recollected levels of smoking were higher than those given at the time of the coronary, and in 1% of cases they were lower.

Changes in physical activity were measured by recording patients' leisure activity before the coronary and one year later. Patients were asked to consider four categories of activity: very active, moderately active, not very active, and very inactive. From these categories they chose that which best described their levels of activity before and after their attack.

Changes in these three variables were grouped into three categories: increased, unchanged, and decreased.

Personality characteristics of neuroticism and extroversion were assessed using the Eysenck personality inventory, form B (Eysenck and Eysenck, 1963) which was completed by the patients in the interviewer's presence.

Results

Table 3 shows the changes in behaviour with regard to smoking, physical activity, and weight for each sex classified under three headings: increased, the same, or decreased.

It will be seen that about two-thirds of the 321 smokers decreased their smoking, including 70 (22%) who stopped altogether. Most of the patients, especially the women, said that they reduced their physical activity. Of the 156 patients who were overweight at the time of the coronary 100 (64%) had lost weight during the year after their discharge from hospital.

Table 3 *Changes in smoking habits, physical activity, and weight, by sex*

<i>Sex</i>		<i>Changes in behaviour</i>			
		<i>Increased</i>	<i>Same</i>	<i>Decreased</i>	<i>Total</i>
Smoking*	Men	9 (3.4)	82 (30.1)	181 (66.5)	272 (100)
	Women	3 (6.1)	17 (34.7)	29 (59.2)	49 (100)
Physical activity	Men	21 (5.6)	129 (34.6)	222 (59.8)	372 (100)
	Women	2 (1.7)	21 (17.4)	98 (80.9)	121 (100)
Weight†	Men	34 (30.0)	3 (2.7)	76 (67.3)	113 (100)
	Women	17 (39.5)	2 (4.5)	24 (56.0)	43 (100)

*321 Smokers only

†156 Overweight patients only

Percentages in brackets

CHANGES IN SMOKING HABITS RELATED TO CERTAIN FACTORS

Medical advice on smoking

Of those who said they had been advised against smoking by their doctor significantly more reduced or stopped smoking than those who said they had not been so advised, Table 4.

Table 4 *Changes in smoking habits in those who were advised against smoking and those who were not*

Advised by doctor against smoking	Increased	No change	Decreased	Total
Yes	7 (3)	59 (24)	176 (73)	242 (100)
No	5 (6)	40 (51)	34 (43)	79 (100)
Total	12	99	210	321 (100)

Excluding 172 non-smokers
 $\chi^2 = 23.2$ df = 2 P < 0.001
 Percentages in brackets

Patients' views on smoking

Those who believed that smoking was harmful were significantly more likely to reduce or stop smoking, Table 5.

Table 5 *Changes in smoking habits and views of patients on its harmfulness*

Smoking considered harmful	Increased	No change	Decreased	Total
Yes	6 (3)	54 (24)	166 (73)	226 (100)
No	6 (6)	45 (48)	44 (46)	95 (100)
Total	12	99	210	321

Excluding 172 non-smokers
 $\chi^2 = 21.88$ df = 2 P < 0.001
 Percentages in brackets

Patients' views of the severity of their attack

No relationship was found between changes in smoking habit and the patients' views on the severity of their attack.

CHANGES IN PHYSICAL ACTIVITY RELATED TO CERTAIN FACTORS

Medical advice on physical activity

The patients did not appear to follow closely the advice which they said the hospital doctor or their general practitioner had given them. Of the 59 who reported that they had been advised by the hospital doctor to take more exercise, 28 (48%) were less active; of the 37 reporting the same advice by their general practitioner, 22 (59%) were less active.

Patients' views on the value of physical activity

Table 6 shows that although 297 (60%) of the patients thought that exercise was beneficial, only 21 (7%) of these patients said that they had

Table 6 *Changes in physical activity and views of patients on its value*

Attitude to physical activity	Increased	No change	Decreased	Total
Beneficial	21 (7.1)	101 (34.0)	175 (58.9)	297 (100)
No effect	0 (0.0)	12 (42.9)	16 (57.1)	28 (100)
Harmful	1 (1.2)	10 (11.9)	73 (86.9)	84 (100)
Don't know	1 (1.2)	27 (32.1)	56 (66.7)	84 (100)
Total	23 (4.7)	150 (30.4)	320 (64.9)	493 (100)

$\chi^2 = 29.76$ df = 6 P < 0.001
 Percentages in brackets

increased their physical activity after the infarction, 175 (59%) had decreased it, and in 34% there was no change. It is interesting that only 84 (17%) of the patients believed that physical exercise was harmful and as might be expected they were most likely to have decreased their physical activity.

