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MODIFICATION OF SMOKING HABITS FIVE MONTHS AFTER MYOCARDIAL INFARCTION: RELATIONSHIP WITH PERSONALITY CHARACTERISTICS

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ABSTRACT – The relationship between personality characteristics and spontaneous modification of smoking habits was assessed in 164 patients after their first myocardial infarction (MI). Smoking habits before the MI were investigated in retrospect and 5 months later. Smoking appeared to have decreased significantly. Persistent smokers could be differentiated from nonsmokers and exsmokers by a significantly high level of state-anxiety and depression. Young persistent smokers had a high level of depression; elderly persistent smokers were highly anxious and had a low level of somatization. The relationship between smoking behaviour modification and personality characteristics is discussed in association with intervention programmes.

Keywords: Myocardial infarction; Personality characteristics; Smoking habits.

INTRODUCTION

Cigarette smoking is a risk factor for the development and progression of coronary heart disease (CHD) in the general population (1, 2). Moreover, it is known that smoking cessation by CHD patients leads to an average decrease in mortality (of over 40%) and in morbidity (3–8). It is therefore not surprising that many studies have focused on the positive effects that smoking cessation has on morbidity and mortality in patients with CHD. Percentages of patients who stopped smoking after their first MI range from 28% to 70% (3–7, 9, 10).

One is inclined to wonder why patients persist in smoking after they have had such a specific warning as an MI. A plausible explanation is that deeply rooted habits are not easy to change. From this point of view, the question arises as to whether personality is important in CHD patients who smoke.

Several personality characteristics have been found to be representative of persistent smokers in general (11–14). In a recently published study (11) that described the

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20-year follow-up of college men and women, personality measures were used as predictors for smoking initiation and cessation. The results showed that exsmokers and current smokers were more impulsive, rebellious (recalcitrant), hostile, socially extroverted, sensation-seeking, and willing to express their personal faults than nonsmokers. Further, exsmokers were less hostile and less sensation-seeking than current smokers. People who initiated smoking were more rebellious, impulsive, sensation-seeking, hostile, less likely to present a positive self-image, and less socially extroverted than nonsmokers.

Most of the research conducted in search of a coronary-prone personality has focused on the Type A behaviour pattern (15, 16), a construct that arose from Friedman and Rosenman's (17) observations of the behaviour of cardiac patients in their private practice during the 1950s. After empirical testing in the 1960s, this construct became widely accepted in the 1970s. More recently, however, the validity of the Type A construct has been questioned (18). Type A behaviour is no longer seen as unidimensional. Some of the dimensions may be relevant to CHD, for example, neuroticism (19–22) somatization, low self-esteem, rigidity (23–25); anxiety, depression (20, 22, 26); anger, aggression, hostility (27, 28), and vital exhaustion (reflecting feelings of excess fatigue, general malaise, and lack of energy) (29).

Considering the positive relationships between the above-mentioned personality characteristics and CHD, between personality characteristics and smoking habits, and between smoking habits and CHD, it seems relevant to investigate these characteristics as predictors of smoking habits after MI.

The relationship of smoking and personality characteristics in post-MI patients has not yet been investigated. Therefore, the aim of the present study was to explore the relationship between personality characteristics and smoking behaviour modification after a first MI.

METHOD

Participants

From January 1993 to October 1994, 378 patients who had been admitted to the cardiology departments of three different hospitals in Rotterdam for their first MI were eligible to take part in this study. A total of 260 (72.4%) patients participated in the investigation ($N = 89$ from the University Hospital Rotterdam Dijkzigt, $N = 92$ from the Havenziekenhuis, and $N = 79$ from the Holy-ziekenhuis; no significant differences were found among the three groups). In the group of nonparticipants, 19 (16.1%) died soon after the MI; 32 (27.1%) refused to participate, and in 30 patients (25.4%) participation was emotionally or physically too demanding. A further 37 patients (31.4%) were excluded due to practical problems such as transfer to another hospital. The study group comprised 185 men and 75 women who had an adequate command of the Dutch language and who were not suffering from any other serious physical or psychiatric disorder. The nonparticipants were similar to the participants regarding gender, but were significantly older than the participants. Patients were recruited while still in hospital.

