

# Psychological effects of a short behavior modification program in patients with acute myocardial infarction or coronary artery bypass grafting. A randomized controlled trial

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## Abstract

**Objective:** The effects of a short intervention on behavioral risk factor modification in patients with coronary artery disease (CAD) on Type A behavior, vital exhaustion, and depression were studied in a randomized controlled trial. **Methods:** Acute myocardial infarction patients or patients who underwent coronary artery bypass grafting (CABG) were randomly assigned to an 8-week multiple risk modification group program ( $n=94$ ) or to a control group ( $n=90$ ) that received usual care with standard physical exercise training. Patients were assessed before intervention, directly after intervention, and at 9-month follow-up. **Results:** The intervention was effective in reducing hostility and total Type A behavior at postintervention ( $P=.01$ ) and at 9-month

follow-up ( $P=.03$ ). The intervention had no overall impact on vital exhaustion and depression, measured by the Beck Depression Inventory (BDI), whereas we unexpectedly found that the percentage of patients with major depression was reduced in the control group but not in the intervention group. **Conclusion:** The results indicate that a short behavioral intervention for coronary patients can result in relatively large and persistent reductions in cognitive aspects of Type A behavior and hostility, in particular. In view of the unwanted findings on the diagnosis of depression, however, we do not unequivocally advise the intervention to the general population of AMI and CABG patients.

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**Keywords:** Psychological outcome; Intervention; Coronary artery disease; Behavior modification; Type A behavior; Vital exhaustion; Depression

## Introduction

Coronary artery disease (CAD) is the leading cause of death in most industrialized Western countries. Many psychological factors have been linked to CAD, as they may be detrimental consequences of the disease, or because they may exert an additional risk for the CAD patient. The significance of intervening in psychological risk factors is elucidated by several recent studies that have stressed the influence of psychosocial risk factors on stabilizing underlying cardiovascular pathophysiology [1,2]. The prognosis

of patients with CAD may be adversely affected by vital exhaustion and depression [3,4], whereas the Type A behavior pattern is another psychological factor that has been linked to CAD [5–8]. Several studies reported epidemiological uncertainties regarding Type A behavior as being an independent risk factor for recurrent AMI [9,10]. Nevertheless, the attention paid to this behavior pattern in rehabilitation programs seems legitimate because several clinical trials have demonstrated that an intervention on Type A behavior after AMI reduces the risk of a new coronary event [11–13]. Moreover, reducing Type A behavior may lead to a decrease in psychological distress factors related to CAD, particularly vital exhaustion. In previous reports, it was postulated that vital exhaustion might reflect a breakdown in adaptive mechanisms to prolonged and uncontrollable psychological stress [14–16].

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Type A behavior, a style of behavior characterized by a continuously harassing sense of time urgency and easily aroused hostility, has been suggested to increase the risk of becoming exhausted.

Cardiac rehabilitation trials that showed clear positive results in reducing Type A behavior and psychological distress, and in reducing cardiovascular morbidity, are comprehensive and lengthy [12,13]. Such intensive, time-consuming programs are not easily applicable in general health care settings. Therefore, we intended to develop a relatively short intervention program of 8 weeks, accessible for a large group of AMI and coronary artery bypass grafting (CABG) patients. Although many studies that demonstrated favorable effects of psychosocial interventions were aimed at the modification of one risk factor in particular [17], our intervention explicitly addressed multiple modifiable risk factors. It was directed at the reduction of psychological stress/distress (Type A behavior in particular), the reduction of excessive consumption of dietary fat, elevated serum cholesterol, lack of physical exercise, and—although less explicitly—smoking and insufficient social support through the involvement of the patients' partners in the intervention [18].<sup>1</sup> The present paper presents the psychological effects of this intervention program.

## Methods

### *Study objectives*

The following hypothesis was tested: Patients in the intervention group profit no more from the intervention than do patients in the control group concerning the primary outcome measures Type A behavior, vital exhaustion, and depression.<sup>2</sup>

### *Participants*

All patients admitted to the University Hospital Maastricht, in Maastricht, the Netherlands, during the period of February 1996 until November 1997 were identified as eligible for the study by a team of physiotherapists working at the hospital's physiotherapy department. These patients were referred to them by cardiologists for physical training following AMI or CABG. Patients included were less than 70 years of age, who were admitted to the University Hospital Maastricht with a confirmed diagnosis of AMI, CABG, or both, and who were able to participate in the regular physiotherapy exercise-program starting early after

discharge at the hospital. Two hundred patients were to be included in the study, a number that was based on feasibility within the time limits of the study. Patients were excluded if they were non-Dutch speaking, illiterate, or if they were currently suffering from any psychiatric disorder that would severely disturb participation in the intervention.