Patients' views on the severity of the attack and physical activity

There was a significant association between changes in physical activity and the patients' views on the severity of the attack. Those who believed their attack had been a severe one were significantly more likely to reduce their activity, Table 7.

Table 7 *Changes in physical activity and patients' views on severity of illness*

Degree of severity	Increased	No change	Decreased	Total
Mild	9 (5.7)	71 (44.9)	78 (49.4)	158 (100)
Moderate	7 (7.2)	29 (29.9)	61 (62.9)	97 (100)
Severe	7 (3.1)	48 (21.2)	171 (75.7)	226 (100)
Total	23 (4.8)	148 (30.8)	310 (64.4)	481 (100)

12 patients could not classify the severity of their attacks
 $\chi^2 = 29.8$ df = 2 P < 0.001
 Percentages in brackets

Angina of effort and physical activity

It might be expected that patients suffering from angina at the time of the follow-up would be more likely to have reduced their physical activity and this in fact was found. Table 8 shows that of the 189 who had angina 144 (75%) reduced their activity but of the 304 who did not have angina 176 (58%) also reduced their activity.

Table 8 *Physical activity in relation to presence or absence of angina one year after discharge from hospital*

Angina	Increased	No change	Decreased	Total
Yes	3 (2.0)	42 (22.0)	144 (75)	189 (100)
No	20 (6.0)	108 (36.0)	176 (58)	304 (100)
	23	150	320	493 (100)

$\chi^2 = 20.26$ df = 2 P < 0.001
 Percentages in brackets

CHANGES IN WEIGHT RELATED TO MEDICAL ADVICE

Of the 156 overweight patients 114 (75%) said they had been advised by the hospital doctor to reduce weight and 73 (64%) did so, but of the 39 who said they had not been given such advice 24 (62%) also lost weight, Table 9.

Table 9 *Changes in weight of the 156 overweight patients in relation to medical advice*

Advice	Increased	No change	Decreased	Total
No advice	13 (33)	2 (5.0)	24 (62)	39 (100)
Advised to reduce weight	38 (32)	3 (4.0)	73 (64)	114 (100)
Total	51 (33)	5 (4.0)	96 (62)	153 (100)

Three patients were not given advice
 $\chi^2 = 0.53$ df = 2 P < 0.50
Percentages in brackets

SOCIAL CLASS AND CIVIL STATE

Patients were classified by the Registrar General's five social classes and by marital state. There were no significant relationships between the changes in behaviour which were studied and social class or civil state.

PERSONALITY: NEUROTICISM AND INTRO-EXTROVERSION

An important determinant of behavioural changes during or after an illness is the personality of the patient. This complex aspect was studied to a limited extent by the use of a personality inventory (Eysenck and Eysenck, 1963) which is intended to measure extroversion and neuroticism.

For the 490 subjects with these measures correctly recorded, the mean neuroticism score with the standard error of the mean was 11.36 (± 0.25) while the mean extroversion score was 13.29 (± 0.15). A statistically significant negative linear trend between neuroticism and extroversion scores was identifiable ($r = 0.2121$, $df = 468$, $P < 0.05$).

No relationship was found between the mean extroversion scores and the three types of changes in behaviour discussed above, or in the case of the mean neuroticism scores, for changes in smoking habits or weight. In the case of physical activity however, it was found that the mean neuroticism scores of those who increased or decreased their physical activity were significantly higher than for those who did not change their behaviour in this respect, Table 10. Again, within each subgroup of physical activity, there were statistically significant negative linear trends between neuroticism and extroversion.