Measures

Smoking behaviour was assessed using a structured interview concerning current and former smoking habits. Recent studies (30–33) comparing self-reports with biochemical measures have shown that the results for respondents not participating in a smoking cessation intervention programme generally appear to be valid.

Personality characteristics were assessed using psychological questionnaires. Neuroticism and Somatization of Neurotic Complaints were assessed by two scales from the "Amsterdamse Biografische Vragenlijst" (ABV, 34). The questionnaire has good reliability and acceptable validity (35). Rigidity and Self-esteem were derived from the validated "Nederlandse Persoonlijkheids Vragenlijst" (NPV, 36); the reliability is considered to be adequate (35). Anxiety and Depression were assessed with the Hospital Anxiety and Depression scale (HAD, (37)). To register anxiety, state and trait, the "Zelf Beoordelings Vragenlijst"

(ZBV, 38) was completed by the patients, and the "Zelf Analyse Vragenlijst" (ZAV, 39) was used to register hostility, state and trait. The reliability and validity of the ZBV and the ZAV are good (35). Vital Exhaustion was measured with the "Maastrichtse Vragenlijst" (MV, 40), which consists of 23 items. Five mood states were measured with the Profile of Moods State (POMS, 41), consisting of 32 items, involving Fatigue, Vigour, Tension, Depression, and Anger.

Well-being and Feelings of Disability, Displeasure, and Social Inhibition were assessed by the Heart Patients Psychological Questionnaire (HPPQ, 42) with 52 items; its reliability and validity are acceptable (35).

Procedure

All of the patients who were hospitalized for their first MI were given a written invitation to participate in the study by the first author. The aim of the study was explained to them, and after informed consent was obtained, a structured interview was conducted at the hospital and patients were subsequently asked to complete the psychological questionnaires. Apart from the regular check-up visits at the cardiology department, the patients were invited back to the hospital to participate in the second measurement approximately 5 months later. The same structured interview was conducted, in which current smoking behaviour was assessed. The POMS, HAD, and HPPQ were also completed for the second time. An interval of 5 months was chosen for the second measurement as a reasonable number of patients had the possibility to participate in a physically oriented cardiac rehabilitation programme after discharge from the hospital, lasting about 3 months. After 5 months, the possible influences of such a programme are assumed to be stabilized.

Analysis

First, subscales for which the percentage of missing data was more than 15 were withdrawn from the analysis; missing values of 15% or less were estimated using the "predicted mean matching" method (43).

The patient group was divided into 3 categories: nonsmokers who had never smoked ($S - -$), exsmokers who had stopped smoking after their first MI ($S + -$), and smokers who were still smoking 5 months after the MI ($S + +$). These categories of smoking habits formed the independent variables. The significance of each continuous variable was tested separately using the univariate one-way analysis of variance. Chi square testing was done for nominal biographical variables. The magnitude of the difference for each separate psychological variable between the smoking categories is indicated by Cohen's D .

The personality characteristics were analyzed jointly to test whether they could differentiate between the 3 categories of smoking behaviour. To be entered into the multivariate model, these variables and their interactions with gender and age had to meet the criteria of a Cohen's D of >0.40 or $D < -0.40$ (44). With linear discriminant analysis according to the Wilks' lambda method, the number of statistically significant ($p > 0.05$) discriminant functions was determined. As the 3 categories of smoking behaviour were differentiated on the basis of psychological variables, the prior probability was considered to be equal for all 3 categories. The group means are presented as standardized scores with a mean of 0.0 and a variance of 1.0.

The linear discriminant solution was crossvalidated, each time with 4/5 "training sample" and 1/5 "validation sample," to gain insight into the stability of the discriminant solution.

