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LIFESTYLE EFFECTS OF GROUP HEALTH EDUCATION FOR PATIENTS WITH CORONARY HEART DISEASE

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In the present study, effects of a health education (INFO) and a PsychoEducational Prevention (INFO + PEP) programme were investigated in three hospitals. These programmes were offered to groups of coronary heart disease (CHD) patients and their partners after discharge from hospital. The INFO was offered to 127 CHD patients in addition to FIT (i.e., standard medical care and physical training). The PEP was offered to 90 patients in addition to the INFO and FIT. A control group of 122 patients received only FIT. The INFO and the PEP consisted of four weekly two-hour group sessions each. In addition, the PEP was followed by seven telephone follow-up contacts.

On average, patients improved their lifestyles during the first three months. Between three and twelve months an extra improvement was found for eating habits, whereas there was a relapse for smoking and a sedentary lifestyle. In the short term, angina pectoris and a longer period of heart complaints were parallelled with a decrease in the risk of maintaining unhealthy eating habits, whereas in the long term a longer period of heart complaints, a younger age and unemployment predicted a lower risk of maintaining unhealthy eating habits. In the short term living with a partner and in the long term female gender were predictive of continued smoking behaviour. In the short term, older age, a first CABG and a specific hospital setting decreased the risk of a continued sedentary lifestyle.

The FIT + INFO + PEP had a favourable short-term effect on eating habits. For smoking and a sedentary lifestyle, however, there were negative effects. In the short term, patients in the FIT + INFO and those in the FIT + INFO + PEP had significantly more problems in quitting a sedentary lifestyle than those in the FIT intervention. In the long term, patients in the FIT + INFO had significantly more problems in stopping smoking compared to those in the FIT.

KEY WORDS: Coronary heart disease, psycho-educational programmes, evaluation, lifestyles.

INTRODUCTION

Due to the fact that more patients survive a cardiac event, the number of coronary heart disease (CHD) patients in need of cardiac rehabilitation services increases. This increasing survival rate has consequences for the kind and diversity of cardiac rehabilitation services, and causes a growth in the use of medical resources and, as a consequence, in health care costs. In line with these developments, in a report of the World Health Organization (WHO, 1993) the aim of cardiac rehabilitation was extended as follows: "The rehabilitation of the cardiac patient is the sum of activities required to influence favourably the underlying cause of the disease, as well as to ensure the patients the best possible physical, mental and

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social conditions, so that they may, by their own efforts, preserve or resume when lost, a normal a place as possible in the life of the community (p. 5)". Also the title of the repor "Needs and action priorities in cardiac rehabilitation and secondary prevention in patient with CHD" reflects a growing awareness that the goals of cardiac rehabilitation service should be expanded from quality of life objectives to secondary prevention. Secondary prevention refers to the reduction of cardiac mortality and morbidity, through pharmacologica therapy, surgery and risk factor modification. Therefore, in addition to standard cardia care, cardiac rehabilitation services should include physical training and health educatio programmes.

Additionally, stress management programmes have to be included. Whereas mos cardiac rehabilitation centres offer a combination of these kinds of programmes, the mai objectives of the programmes differ. While stress management programmes are primaril focused on reduction of emotional distress or improvement of quality of life, the main ain of health education programmes is to give the patient an active role in controlling, stabilizing or slowing down the progression of the disease. As such, risk factor modification and or improvement of unhealthy lifestyles forms a part of health education programmes. O the other hand stress management programmes can also facilitate secondary preventio objectives. Stress as a consequence of the cardiac event can inhibit the modification o unhealthy lifestyles. A primary objective for health education programmes, however, is t encourage patients to quit smoking, to improve their eating habits and to do more physica exercise.

In various qualitative and quantitative reviews positive effects were found of stress management and health education programmes on (cardiac) mortality, nonfatal cardiac recurrences risk factors, lifestyles related to risk factors, and emotional distress (Dusseldorp *et al.* 1999; Ketterer, 1993; Linden *et al.*, 1996; Mullen *et al.*, 1992; US Department of Healt and Human Services, 1995). In spite of the positive results, in most studies it is conclude that the effectiveness of cardiac rehabilitation services ought to be improved. Screening o coronary patients for cardiac rehabilitation services is strongly recommended, in order t be able to offer individualized (combinations of) cardiac rehabilitation services. In addition the growth in use of cardiac rehabilitation services and, as a consequence, in health car costs, makes it necessary to offer programmes to patients who, most probably, will benefi most from these programmes.

Patients with unhealthy lifestyles (smoking, unhealthy eating habits, and/or a sedentar lifestyle) should be selected for health education programmes. Screening on these unhealth lifestyles enables health professionals to focus their interventions on priorities which ar important according to the patient. Screening exclusively on these lifestyles, however, i not enough. The selection of high-risk patients can be improved, using demographic an medical predictors of lifestyle changes. Many studies reveal relationships of medical o demographic characteristics with risk behaviour change. Empirical findings show that amongst others, demographic and medical variables have to be included as predictors in a evaluation study. Based on a review of 14 studies Burling *et al.* (1984) concluded that mal patients and patients with a more severe myocardial infarction showed higher smokin cessation rates than female patients and patients with a less severe myocardial infarction Salonen *et al.* (1985) showed that not-working or unemployment before the heart attack, i addition to more self-reported recovery afterwards was predictive for continuing smoking Conroy *et al.* (1986) found that smoking cessation and weight reduction were related t a younger age and a higher level of education in myocardial infarction patients. Furthermore male, urban, younger patients with a higher level of education demonstrated higher adherenc with medical advice for physical exercise. Also Engblom *et al.* (1992) found a mor marked increase in the ratio of serum HDL cholesterol to total cholesterol in younge patients aged 55 years or under after multifactorial rehabilitation.