### *Procedure*

After informed consent was given, patients were randomly assigned to either the intervention ( $n=106$ ) or a control group ( $n=98$ ). To allocate men and women to the intervention or control group, a stratified randomization procedure was developed by a person not further involved in the study. The outcome of the randomization was put in a sealed envelope, and patients received this envelope after the baseline interview. Both groups (intervention and control) received usual medical care. For patients that were assigned to the intervention, the intervention started within 3–8 weeks after discharge.

Psychological assessments for the intervention group were performed (1) at baseline before the beginning of the intervention, (2) 8 weeks later immediately after the intervention, and (3) 9 months after the termination of the intervention, which was approximately 1 year after admission to the hospital. Measures for control patients were collected at comparable moments in time. Psychological measures consisted of interviews and self-report questionnaires. The interviewers (four in total) remained unaware of patient group assignment. All interviews were recorded on videotape. Interviewers received an intensive training in conducting and scoring the interviews.

### *Usual care*

Both the control and the intervention groups received the same usual medical care, consisting of regular check-ups by a cardiologist who was blinded to group allocation, and they all had postdischarge exercise training sessions. In the Netherlands, exercise training is part of the usual care for patients with AMI or CABG. Patients received standardized exercise training three times a week during 6 weeks.

During the regular medical check-ups, standard usual care was offered, comparable with the care that patients received who did not participate in the study. This meant that the cardiologist systematically checked the clinical history, performed physical examination, a 12-lead ECG recording was done, and if appropriate, blood tests were performed. Titration of drugs was performed until clinical results were satisfactory. The cardiologist provided concise information on risk modification; for example, patients were advised to eat a low-fat diet. For each AMI patient, exercise tests were performed according to the Bruce Protocol during hospitalization, and 1 year after discharge. The CABG patients only had an exercise test 1 year after discharge.

<sup>1</sup> Effects of the intervention on improving dietary habits and cholesterol are published elsewhere [19].

<sup>2</sup> Secondary outcome measures were anxiety and quality of life, which will not be presented in this paper.

## Intervention

In addition to the usual care described above, patients allocated to the intervention were offered a combined stress-management and health education program during eight weekly 2.5-h sessions. Table 1 presents the outline of the program. The contents of the intervention were primarily based on the methods of three major long-term clinical trials, the Recurrent Coronary Prevention Project (RCPP; [20]), Project New Life [11], and the Lifestyle Heart Trial [21], adapted to a format that would be feasible within the context of a short intervention program. During the sessions, 6 to 10 cardiac patients and their partners (whose participation was encouraged) were informed about CAD risk factors and risk factor modification by a multidisciplinary team (Table 1). The first hour-and-a-half consisted of didactic presentations of these issues, including advice and/or exercises to actively modify each participant's CAD risk factor profile. In the remainder of each session, the participants were encouraged to report their experiences with the issues at hand. Each session was concluded with breathing and relaxation exercises based on the work of Van Dixhoorn [22]. The purpose of these exercises was primarily to increase the patients' sense of relaxation and body awareness. Patients were given the opportunity to take an audiocassette tape home with them to practice these breathing and relaxation exercises. At the end of most sessions, patients were given homework assignments, as well as written information, with reference to the specific topics mentioned above. All sessions were led by a psychologist, and either a social worker or a pastor was present as cotherapist. After the last session, three follow-up sessions were scheduled at 3, 6, and 9 months, to discuss the achievement that the patients had made with respect to risk factor modification.

## Psychological measures

Type A behavior was measured using a Dutch version of the Videotaped Structured Interview (VSI; [23]). The

VSI covers three principal components of Type A behavior: hostility, time urgency, and insecurity. An interviewer notes the content of a participant's responses to 32 questions and also observes and records specific psychomotor and physiologic manifestations diagnostic of Type A behavior (e.g., tense posture, head nodding when interviewer speaks, interruption of the interviewer). For practical reasons, it was not possible to score psychomotor characteristics for the total study population. Instead, videotaped interviews of a random sample of 50 patients were reviewed to score psychomotor, behavioral, and physiologic manifestations of Type A behavior at baseline and 9-month follow-up.