RESULTS

Patient Characteristics

A baseline measurement was obtained from 260 patients; 204 (78.5%) of them participated in the second measurement, carried out approximately 5 months after the MI. All patients were advised to quit smoking by their cardiologist. None of the patients participated in any type of structured smoking cessation programme after the MI, neither during hospitalization nor after discharge from the hospital. In the drop-out group, 21.4% died before the second measurement, 62.5% did not want to participate any further, and 16.1% dropped out for several other reasons, such as the onset of other physical or psychiatric disorders in the period after the MI. The drop-outs did not differ in age, gender, or smoking behaviour from the participants. After correction for inconclusive data, 164 patients entered the analysis. Table I summarizes the biographical characteristics of the 3 categories: the nonsmokers who

Table I. — Biographical characteristics of the 3 differentiated categories (in percentages), *N* = 164

Smoking categories and biographical characteristics	S — — <i>N</i> = 90	S + — <i>N</i> = 45	S + + <i>N</i> = 29
Male	71.1	88.9	79.3
Age (in years, mean (SD))	65.95 (9.25) ^a	55.28 (12.02) ^b	56.16 (11.83) ^b
Living with a partner	82.0	77.3	60.7
Occupational status			
employed	21.4 ^a	46.7 ^b	42.9 ^b
unemployed	1.1	4.4	10.7
retired	46.1	17.8	28.6
housewife	21.4	8.9	7.1
unfit for work	6.7	20.0	10.7
not working for unknown reasons	3.4	2.2	0.0

Means with different superscripts were significantly different, while those with the same superscript were not significantly different. S — —: non-smokers; S + —: ex-smokers; S + +: smokers.

had never smoked (S — —), the exsmokers who had stopped smoking after the MI (S + —), and the smokers who were still smoking 5 months after the MI (S + +).

No significant differences were found between the 3 categories for gender or for living with a partner. A statistically significant difference was found for age: the patients in the S — — group were approximately 10 years older than the patients in the other two categories. Occupational status differed significantly in line with this finding: in the S — — group, proportionally fewer patients were employed.

Differentiation of the Separate Variables

S + + was significantly more depressive than S — — and S + —, and S + + compared to S — — had significantly less vigour (*p* < 0.05, two-tailed). For the purpose of unambiguous interpretability, the values were transformed into *T*-scores (mean = 50; standard deviation = 10) for all of the patients. Figure 1 presents the *T*-scores for the different

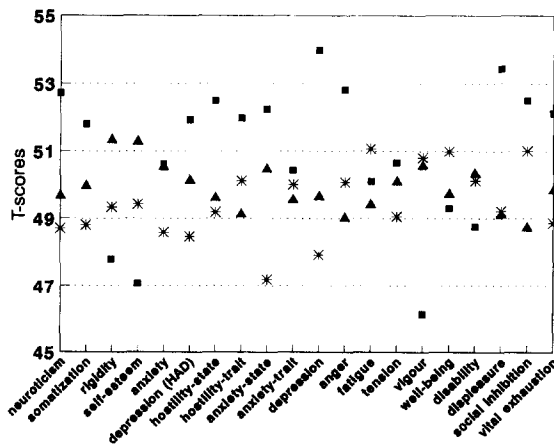


Fig. 1. *T*-scores for personality characteristics with respect to smoking habits. ▲ = S — —, nonsmokers; * = S + —, exsmokers; ■ = S + +, smokers.

personality characteristics in the three different categories. Cohen's D was used to gain an insight into the magnitude of the differences between categories. $S - -$ compared to $S + +$ showed that Cohen's D values for self-esteem and vigour were larger than 0.40, while for displeasure Cohen's D was less than -0.40 . $S + -$ compared to $S + +$ showed one personality characteristic with a Cohen's D greater than 0.40, namely vigour, while state-anxiety, depression (assessed by the POMS), and displeasure had values lower than -0.40 . There were no differences greater than 0.40 or less than -0.40 between $S + -$ and $S - -$. The results are presented in Table II.

Differentiation of the Joint Variables

Multiple discriminant analysis was performed for 5 psychological variables (self-esteem, state-anxiety, depression, vigour, and displeasure) and for 9 interaction terms (neuroticism and state-hostility with gender; neuroticism, somatization, anxiety, depression, state-anxiety, well-being, and disability with age). It appeared that one discriminant function was statistically significant ($p < 0.05$) with a canonical correlation between the 3 categories of smokers and the variables entered in the discriminant model of 0.33. The eigenvalue was equal to 0.12. In total, 3 variables contributed significantly to the differentiation of the 3 categories. The most important variable, although negatively associated, turned out to be the interaction of depression, assessed by HAD, with age. In addition, 2 main variables were of importance, namely, state-anxiety, assessed by the ZBV, and depression, assessed by the POMS. These main variables were positively associated.