In the current study the effects of participation in a health education programme (INFO or in a combination of an INFO module and a Psycho-Educational Prevention programm (PEP) on smoking cessation, healthy eating habits and physical exercise were investigatec controlling for demographic and medical variables. The following research questions wi be answered:

1. To what extent do patients change their lifestyles in the period from before the cardia event until 3 and 12 months after the cardiac event?
2. To what extent does participation in INFO or in a combination of INFO and PEP decreas the risk of maintaining unhealthy lifestyles 3 and 12 months after the cardiac event, contro ling for demographic and medical variables?

METHODS

Subjects

Between February 1997 and April 1998, physicians, physiotherapists and nurses in the Isal Clinics (De Weezenlanden, Zwolle), Catharina Hospital (Eindhoven) and Tweestede Hospital (Tilburg), in the Netherlands informed 453 consecutive coronary heart patient about the possibility to participate in the research and rehabilitation programmes (informe consent procedure). Inclusion criteria were: hospitalization after a myocardial infarctio (MI), percutaneous transluminal coronary angioplasty (PTCA), or coronary artery bypas grafting (CABG); age lower than 70; no congestive heart failure; being able to read an write the Dutch language; and no psychotic episodes. Participation in the study was volur tary; 339 coronary heart patients participated in the pre-test, in the first follow-up thre months after the cardiac event (follow-up I), and in the rehabilitation programmes (11 patients had refused to participate in the study and 77 patients dropped out before follow up I). All 339 patients finished the rehabilitation programmes before follow-up I. At 1 months (follow-up II) there was an additional drop-out of 48 patients.

Design

A quasi-experimental pre-test post-test control group design was used. In one experiment condition patients were offered the INFO module in addition to standard medical care an physical training (FIT + INFO, $n = 127$), in the other experimental condition patien received both the INFO and the PEP module in addition to standard medical care and phy ical training (FIT + INFO + PEP, $n = 90$). In a third condition patients only received stanc ard medical care and physical training (FIT, $n = 122$). In order to prevent patients in or condition from becoming aware of another condition (diffusion effect), during a period c four months patients were assigned to the FIT condition, in another period of four montl to the FIT + INFO condition, and in a third period to the FIT + INFO + PEP condition. Th procedure was applied within each of the three hospitals. The FIT condition was referre to as control condition, since this condition was a part of the standard care in all thre hospitals.

There were three measurement points, a pre-test immediately before or after discharge from the hospital, and two follow-up tests, three (I) and twelve (II) months after hospitalization. At 12 months there were 113 (93%) patients left in the FIT condition, 107 (84%) patients in the FIT + INFO and 71 (79%) patients in the FIT + INFO + PEP condition.

Characteristics of the Programmes

The INFO and PEP programmes are offered in addition to a FIT programme (Berkhuysen and Rispens, 1995/1996). The INFO programme (van Elderen and Leenders, 1995/1996) consisted of four weekly two-hour sessions for groups of between 10 and 15 patients together with their partners. Sessions were offered as soon as possible after hospitalization. During each of the subsequent sessions a health professional, involved in the standard care of coronary heart patients, discussed specific topics related to heart disease. Medical issues, risk factors and medication were discussed by a cardiologist, diet and healthy eating habits by a dietician, the modification of unhealthy lifestyles related to risk factors and anxiety and depression by a psychologist, and somatic and social consequences of the coronary heart disease by a nurse or a social worker. An attempt was made to discuss these topics as much as possible in interaction with patients and partners. The sessions did not have to be followed in a specific order, patients and partners therefore could start immediately after dismissal from the hospital, independent of the specific session that was offered the week after discharge.

The PEP programme (van Elderen and Echteld, 1995/1996) consisted of one intake session a few weeks after the cardiac event and four weekly two-hour sessions for groups of between six and eight patients together with their partners. During the year after discharge from hospital and after the group sessions seven telephone contacts with the patients took place. Intake and telephone follow-ups were either taken care of by the psychologist offering also the PEP group sessions, or by a nurse coordinator who participated in the PEP sessions.

The topics of the group sessions were: the modification of unhealthy lifestyles (smoking cessation, dieting and healthy eating habits, and physical exercise), stress management (learning to cope with anxiety, depression, frustration and irritability), and the uptake of social and leisure activities. Self-control techniques, Rational-Emotive Therapy (RET) and relaxation exercises were part of the intervention. In addition, strategies to increase the motivation of the patients were included. All methods were focused on self-management of patients and partners. During telephone follow-ups patients were given the opportunity to talk about their psychosocial problems. Additionally, the telephone contacts were focused on relapse prevention. Patients were reminded of agreements and new resolutions they had made concerning healthy lifestyles, and they were encouraged to discuss the problems they had encountered in living up to these resolutions.