Vital exhaustion was measured by the Maastricht Interview for Vital Exhaustion (MIVE; [24,25]). The interview contains 23 items that can be answered by either yes (1 point) or no (0 points). A score of  $\geq 8$  is considered positive for vital exhaustion.

Depressed mood state was assessed using a structured interview according to the Diagnostic and Statistical Manual of Mental Disorders (third edition, DSM-III-R) classification of Major Depressive Disorder (Structured Clinical Interview for DSM-III-R, or SCID).

In addition to the interview, the Beck Depression Inventory (BDI) was administered [26]. The BDI contains 21 items, covering symptoms and attitudes displayed frequently by depressed patients. Scores  $< 10$  represent none or minimal depression; 10–18 mild to moderate depression; 19–29 moderate to severe depression; 30–63 severe depression [27].

## Clinical data

Clinical data, used for baseline comparisons of the intervention and control groups, were collected by a cardiologist from the University Hospital Maastricht, who was blinded to the patients' group allocation. Structured inventories were filled out, which contained items concerning the patient's medical history (obtained from the medical

Table 1  
Contents of the intervention sessions

Session	Contents
1	Explanation of the aim of the intervention. An inventory is made of the patients' histories and risk factors (psychologist).
2	The concepts of atherosclerosis, AMI and CABG (cardiologist).
3	Healthy diet (dietitian). Patients are given advice to eat a low-fat diet, how to do so, and the health benefits of radical low-fat dietary changes are pointed out to them. Special attention is paid to the favorable effects of a vegetarian diet.
4	Physical exercise (physiotherapist).
5	Type A behavior/hostility and stress: 1 (psychologist). Strategies are discussed for modification of Type A behavior. Signs and symptoms of Type A behavior are presented, together with epidemiological evidence about the pathogenicity of Type A behavior. Major behavioral drills from the Recurrent Coronary Prevention Project are discussed.
6	Type A behavior/hostility and stress: 2 (psychologist). The concept of chronic sympathetic hyperarousal as major pathophysiological process underlying Type A behavior is introduced. Health-promoting coping strategies with life stressors and daily hassles and prevention of anger, hostility and aggression are discussed and practiced.
7	Personal values and social support systems (pastor).
8	Evaluation of the program and identification of problems in the process of behavior change (psychologist). Contribution of general practitioner to recovery process and behavior change (general practitioner).

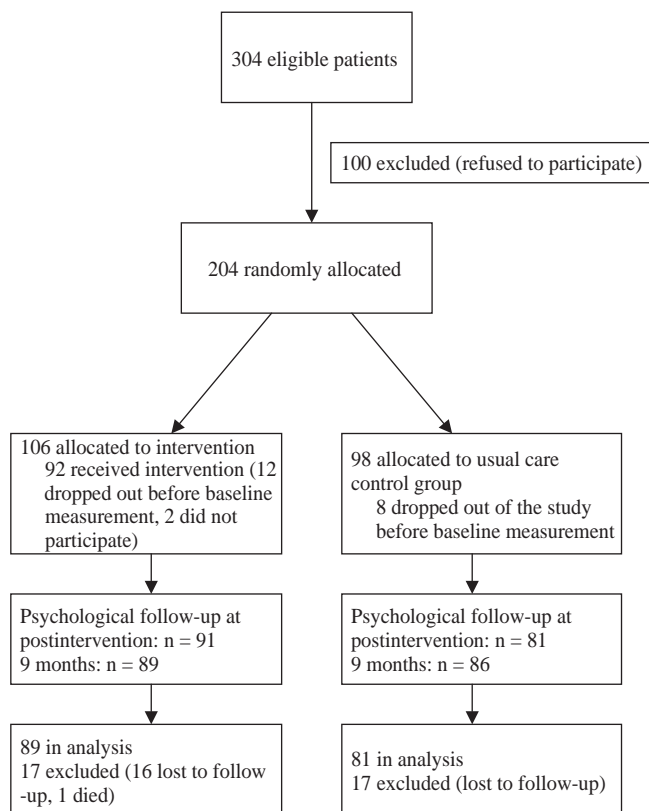


Fig. 1. Flowchart of patients included in the study.

files), angina pectoris, dyspnea, enzymatic infarct size during hospitalization, medication, and echocardiographic as well as angiographic data, if available. In addition, during follow-up, cardiac complaints and cardiac or other events were recorded.