As expected, it turned out that the variables entered in the final discriminant model correlated best with the linear discriminant function. Furthermore, 2 interaction variables were inversely correlated. In other words, the interaction of age with somatization and of age with anxiety were inversely related with the discriminant function (Table III).

Persistent smokers (category 3) reached the highest group mean on the discriminant function (0.59), whereas category 2, exsmokers, had the lowest group mean on that function (-0.45). In other words, persistent smokers appeared to have higher state-anxiety and a higher level of depression than the other 2 smoking categories. Exsmokers (category 2) could be characterized by a relatively low level of state-anxiety and a relatively low level of depression. Due to the negative interaction between depression and age, it was evident that the young persistent smokers had a high level of depression. Furthermore, the elderly persistent smokers were more anxious than the exsmokers and were characterized by a low level of somatization. The stability of the solution, assessed by cross-validation, appeared to be of high quality (Table IV).

DISCUSSION

Although cigarette smoking is generally accepted as a risk factor for cardiovascular disease, about 40% of the smokers in the present study did not change their smoking habits after their first myocardial infarction (MI). This finding is in line with the literature (3-8). The underlying purpose of this study was to gain an insight into the psychology of persistent smoking after an MI and to explore the relationship of smoking habits after a first MI and personality characteristics. The results showed that the persistent smokers could be distinguished from the nonsmokers and the

Table II. — Means, confidence interval, and Cohen's *D* for the 3 different categories: S - -, S + -, and S + +

	S - -			S + -			S + +			Cohen's <i>D</i>		
	μ	95% C.I.	μ	95% C.I.	μ	95% C.I.	S - -	S + -	S + +	S - -	S + -	S + +
ABV												
Neuroticism	42.61	37.33 to 47.89	40.20	34.06 to 46.34	49.79	40.69 to 58.89	0.10			-0.29		-0.39
Somatization	19.22	17.80 to 20.64	18.44	16.82 to 20.06	20.38	17.68 to 23.08	0.12			-0.17		-0.28
NPV												
Rigidity	34.93	33.11 to 36.75	33.13	30.65 to 35.61	31.76	28.46 to 35.06	0.21			0.36		0.16
Self-esteem	29.78	28.50 to 31.06	28.64	27.08 to 30.20	27.24	24.74 to 29.74	0.20			0.40		0.22
HAD												
Anxiety	3.86	3.24 to 4.48	3.31	2.35 to 4.27	4.41	2.99 to 5.83	0.18			0.00		-0.19
Depression	5.37	4.57 to 6.17	4.64	3.74 to 5.54	5.38	3.86 to 6.90	0.20			-0.17		-0.34
ZBV												
Anxiety-state	38.86	36.62 to 41.10	35.29	32.29 to 38.29	40.72	36.36 to 45.08	0.34			-0.17		-0.49
Anxiety-trait	35.17	33.11 to 37.23	35.58	32.70 to 38.46	36.00	32.26 to 39.74	0.00			-0.08		-0.04
ZAV												
Hostility-state	11.22	10.60 to 11.84	11.07	10.53 to 11.61	12.17	10.05 to 14.29	0.00			-0.23		-0.27
Hostility-trait	15.52	14.48 to 16.56	15.98	14.78 to 17.18	16.86	14.92 to 18.80	-0.10			-0.27		-0.17
MV												
Vital exhaustion	7.29	5.97 to 8.61	6.67	5.07 to 8.27	8.66	6.10 to 11.22	0.10			-0.21		-0.031
POMS												
Fatigue	5.32	4.06 to 6.58	6.31	4.43 to 8.19	5.72	3.34 to 8.10	0.00			-0.07		0.10
Vigour	11.67 ^a	10.75 to 12.59	11.76 ^{a,b}	10.64 to 12.88	9.69 ^b	7.75 to 11.63	-0.02			0.43		0.44
Tension	5.47	4.41 to 6.53	4.93	3.65 to 6.21	5.72	3.64 to 7.80	0.11			-0.05		-0.15
Depression	3.82 ^a	2.62 to 5.02	2.76 ^a	1.68 to 3.84	6.41 ^b	3.11 to 9.71	0.21			-0.37		-0.53
Anger	4.18	3.16 to 5.20	4.71	3.27 to 6.15	6.14	3.64 to 8.64	0.00			-0.36		-0.36
HPPQ												
Well-being	25.90	24.28 to 27.52	26.82	24.76 to 28.88	25.55	22.65 to 28.45	-0.12			0.05		0.16
Disability	24.84	23.52 to 26.16	24.69	22.83 to 26.55	23.83	21.25 to 26.41	0.02			0.16		0.13
Displeasure	15.48	14.60 to 16.36	15.51	14.39 to 16.63	17.34	15.32 to 19.36	-0.01			-0.40		-0.40
Social inhibition	11.14	10.50 to 11.78	11.84	10.90 to 12.78	12.31	11.13 to 13.49	0.23			-0.38		-0.15