Instruments of Measurement

Health promoting behaviour, demographic and medical variables were assessed by the Leiden Screening Questionnaire for Heart Patients (LSQ-H, van Elderen *et al.*, 1997):

1. Demographic variables: gender, age, single/living together, education (primary only, low, middle or high), and employment or not;
2. Medical variables: kind of and number of cardiac events, duration of cardiac complaints, self-reported New York Heart Association (NYHA);

3. Hospital setting (Catharina Hospital Eindhoven, Isalaklinieken Zwolle, Tweestede Hospital Tilburg);
4. Patients were asked at the pre-test about their risk behaviour before the cardiac even In addition, the lifestyles were assessed at the two follow-up tests. The following thre lifestyles were included in the LSQ-H:

   – Eating habits (Eating Habits Scale (Scholten *et al.*, 1994, based on the WHO MON ICA-questionnaire [WHO, MONICA, 1988]): 9 items, range 14–38, $\alpha = 0.72$). Thi scale was dichotomized, with category 0 indicating "healthy eating habits" (scoring i the seven highest deciles on the Eating Habits Scale, i.e., 24 or higher), and category indicating "unhealthy eating habits" (scoring in the lowest three deciles on the Eatin Habits Scale, i.e., lower than 24);
   – Smoking behaviour (LSQ-H: one item: yes or no);
   – Exercise behaviour (LSQ-H: assessed by merging two items, resulting in one iten physical exercise during at least 20 minutes (never; once or twice a week; three time or more every week)). Patients who exercised less than three times a week at least 2 minutes, were considered having a sedentary lifestyle. Exercising was broadly define as: walking briskly, cycling, swimming, jogging, dancing, or other forms of physica efforts.

Statistical Analysis

Pre-test differences between the FIT, FIT + INFO, and FIT + INFO + PEP condition concerr ing demographic and medical variables, lifestyles and risk behaviours of the patients wer examined with analyses of variance (for continuous variables) and Pearson χ^2 analyses (fc categorical ones).

Wilcoxon Signed Ranks Tests were carried out to investigate changes in lifestyle between the measurement points. These tests were performed at a two-tailed 5% signific ance level ($p_{\text{two-tailed}} \leq .05$). In addition, Mann-Whitney Tests were performed to investigat whether drop-out from follow-up I to II was related to risk category (unhealthy behavior or not). We expected a positive relationship between drop-out and unhealthy behaviour: Therefore, these tests were performed at a one-tailed 5% significance level ($p_{\text{one-tailed}} \leq .05$)

Concerning the evaluation of the effects of the INFO and INFO + PEP conditions o eating habits, smoking and exercise behaviour, controlling for relevant demographi and medical variables, logistic regression analyses (with SPSS 10.0; Norušis and SPS Inc., 1999) were performed. We used indicator contrasts for the categorical treatment var: able and categorical covariates. Predictor variables entered the analyses in two group (called blocks). In a first block, all five demographic and three medical variables, an hospital setting were entered. A backward stepwise procedure was used to select variable: which were significantly related to eating habits, smoking and exercise behaviour (at eac follow-up test), respectively. The criterium for removal of a variable was .10. In the table these variables are reported as first block in the hierarchical logistic regression analysi: Then, in a second block the treatment condition (FIT, FIT + INFO and FIT + INFO + PEF was included in the analysis, to evaluate effects on health behaviours. We expected favourable effect of the FIT + INFO and FIT + INFO + PEP condition compared to the FI' only condition. Therefore, these contrasts were tested at a one-tailed 5% significance leve ($p_{\text{one-tailed}} \leq .05$).

RESULTS

Demographic and Medical Characteristics

Demographic characteristics. There were 286 male patients and 53 female patients. On average the mean age of the respondents was 56.9 ($SD = 8.36$; range 34–70), for male patients 57.0 ($SD = 8.39$; range 34–70) and for female patients 56.4 ($SD = 8.24$; range 36–70). Three hundred and three patients lived with a partner, 36 were single. With respect to level of education, 63 patients finished elementary school, 127 patients lower vocational education, 68 patients medium vocational or secondary education, and 80 patients had higher secondary or vocational education (one missing value). Hundred and fifty patients were employed for 10 hours or more a week.

Medical characteristics. Two hundred and eleven patients suffered from cardiac complaints one year or less, 35 patients 2–3 years, 28 patients 4–6 years, and 52 patients more than 6 years. NYHA self-reports revealed 152 patients without limitations or chest pain, 49 patients with chest pain only in case of strong or long-lasting physical effort, 50 patients with chest pain and minor limitations in case of normal activities, 33 patients with chest pain and major limitations in case of normal activities, and 41 patients experiencing chest pain in case of any physical effort, even in rest. On average patients scored 1.27 ($SD = 1.45$, range 0–4) on NYHA. Based on the kind and number of cardiac events the following distinction could be made: 218 patients had a first cardiac event, while 121 patients had experienced two or more cardiac events. In the group of 218 patients with a first cardiac event, 126 patients were hospitalized due to MI or to a combination of MI and a PTCA, 14 patients had experienced a PTCA exclusively, 66 patients a CABG and 12 patients another combination of events.

Pre-test Differences

Results of analyses of variance and χ^2 analyses for pre-test differences between the three conditions on the demographic and medical characteristics are shown in Table 1. A statistically significant difference was found for hospital setting. In the Isalaklinieken in Zwolle relatively more patients participated in the FIT condition. In addition, a tendency was found concerning employment. In the FIT condition relatively more patients were unemployed, in the FIT + INFO condition relatively more patients were employed. On other demographic and medical characteristics no statistically significant differences were found between patients in the three treatment conditions.

With reference to the dependent variables (eating habits, smoking, and physical exercise, Table 2) no statistically significant differences between patients in the three treatment conditions were found for eating habits and exercise behaviour. A trend, however, was found for smoking behaviour. At the pre-test there were relatively less "smokers" in the FIT condition.