### Statistical analyses

Analyses were performed according to the intention-to-treat principle, meaning that patients were analyzed in the original groups formed by randomization. The effects of the intervention on psychological outcome measures were assessed by means of analyses of covariance (ANCOVA), using the baseline scores as a covariate, to correct for differences in scores at baseline between the control and intervention groups. In addition, for each of the psychological outcome measures, the variables gender, age, and “AMI (+CABG) versus CABG only” were used as preplanned covariates in the analyses. This last variable was included because of the possible influence an AMI experience might have on the psychological outcome measures. Logistic regression analyses were used to compare the intervention and control groups on SCID depression. Separate analyses were performed for effects at postintervention and 9-month follow-up.

## Results

### Participants and baseline characteristics

Fig. 1 shows a flowchart of the patients approached for participation in the study. Two hundred four patients gave signed informed consent, which was 67% of all eligible patients. One hundred patients refused to participate for the following reasons: work or too busy (17%), no need, or knows how to make lifestyle changes without help (17%), visiting the hospital too often, it will be too much (12%), not motivated to make changes (6%), personal or health problems (6%), partner does not take part (5%), does not want any obligations (4%), prefers not to be confronted with disease (4%), too shy to take part in group intervention (2%), does not want to hear other patients sorrows (2%), other (5%), unknown (20%). Compared with the participants, nonparticipants were more often female (participants, 13.7% female vs. nonparticipants 33.0%;  $P=.00$ ). There were no differences between participants and nonparticipants in mean age (55.6 vs. 57.3, respectively;  $P=.13$ ) and cardiac incidence for which they were hospitalized (participants: 69.1% AMI, 7.8% AMI+CABG, 23.0% CABG;

Table 2

Baseline characteristics of patients in the control ( $n=94$ ) and the intervention ( $n=90$ ) groups

Characteristic	Intervention (%)	Control (%)
Male	86.2	86.7
Clinical history		
Previous myocardial infarction	24.5	22.2
Previous CABG	4.3	2.2
Previous PTCA	11.7	8.9
Reason for admission		
Myocardial infarction	73.4	66.7
Myocardial infarction+CABG	7.4	7.8
CABG	19.1	25.6
Medication at entry in the study		
Beta blockers (2) <sup>a</sup>	86.0	82.0
Nitrates (2)	37.6	29.2
Platelet inhibitor drugs or anticoagulants (2)	89.2	87.6
Clinical status at entry in the study		
Angina pectoris (3)	28.3	16.9
Dyspnea (3)	35.5	29.5
Mean age, years [S.D.]	55.6 [8.0]	55.2 [9.7]
Echocardiography at discharge:	53.3 [9.0]	51.6 [11.4]
LVEF [S.D.] (58)		
Psychological variables		
Type A behavior (total) [S.D.]	220.1 [54.7]	210.5 [62.4]
Vital exhaustion [S.D.] (1) <sup>a</sup>	6.2 [4.9]	4.8 [4.5]
Depression [S.D.] (BDI) (12)	8.4 [6.8]	6.7 [5.2]
% Major depression (SCID) (19)	14.9	9.0

CABG=coronary artery bypass grafting; PTCA=percutaneous transluminal coronary angioplasty; LVEF=left ventricular ejection fraction; BDI=Beck Depression Inventory. Range of scores for each measurement: Type A behavior, 2–385; vital exhaustion, 0–23; depression (BDI), 0–63.

<sup>a</sup> Numbers in parentheses are the number of patients for whom data are not available.

nonparticipants: 73.0% AMI, 5.0% AMI+CABG, 22.0% CABG;  $P=.62$ ).

Despite considerable efforts to reduce missing data to a minimum, dropouts could not be avoided. Of all 204 patients included in the study, 20 dropped out, reducing the total number of patients in the study to 184. Because they dropped out before baseline measurement, the time at which patients received their group allocation, this cannot have invalidated the randomization. Baseline demographic and clinical characteristics of the total sample of 184 patients in the study are shown in Table 2. With reference to the psychological variables (Type A behavior, vital exhaustion, and depression), statistically significant differences between patients in the intervention and control groups were found on vital exhaustion, and a trend for significance was found for BDI depression. On average, patients randomized to the intervention group had higher scores on vital exhaustion ( $P=.05$ ) and BDI depression ( $P=.07$ ) than did patients in the control group (Table 2).