Means on each line with different superscripts were significantly different, while those with the same superscript were not significantly different. S - - : non-smokers; S + - : ex-smokers; S + + : smokers.

Table III. — Standardized canonical discriminant function coefficient

	Function
Depression (HAD) by age	-0.70
Depression (POMS)	0.57
State-anxiety (ZBV)	0.50
Somatization (ABV) by age	-0.44
Anxiety (HAD) by age	-0.43

Table IV. — Group centroids of the canonical discriminant function before and after cross-validation

Group	Function (before cross-validation)	Function (after cross-validation)
S - -	0.036	0.046
S+ -	-0.453	-0.398
S+ +	0.591	0.534

exsmokers by a high level of state-anxiety (ZBV) and a high depression level (POMS). There was some evidence that the personality characteristics determinant for smoking were modified by age. Hostility did not play a role in this study, although it has been mentioned in the literature as a particular personality characteristic of persistent smokers (11-14).

From prior studies (45, 46) it is known that post MI patients who entered a smoking cessation intervention programme (62% and 69% smoking cessation) had higher rates of smoking cessation than the patients who received usual care (51% and 55% smoking cessation, respectively). In line with our findings, an appropriate method of approaching smoking cessation would appear to be an intervention programme aimed particularly at smokers with the above-described personality characteristics. Such an intervention programme should pay attention to related thoughts and behaviour and should encourage patients to improve or change in a positive way.

Further, it may be worthwhile to focus on the structure of the motives of cardiac patients to stop or not to stop smoking and, as a consequence, on the development of motivation techniques. Smoking is a consequence of conditioning; it is a way of relaxing in times of stress or nervousness, but it could also be an acquired behaviour. For most people, smoking cessation causes a great deal of tension if no alternative is offered to avoid, suppress, or cope with feelings of stress. Because cardiac patients in particular are expected to translate (unconsciously) their problems into somatic terms, it could be useful to focus the intervention on their bodily awareness with, for example, breathing therapy (47) as an alternative for smoking.

Such an intervention programme could operate independently, but it could also be integrated into existing rehabilitation programmes. Apart from hospital-based "quit-smoking interventions" (48), the rehabilitation of CHD patients is nowadays characterized by a multidisciplinary approach with medical, social, and psychological aspects (49). In line with this tradition, extra attention should be paid to smokers with the above-mentioned personality characteristics during rehabilitation.

We were able to differentiate the persistent smokers from the other two categories of

smokers, but unfortunately not (yet) perfectly. This may be related to the instruments used. As the reliability and validity were satisfactory, this cannot fully explain our findings. Another explanation could be the existence of other, up to now, unknown variables with differential qualities that require further investigation.

Another restriction of this study is that unfortunately it was impossible to measure how much advice patients were given by their cardiologist or general practitioner to quit smoking after discharge from the hospital. Such advice has at least a small effect, but is out of reach of observation. Nevertheless, this possible effect will be equally divided among the 3 categories.

Further, it is well established that smokers are "economical with the truth" as regards their smoking habits; the deception rate ranges from 16% to 40% among participants in a smoking cessation programme (50, 51). Biochemical measures, however, to avoid this problem are not reliable either (31-33). Comparing self-reports with biochemical measurements among respondents not involved in a smoking cessation programme gives high correspondence between the different methods. Knowing this, in spite of the shortcomings of the method, a structured interview has been chosen in this study.

In the light of the results of the present study, to supply tailor-made intervention programmes to support CHD patients in their endeavour to stop smoking, more attention should be paid to personality characteristics. The effect of such a programme on smoking habits after myocardial infarction needs to be studied.

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