Change Over Time in All Patients

Eating habits. Eating habits in the total group of coronary heart patients ($N = 328$) showed a significant improvement between the pre-test and first follow-up ($Z = -4.007$; $p_{\text{two tailed}} \leq .001$). Of 88 patients (26.8% of 328) scoring unhealthy at the pre-test, 53 (16.1% of 328) patients scored healthy at the first follow-up, while 19 of 240 patients (5.8% of

Table 1 Comparison between the three conditions (FIT, FIT + INFO and FIT + INFO + PEP) with regard to demographic and medical characteristics at the pre-test (*N* varied between 325 and 339)

Demographic and medical characteristics	*FIT*	*FIT + INFO*	*FIT + INFO + PEP*	χ^2/F *(df)*
Gender				1.80 (2)
Male	99	108	79	
Female	23	19	11	
Age				.64 (2,336)
Mean	57.55	56.72	56.28	
SD	7.74	8.49	8.97	
Living situation				.67 (2)
With partner	107	114	82	
Without partner	15	13	8	
Level of education				5.69 (6)
Primary only	22	23	18	
Low level of education	51	44	32	
Middle	27	22	19	
High	22	38	20	
Employment				5.12⁺ (2)
Employed	44	63	43	
Non-employed	76	62	47	
Duration of cardiac complaints				2.63 (6)
< 1 year	79	79	53	
2–3 years	12	14	9	
4–6 years	14	9	5	
> 6 years	17	21	14	
NYHA self-reported				0.34 (2,322)
Mean	1.31	1.18	1.33	
SD	1.40	1.44	1.53	
Cardiac event				7.06 (8)
First MI	42	51	33	
First PTCA	8	5	1	
First CABG	20	24	22	
First multiple events	4	4	4	
Reccurent events	48	43	30	
Hospital Setting				10.92* (4)
Eindhoven	26	43	30	
Tilburg	33	27	30	
Zwolle	63	57	30	

⁺$p_{\text{two-tailed}} \leq .10$; *$p_{\text{two-tailed}} \leq .05$.

Table 2 Comparison between the three conditions (FIT, FIT + INFO and FIT + INFO + PEP) with regard to lifestyles as determined at the pre-test

	FIT	*FIT + INFO*	*FIT + INFO + PEP*	*N*	χ^2 *(df)*
Eating habits				328	4.12 (2)
Unhealthy	25	36	27		
Healthy	97	86	57		
Smoking				336	5.50* (2)
Yes	52	71	50		
No	69	56	38		
Exercise				317	0.05 (2)
Not sufficient	73	72	52		
Sufficient	44	43	33		

*$p_{\text{two-tailed}} \leq .05$.

328) changed their eating habits from healthy to unhealthy. There were 221 patients (67.4% of 328) maintaining their healthy eating habits, and 35 patients (10.7%) maintaining thei unhealthy eating habits.

Between the pre-test and the second follow-up there was also a significant favourabl time effect ($n=269$; $Z=-5.252$; $p_{\text{two-tailed}} \leq .001$). From a group of 71 patients (26.4% o 269) scoring unhealthy at the pre-test, 49 (18.2% of 269) scored healthy at the secon follow-up, while 9 of the 198 patients (3.3% of 269) changed their eating habits fron healthy to unhealthy. Twenty two patients (8.2% of 269) maintained unhealthy eating habits

To investigate cross-overs and/or relapses, the time effect between the first and th second follow-up was also computed. Between the first and the second follow-up there wa also a positive time effect ($n=269$; $Z=-2.335$; $p_{\text{two-tailed}} \leq .05$). From a group of 44 patient (16.4% of 269) scoring unhealthy at the first follow-up, 22 (8.2% of 269) scored healthy a the second follow-up, while 9 of the 225 patients (3.3% of 269) changed their eating habit from healthy to unhealthy. Twenty two patients (8.2% of 269) maintained unhealthy eatin habits.

Drop-out at the second follow-up was not significantly related to risk category at the firs follow-up (unhealthy eating behaviour or not).

Smoking. From the total group of 336 patients before the cardiac event, 163 (48.5%) wer non-smokers, 173 (51.5%) were smokers. Two significant time effects were found. In th group of 173 smokers 119 patients (68.8%) had quit smoking at the first follow-up, thre months after discharge from hospital ($Z=-10.909$; $p_{\text{two-tailed}} \leq .001$).

At the second follow-up 12 months after the cardiac event, smoking data of 284 patient were included in the analyses. In the group of 143 smokers before the cardiac event 8 patients (62.2%) had quit smoking at the second follow-up ($Z=-9.276$; $p_{\text{two-tailed}} \leq .001$).

Between the first and the second follow-up, there was an unfavourable time effect, 1 patients who had quit smoking at the first follow-up, started smoking again, one smoke stopped smoking ($n=284$; $Z=-3.500$; $p_{\text{two-tailed}} \leq .001$). Drop-out at the second follow-u showed a significant difference between smokers and non-smokers at the first follow-u ($n=336$; $Z=-1.904$; $p_{\text{one-tailed}} \leq .05$), smokers having a drop-out rate of 24.1%, while non smokers having a drop-out of 13.8%.

Exercise behaviour. At the pre-test 197 (62.1%) of 317 patients reported a sedentary lifestyl (exercising less than three times 20 minutes a week). At the first and second follow-up test significant time effects were found. In the group of 197 sedentary patients before the car diac event, 92 patients (29.0% of 317) reported sufficient exercise behaviour three month after discharge from hospital, whereas 29 non-sedentary patients (9.2% of 317) befor the cardiac event reported a sedentary lifestyle at the first follow-up ($Z=-5.727$ $p_{\text{two-tailed}} \leq .001$). In the group of 317 patients 105 patients (33.1%) reported insufficien exercise behaviour at both measurement points.