### Type A behavior

Scores on Type A behavior and its components at baseline and follow-up are reported in Table 3. For two of the three different components of Type A behavior, the intervention effect was significant. In the intervention group, the reduction of the cognitive hostility scores was 9.0 points larger than in the control group at postintervention [ANCOVA: 95%

Table 3

Type A behavior and its components—mean scores at baseline, at postintervention, and at 9-month follow-up in the intervention and control groups

Measure	Intervention			Control		
	M	S.D.	n	M	S.D.	n
<i>Type A behavior/cognitive</i>						
Hostility						
Baseline	74.1	20.8	89	71.2	23.8	81
Post	50.3	25.2		57.2	25.5	
9 months	53.6	25.3		58.9	29.5	
Time urgency						
Baseline	100.1	25.5	89	98.3	29.0	81
Post	62.6	29.5		72.8	32.3	
9 months	66.5	29.6		75.0	32.1	
Insecurity						
Baseline	45.4	21.1	89	43.4	22.5	81
Post	24.4	20.0		24.1	21.9	
9 months	25.8	20.6		26.3	22.6	
<i>Type A behavior/psychomotor</i>						
Hostility						
Baseline	32.3	18.0	22	37.0	13.6	28
9 months	31.6	14.6		35.0	11.6	
Time urgency						
Baseline	42.1	15.2	22	50.0	14.3	28
9 months	42.1	13.2		46.6	15.5	

Range of scores for each measurement—cognitive: hostility, 2–145; time urgency, 0–160; insecurity, 0–80; psychomotor: hostility, 0–110; time urgency, 0–110.

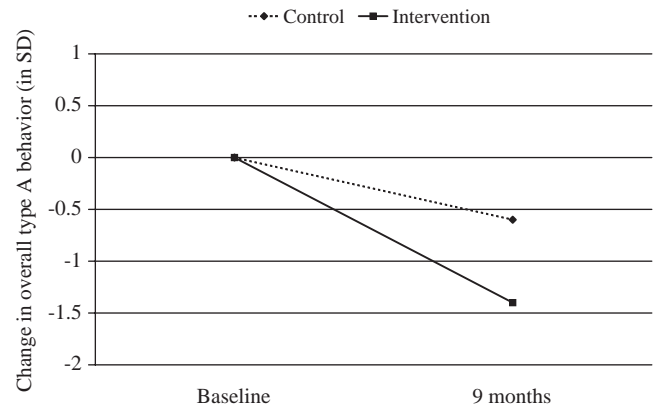


Fig. 2. Changes in overall type A behavior in SD at 9-month follow-up, for the control group and the intervention group. (The difference between the control and intervention groups in the decrease of Type A behavior from baseline to follow-up:  $P=.002$ ).

CI:  $-15.1/-2.8$ ,  $F(1,164)=8.24$ ,  $P=.01$ ] and 7.7 points at 9-month follow-up [95% CI:  $-14.5/-0.9$ ,  $F(1,164)=4.97$ ,  $P=.03$ ].<sup>3</sup> The reduction in time urgency scores was 11.5 points larger in the intervention group than in the control group at postintervention [95% CI:  $-19.8/-3.2$ ,  $F(1,164)=7.49$ ,  $P=.01$ ] and 9.9 points larger at 9-month follow-up [95% CI:  $-18.0/-1.9$ ,  $F(1,164)=5.94$ ,  $P=.02$ ]. The reduction in insecurity scores was 0.8 points larger at postintervention and, at 9-month follow-up, 1.8 points larger in the intervention group than in the control group, a difference that was not significant at postintervention [95% CI:  $-6.5/5.0$ ,  $F(1,164)=0.07$ ,  $P=.79$ ] or at 9-month follow-up [95% CI:  $-7.5/4.0$ ,  $F(1,164)=0.37$ ,  $P=.54$ ].