Table 10 *Changes in physical activity by neuroticism scores*

N scores	Changes in physical activity		
	Increased	Same	Decreased
Mean neuroticism scores	12.2	9.5	12.2
Standard error	+0.97	+0.42	+0.32

$F = 12.62$ df = 2.487 P < 0.05
There was a significant difference between the mean neuroticism scores in the categories of physical activity.

Discussion

Mulcahy *et al.* (1975) found that average cigarette consumption was significantly lower among those surviving a four-year period after a first coronary attack, than among the decedents. Wilhelmsson *et al.* (1975) found that the recurrence rate and mortality rate of patients who gave up smoking after a myocardial infarction was only half that of those patients who continued to smoke. It is important therefore that coronary patients should be encouraged to give up the habit.

In this study 22% of the 321 smokers gave up smoking altogether and 43% reduced their smoking. Burns (1969) using the Maudsley personality inventory found that coronary patients who gave up smoking after their attack had lower neuroticism scores than those who continued to smoke. In general the results of our study did not support this finding.

The reported advice given by the doctor appeared to have been effective in helping to achieve this change in behaviour. The patient's own conviction that the habit was harmful was also shown to be important, but this factor may have been confounded with, and indeed the result of, the medical advice given.

A reduction of weight, especially in the obese, is usually considered desirable for those who have had a myocardial infarction. Mulcahy *et al.* (1975), however, did not find a significant difference in the mean changes in weight between their survivors and the decedents. A randomised controlled clinical trial of weight reduction in overweight cases is required to determine the value of this behavioural change in the postinfarction period. In our study we found that 64% of overweight patients had lost weight and that medical advice seemed to have contributed significantly to this result.

The popular conception that a fatal heart attack may result from sudden or excessive physical exertion may be one of the reasons why 297 (65%) of patients in this series said that they thought exercise was beneficial, but only 21 (7%) of these did increase their activity. Unlike their behaviour in relation to smoking and weight, those who

said they were advised by their doctors to take more exercise did not appear to accept the advice. This may be attributed in part to angina in some of the patients who were less active a year after their coronary but more than half of those who reduced their activity did not suffer from angina. The patients were especially likely to reduce their physical activity if they thought they had had a severe attack.

Mulcahy and Hickey (1970) and Monteiro (1973) drew attention to the presence of chronic anxiety in patients who had had an infarction as a cause of failure to return to work or to be physically active. The raised neuroticism scores are a sign of anxiety (Bendig, 1960) and could explain the tendency in these patients to reduce physical activity. This study shows that in spite of the efforts to persuade patients to be more active than before their coronary, most were less so, even one year afterwards. The 5% who increased their amount of physical activity and the 65% who decreased it had significantly higher mean neuroticism scores than those who did not change their physical activity, Table 10. Seventy-two per cent of men under the age of 65 were back at work within a year of their infarction so physical deterioration was not the cause. It was revealed by patients that there was no sustained encouragement available to them once they had returned to normal living although this would have helped them to resume at least their precoronary levels of activity with confidence. There would appear to be a need for more rehabilitation clinics for the postinfarction patients where beneficial behavioural changes could be encouraged and anxiety assuaged.

Shaw and McNiven (1974) in a small pilot trial of such a clinic, found that the frequent visits by patient and spouse helped to bring about a reduction in smoking and an early return to work. It was demonstrated by Ball and Turner (1974) that success in persuading patients to abandon smoking could depend on convincing doctors of the effectiveness of antismoking advice. Burt *et al.* (1974) reported that two-thirds of their patients gave up smoking and attributed their improved results to the establishment of a good doctor-patient relationship in the follow-up period.

Conclusions

A large proportion of patients in this series who survived a first acute myocardial infarction, changed their behaviour with regard to smoking, weight, and physical activity.

Giving up or reducing smoking has been shown by other workers to be associated with a lower risk of a recurrent infarction and of death. Although

there is presumptive evidence that weight loss in the obese and increased activity should improve the prognosis, there does not yet appear to be conclusive evidence that this is so. Controlled clinical trials to test the value of additional and more intensive advice and support to patients in the postcoronary period would add to present knowledge. In the meantime, all patients who have had an infarction and who smoke should be strongly advised to give it up as there is no doubt that many can succeed in doing this.

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