At the second follow-up data of 266 patients were included in the analyses. Of 15 sedentary patients before the cardiac event, 63 patients (23.7% of 266) reported a non sedentary lifestyle. In the group of 107 non-sedentary patients before the cardiac event, 3 patients (11.3% of 266) reported a sedentary lifestyle ($Z=-3.422$; $p_{\text{two-tailed}} \leq .001$). Ninet six patients (36.1%) maintained their sedentary lifestyle.

Between the first and the second follow-up tests, a trend was found in the negative direc tion. Of 109 sedentary patients at the first follow-up, 34 patients (12.8% of 266) reporte sufficient exercise 12 months after the cardiac event. Of 157 non-sedentary patients at th first follow-up, 51 patients (19.2% of 266) reported a sedentary lifestyle at the second follow-up ($Z=-1.844$; $p_{\text{two-tailed}} \leq .10$). Seventy five patients (28.2%) maintained their sedentary lifestyle. Drop-out was not significantly related to risk category (exercising sufficiently *vs.* not sufficiently).

Treatment Effects for Selected Risk Groups Controlling for Demographic and Medical Characteristics

In a next phase it was studied to what extent the FIT + INFO and the FIT + INFO + PEP conditions had favourable effects for selected risk groups controlling for demographic and medical characteristics (also referred to as covariates).

With respect to the evaluation of treatment effects on eating habits, patients scoring in the category "unhealthy" (see instruments of measurement) at the pre-test were selected for the effect analyses. The analyses concerned 77 patients in the short term three months after the cardiac event, and 62 patients in the long term 12 months after the cardiac event (without patients with missing values on the covariates).

For the evaluation of treatment effects on smoking behaviour only "smokers" at the pre-test were included in the analyses. The analyses concerned 160 patients in the short term and 131 patients in the long term (without patients with missing values on the covariates).

For the evaluation of treatment effects for selected risk groups on a sedentary lifestyle, patients with a sedentary lifestyle at the pre-test (see instruments of measurement) were included in the analyses. The number of patients in the analyses was 180 in the short term, and 143 in the long term (without patients with missing values on the covariates).

Effects of treatment, demographic and medical characteristics on patients with unhealthy eating habits. In Table 3 results of hierarchical logistic regression analyses are presented for patients who had unhealthy eating habits before the cardiac event.

In the short term block 1 of the hierarchical logistic regression analysis indicates that duration of cardiac complaints and self-reported NYHA are important predictors of eating habits. A shorter period of cardiac complaints and less limitations in activities due to angina pectoris at the pretest are predictive of maintaining unhealthy eating habits. It has to be noted, that gender could not be entered in the analysis, because of the finding that all

Table 3 Results of hierarchical logistic regression analyses of unhealthy eating habits at the short term and the long term, for patients who had unhealthy eating habits before the cardiac event (0 = quit, 1 = maintained; short term $n = 77$, long term $n = 62$)

Blocks and predictors	*Short term Odds Ratio*	*95% CI*	*Long term Odds Ratio*	*95% CI*
1				
Duration of cardiac complaints	0.46*	0.21–1.02	0.40⁺	0.16–1.04
NYHA	0.71⁺	0.48–1.05		
Age			1.12*	1.01–1.24
Employment (No *vs.* Yes)			0.09**	0.01–0.53
2				
Treatment				
INFO + FIT *vs.* FIT	0.98	0.30–3.16	0.89	0.19–4.19
PEP + INFO + FIT *vs.* FIT	0.30⁺	0.08–1.20	0.83	0.14–4.94

Note: short term: three months after the cardiac event; long term: twelve months after Cardiac event; CI = confidence interval. $^{+}p_{\text{two-tailed}} \leq .10$; $^{*}p_{\text{two-tailed}} \leq .05$; $^{**}p_{\text{two-tailed}} \leq .01$.

female patients ($n = 6$) changed to healthy eating habits. Block 2 of the analysis shows tha treatment (FIT, FIT + INFO, FIT + INFO + PEP) is a marginally significant predictor fo maintaining unhealthy eating habits at the short term ($p_{one\text{-}tailed} \leq .05$). Participation in th FIT + INFO + PEP condition decreases the odds of maintaining unhealthy eating habits b a factor 0.30 (95% confidence interval 0.08–1.20) compared to the FIT condition. Thi means that patients in this condition have a relatively 0.30 lower risk of maintainin unhealthy eating habits than patients in the FIT condition.

In the long term, in block 1 age and employment had significant contributions to th prediction. Being older or being employed were predictive of maintaining unhealthy eatin habits. In addition, a shorter period of cardiac complaints tended to be predictive of main taining unhealthy eating habits. Again, gender could not be entered in the analysis, becaus all female patients ($n = 4$) changed to healthy eating habits. In the long term treatment is no a significant predictor for eating habits.

Effects of treatment, demographic and medical characteristics on smoking behaviour. I Table 4 results of hierarchical logistic regression analyses are presented for patients wh had smoked before the cardiac event.

Block 1 shows that living situation was a significant predictor for smoking status in th short term. At the first follow-up living together with a partner was parallelled with a lowe percentage of patients who had quit smoking (66.9%) than for patients living withou a partner (81.8%). At the second follow-up, female gender proved to increase the risk o continuing smoking behaviour. At the first follow-up, treatment was not a significan predictor for smoking cessation. At the second follow-up, however, patients in the FIT - INFO condition had a higher risk of continuing smoking behaviour than patients in the FI condition.

Effects of treatment, demographic and medical characteristics on exercise behaviour. I Table 5 results of hierarchical logistic regression analyses are presented for patients wit a sedentary lifestyle before the cardiac event.

At the first follow-up, block 1 shows that kind and number of cardiac events, age and hospita setting were predictive for exercise behaviour. In the short term, patients after a first coronar bypass surgery and older patients have a lower risk of maintaining a sedentary lifestyl than patients with recurrent cardiac events. Patients after a first myocardial infarction tende

Table 4 Results of hierarchical logistic regression analyses of smoking habits at the short term and the long term, for patients who smoked before the cardiac event (0 = quit, 1 = continued; short term $n = 160$, long term $n = 131$)

Blocks and predictors	*Short term Odds Ratio*	*95% CI*	*Long term Odds Ratio*	*95% CI*
1				
Single/living together	4.51*	1.00–20.41		
Gender (Female *vs.* Male)			3.20*	1.11–9.19
2				
Treatment				
INFO + FIT *vs.* FIT	1.49	0.66–3.36	2.89*	1.17–7.18
PEP + INFO + FIT *vs.* FIT	1.02	0.40–2.58	1.97	0.72–5.40

Note: short term: three months after the cardiac event; long term: twelve months after cardiac event; CI = confidence interval. $*p_{two\text{-}tailed} \leq .05$.

Table 5 Results of hierarchical logistic regression analyses of sedentary lifestyle at the short term and the long term, for patients who showed a sedentary lifestyle before the cardiac event (0 = quit, 1 = maintained; short term $n = 180$, long term $n = 143$)

Blocks and predictors	*Short term Odds Ratio*	*95% CI*	*Long term Odds Ratio*	*95% CI*
1				
Duration of cardiac complaints			1.34⁺	0.97–1.83
Cardiac event				
First MI *vs.* recurrence	0.46⁺	0.21–1.03		
First PTCA *vs.* recurrence	0.25	0.03–1.86		
First CABG *vs.* recurrence	0.16**	0.06–0.43		
First Multiple *vs.* recurrence	0.55	0.10–2.98		
Age	0.94**	0.90–0.98		
Employment (No *vs.* Yes)			0.53⁺	0.26–1.06
Hospital				
Setting 1 *vs.* Setting 3	4.44***	1.91–10.34		
Setting 2 *vs.* Setting 3	1.43	0.62–3.28		
2				
Treatment				
INFO + FIT *vs.* FIT	2.63*	1.22–5.68	1.37	0.64–2.92
PEP + INFO + FIT *vs.* FIT	3.10*	1.27–7.59	1.41	0.58–3.39

Note: short term: three months after the cardiac event; long term: twelve months after cardiac event; CI = confidence interval. ⁺$p_{two\text{-}tailed} \leq .10$; *$p_{two\text{-}tailed} \leq .05$; **$p_{two\text{-}tailed} \leq .01$; ***$p_{two\text{-}tailed} \leq .001$.

to have a lower risk of a sedentary lifestyle at the first follow-up than patients with recurrent cardiac events. Additionally, in one hospital at the first follow-up patients had a higher risk of a sedentary lifestyle.

Treatment was a significant predictor for exercise behaviour at the first follow-up. Patients in the FIT + INFO condition and patients in the FIT + INFO + PEP condition had a higher risk of maintaining a sedentary lifestyle than patients in the FIT condition.

In the long term duration of cardiac complaints and employment were important predictors. Having a longer period of cardiac complaints and being employed tended to be predictive for maintaining a sedentary lifestyle. Treatment was not a significant predictor for exercise behaviour in the long term.

DISCUSSION

Based upon our findings a first conclusion is that on average patients improve their lifestyles during the first three months after hospitalization. In addition, between 3 and 12 months after the cardiac event, an extra improvement is found for eating habits. On the other hand, during this period there is a relapse for smoking and exercise behaviour, which means that a significant number of patients start smoking again or fall back in a sedentary lifestyle. An explanation for the different profiles in lifestyles over time can be found in the fact that patients start with smoking cessation and postpone intentions for healthy eating habits. Most health professionals advise patients as a first priority to quit smoking and, at a later point in time, when the difficulties with smoking cessation are surmounted, to start with eating habits, more in particular with weight reduction regimens.

A second set of conclusions concerns the effects of the FIT + INFO and FIT + INFO + PEP programmes. A favourable short-term effect was found for the combination FIT + INFO + PEP on eating habits. While for the entire group eating habits improved between

3 and 12 months after the cardiac event, in the long term the treatment effect could nc be maintained. In the short term significant differences in smoking cessation between th three treatment conditions could not be found. Unexpectedly, in the long term, for smokin; behaviour negative effects were found, more patients in the FIT condition quit smokin; than in the FIT + INFO condition. These negative findings need further consideration. A explanation for the negative effect in the FIT + INFO condition could be that health educa tion was offered to patients and partners in too large groups. It proved to be difficult to giv enough personal attention in groups of 20 to 30 patients. Patients' evaluations revealed tha they, indeed, complained about the size of the groups. The attainment of positive effect asks for individualized positive feedback to the patients. On the other hand, in every condi tion more than 50% of the patients smoking at the pre-test had quit smoking at the follow up tests. The impact of the cardiac event, apparently is very strong making it difficult t have additional treatment effects. Finally, perhaps the clinical psychological technique used in the INFO and INFO + PEP programmes are not effective enough to convince th obstinate smokers. According to Lewin *et al.* (1995) "goal setting and pacing" are the mos important ingredients in a rehabilitation programme. In other words, negotiate with th patient until an agreement exists about a specific goal the patient has and then together wit the patient start a shaping procedure is important. In the INFO and PEP programmes sev eral clinical psychological methods were used for both secondary prevention and stres management objectives. Patients were not selected on the basis of their needs to improv quality of life or their needs to change unhealthy lifestyles. A variety of methods fo a diversity of problems can be an explanation for the absence of favourable effects. In th future, there is a need to screen patients for secondary prevention and stress managemen interventions. It could have been possible that the inclusion of patients with healthy life styles in the treatment programmes influenced content, strategies and discussions in th INFO and PEP programmes. In addition, programmes have to be tailored to the specifi goals which are mentioned by patients themselves. Patients have to choose one or tw goals to strive for in the rehabilitation programmes. Therefore, screening to select onl motivated patients with unhealthy lifestyles and programmes tailored to the objectives o the individual patients will probably increase favourable effects.

Concerning the negative treatment effects on exercise behaviour in favour of the FI condition, another explanation can be offered. Compared to the extensive FIT programm (mostly 24 sessions) it could not be expected that INFO or INFO + PEP (four and eigh sessions) had much extra effect on exercise behaviour. The FIT programme, however, wa more effective on exercise behaviour than the combinations of programmes. An explanatio could be that having a number of goals to strive for in the combined programmes result in a priority or feasibility problem. When patients are confronted with several objectives it could be possible that exercise behaviour gets a lower priority.

A third set of conclusions concerns the contribution of demographic and medical charac teristics in the prediction of maintaining unhealthy lifestyles. In the short term, in additio to the PEP programme, more limitations in physical exercise due to angina pectoris an a longer period of cardiac complaints were parallelled with a decrease in the risk of main taining unhealthy eating habits. In the long term, patients with a shorter period of cardia complaints, older patients and patients with a paid job had a higher risk of maintainin unhealthy eating habits. At the first follow-up living together with a partner was parallelle with a lower percentage of patients who had quit smoking than for patients living withou a partner, at the second follow-up female gender was predictive of continued smokin behaviour. In the short term, older age, a first CABG and a specific hospital setting wer predictive for a less sedentary lifestyle. Finally, a longer period of cardiac complaints and a paid job were predictors of a continued sedentary lifestyle at the second follow-up.

A remarkable finding is that a discrepancy exists between the prediction for continuing unhealthy eating habits, smoking and a sedentary lifestyle. For example, it is understandable that angina pectoris and a longer duration of cardiac complaints motivate patients to improve their unhealthy eating habits. But, why are these medical characteristics predictive for improvement of eating habits and not for smoking cessation? And why is a longer period of cardiac complaints predictive for a decrease in unhealthy eating habits and an increase in a sedentary lifestyle? Are there still misconceptions after the rehabilitation programme about the risks of exercising in case of angina pectoris or functional heart complaints? At any case, after a first bypass surgery (which reduces angina pectoris) the risk of a sedentary lifestyle decreases, which is in line with this explanation. In addition, do patients still think that stress is the most important risk factor both for the onset and the progression of coronary heart disease, and that the stress of smoking cessation will contribute to another heart attack? Furze and Lewin (2000) found that stress may still be the major attribution of angina made by the patient even where they have other very significant risk factors. As causal attributions can be important for lifestyle changes, health professionals have to be careful not to reinforce wrong or partly wrong attributions (Furze and Lewin, 2000). Therefore, additional training could be needed for all health professionals dealing with cardiac patients to help them to elicit their patients' causal attributions and to correct misconceptions of the patients. Furthermore, age was a significant predictor for exercising and eating habits, not for smoking cessation, whereas employment was a significant predictor for eating habits and for exercising, not for smoking cessation. Probably, older patients have more free time for exercising, but are less inclined to change old patterns of eating habits, while employed patients have less time for exercising and preparing healthy meals. Additionally, female gender and living together increased the risk of continued smoking behaviour. When asked for reasons to start smoking again, female patients often argue that smoking is a way of keeping their body weight down. The finding that 66.9% of the patients living together quit smoking, whereas 81.8% of the patients without a partner stopped smoking, is difficult to explain. It could be possible that living together with a partner who still smokes, inhibits smoking cessation. We have, however, no data on smoking status of the partner. In future research this explanation has to be explored. Finally, large hospitals had probably more opportunities to tailor the physical training programmes (FIT) to the specific characteristics of the patients. Less favourable effects were found in a smaller hospital in the study.

Methodological shortcomings have also to be mentioned as possible explanations for the absence of favourable effects of the INFO and PEP programmes and for the discrepancies between the prediction of the three different lifestyles. Taking the rule of thumb for 15 cases per predictor for a reliable regression equation (Stevens, 1992), sample sizes should be 225 at least. Therefore, sample sizes for all three lifestyles are rather low, limiting the stability of the findings. For eating habits the sample size is a serious problem, limiting also the statistical power of the analyses.

Therefore, the results for eating habits are less reliable. In addition, we measured self-reports of lifestyles. Certainly, in the case of eating habits, hypertension, dyslipidemia, and body weight have to be measured in addition to the self-report data.

Last but not least, predictors and/or evaluation studies should inform health professionals offering rehabilitation services about the selection of patients. It turned out that demographic and medical characteristics, such as gender, age, living situation, employment, self-reported angina pectoris, duration of heart complaints, and a first bypass surgery, were significan predictors for lifestyles 3 and 12 months after the cardiac event. As such, these finding lead us to hypotheses about important selection variables. Females (smoking cessation) older or employed patients and patients with less physical limitations and a shorter perio of cardiac complaints (eating habits), younger patients and patients with recurrent cardia events (physical exercise), are more in need of cardiac rehabilitation services directed a these specific lifestyles. More research is needed to improve our knowledge on screenin criteria. We emphasize that these hypotheses should be confirmed in future research to b able to use the variables for selection of patients. Screening on relevant predictors, an programmes tailored to the priorities of the individual patients will probably increas favourable effects of health education programmes for coronary heart patients.

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References

Berkhuysen, M.A. and Rispens, P. (1995/1996) Chapter II Bewegingsmodules (Physical exercise programmes) In: *Richtlijnen Hartrevalidatie Deel II* [*Guidelines Cardiac Rehabilitation, Part II*]. Den Haag: Revalidati Commissie NHS/NVVC [Rehabilitation Committee Netherlands Heart Foundation and Netherlands Societ for Cardiologists].

Burling, T.A., Singleton, E.G., Bingelow, G.E., Baile, W.F. and Gottlieb, S.W. (1984) Smoking followin myocardial infarction: A critical review of the literature. *Health Psychology*, **3**, 83–96.

Conroy, R.M., Mulcahy, R., Graham, I.M., Reid, V. and Cahill, S. (1986) Predictors of Patient Response t Risk-Factor Modification Advice after Admission for Unstable Angina or Myocardial Infarction. *Journal c Cardiopulmonary Rehabilitation*, **6**, 344–357.

Dusseldorp, E., Van Elderen, T., Maes, S., Meulman, J. and Kraaij, V. (1999) A Meta-Analysis of Psychoeduca tional Programs for Coronary Heart Disease Patients. *Health Psychology*, **18**, 506–519.

Engblom, E., Hämäläinen, H., Lind, J., Mattlar, C.E., Ollila, S., Kallio, V., Inberg, M. and Knuts, L.R. (1992 Quality of life during rehabilitation after coronary artery bypass surgery. *Quality of Life Research*, **1**, 167–175

Furze, G. and Lewin, B. (2000) Causal attributions for angina: results of an interview study. *Coronary Healt Care*, **4**, 130–134.

Ketterer, M.W. (1993) Secondary Prevention of Ischemic Heart Disease. The Case for Aggressive Behaviora Monitoring and Intervention. *Psychosomatics*, **34**, 478–484.

Lewin, B., Cay, E.L., Todd, I., Soryal, I., Goodfield, N., Bloomfield, P. and Elton, R. (1995) The angina manage ment programme: a rehabilitation treatment. *British Journal of Cardiology*, **2**(8), 221–226.

Linden, W., Stossel, C. and Maurice, J. (1996) Psychosocial interventions for patients with coronary arter disease. *Archives of Internal Medicine*, **156**, 745–752.

Mullen, P.D., Mains, D.A. and Velez, R. (1992) A meta-analysis of controlled trials of cardiac patient educatior *Patient Education and Counseling*, **19**, 143–162.

Norušis, M.J. and SPSS Inc. (1999) *SPSS Regression Models 10.0*. Chicago, IL: SPSS Inc.

Salonen, J.T., Hämynen, H. and Heinonen, O.P. (1985) Impact of a HE program and other factors on stoppin smoking after heart attack. *Scandinavian Journal of Social Medicine*, **13**, 103–108.

Scholten, H., van der Doef, M., Maes, S. and Sachtleven, H. (1994) "Gezonde Voeding, een goede keus": Onderzoe naar de effecten van een voedingsvoorlichtingsproject. ["Healthy food, a good choice": Study of the effects o a food health education project]. *Gedrag & Gezondheid (Behaviour and Health)*, **22**, 44–51.

Stevens, J. (1992) *Applied Multivariate Statistics for the Social Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum

US Department of Health and Human Services, Public Health Service (1995) *Cardiac Rehabilitation: Clinical Practice Guideline*. Washington, DC: Agency for Health Care Policy and research. National Heart, Lung, and Blood Institute.

van Elderen, T., Chatrou, M., Weeda, H. and Maes, S. (1997) *Leidse Screening Vragenlijst voor Hartpatiënten 0, 1 and 2*. [*LSV-H; LSQ-H; Leiden Screening Questionnaire for Heart Patients, version 0, 1 and 2*]. Section Clinical and Health Psychology. Leiden, The Netherlands: Leiden University.

van Elderen, T. and Echteld, M. (1995/1996) Chapter IV Psycho-Educatieve Preventiemodule [Psycho-Educational Prevention programme, PEP]. In: *Richtlijnen Hartrevalidatie Deel II* [*Guidelines Cardiac Rehabilitation, Part II*]. Den Haag: Revalidatie Commissie NHS/NVVC [Rehabilitation Committee Netherlands Heart Foundation and Netherlands Society for Cardiologists].

van Elderen, T. and Leenders, I. (1995/1996) Chapter III Voorlichtingsmodule [Health Education programme, INFO]. In: *Richtlijnen Hartrevalidatie Deel II* [*Guidelines Cardiac Rehabilitation, Part II*]. Den Haag: Revalidatie Commissie NHS/NVVC [Rehabilitation Committee Netherlands Heart Foundation and Netherlands Society for Cardiologists].

WHO MONICA project principal investigators (1988) The World Health Organization MONICA Project (Monitoring trends and determinants in Cardiovascular diseases): A major international study. *Journal of Clinical Epidemiology*, **41**, 105–114.

World Health Organization, Regional Office for Europe (1993) *Needs and action priorities in cardiac rehabilitation and secondary prevention in patients with CHD*. Copenhagen: World Health Organization.