In a random sample of 50 patients, the psychomotor characteristics of Type A behavior hardly changed from baseline to 9-month follow-up. The intervention group did not differ from the control group regarding change of psychomotor hostility and psychomotor time urgency scores, which was 0.6 points larger in the intervention group [hostility: 95% CI:  $-6.1/5.0$ ,  $F(1,44)=0.04$ ,  $P=.84$ ; time urgency: 95% CI:  $-8.4/7.3$ ,  $F(1,44)=0.02$ ,  $P=.88$ ].

ANCOVA was performed with the 50 patients whose psychomotor Type A characteristics were known, to compute the impact of the intervention on overall Type A behavior (psychomotor plus cognitive Type A behavior; not in table). The reduction in overall Type A behavior at 9-month follow-up was 56.9 points larger in the intervention group than in the control group [95% CI:  $-92.0/-21.7$ ,  $F(1,44)=10.63$ ,  $P=.00$ ]. Fig. 2 shows the reduction in overall Type A behavior at follow-up for the intervention and control patients ( $n=50$ ). The reduction from baseline in Type A behavior is expressed in overall S.D. at baseline.

<sup>3</sup> Reported differences between the control and intervention groups in this and subsequent sections are adjusted for baseline differences and aforementioned covariates (ANCOVA).

### Vital exhaustion

Table 4 shows the scores on vital exhaustion and depression. Due to missing data, there may be small differences in the number of participants for the different outcome measures.

The intervention and the control groups both showed reductions in vital exhaustion and depression (BDI) at postintervention and at 9-month follow-up. For vital exhaustion, no statistically significant differences were found between the scores of the patients in the intervention and control groups at postintervention; the reduction was 0.1 points larger in the control group [ANCOVA: 95% CI:  $-1.1/1.4$ ,  $F(1,163)=0.05$ ,  $P=.82$ ] and 1.0 points larger in the intervention group at 9-month follow-up [95% CI:  $-2.5/0.5$ ,  $F(1,163)=1.64$ ,  $P=.20$ ].

### Depression

Differences between the intervention and control groups in the scores of depression (BDI) at postintervention and at 9-month follow-up were not significant; the reduction was 0.5 points larger in the control group at postintervention [ANCOVA: 95% CI:  $-0.8/1.7$ ,  $F(1,152)=0.50$ ,  $P=.48$ ] and 0.1 points at 9-month follow-up [95% CI:  $-1.3/1.4$ ,  $F(1,152)=0.01$ ,  $P=.92$ ].

The percentage of depressed patients as measured by the SCID interview increased in the intervention group from 15% at baseline to 17% at postintervention and 21% at the 9-month follow-up; in the control group, 9% were depressed at baseline, 5% at postintervention, and 18% at 9-month follow-up. Effects on depression as measured by this interview were assessed by means of logistic regression analyses. At postintervention, the odds ratio (OR) for depression, as measured by the SCID interview, was 3.68 in favor of the control group (95% CI: 1.10/12.37,  $P=.04$ ). The difference between the intervention and the control groups disappeared at 9-month follow-up (OR=1.01, 95% CI: 0.44/2.31,  $P=.99$ ).

Table 4  
Vital exhaustion and depression—mean scores at baseline, at postintervention, and at 9-month follow-up in the intervention and control groups

Measure	Intervention			Control		
	x	S.D.	n	x	S.D.	n
Vital exhaustion						
Baseline	5.9	4.7	89	4.7	4.2	80
Post	5.5	5.3		4.4	4.8	
9 months	4.6	5.7		4.7	5.5	
Depression (BDI)						
Baseline	8.5	6.9	83	6.4	4.6	75
Post	7.7	6.0		5.8	4.9	
9 months	6.9	4.8		5.8	5.1	

BDI=Beck Depression Inventory. Range of scores for each measurement: vital exhaustion, 0–23; depression (BDI), 0–63.

### Morbidity and mortality

The intervention group did not differ from the control group in the number of recurrent events at any of the follow-up measurements. All patients survived during the 9-month follow-up period, apart from one patient in the intervention group. The cause of death was noncardiac (cancer). A total of 17 patients had experienced one or more recurrent cardiovascular events during the 9 months of follow-up, 9 in the intervention group and 8 in the control group. Ten patients had had a CABG operation (6 in the intervention group and 4 in the control group), and 8 patients underwent a percutaneous transluminal coronary angioplasty (PTCA; 3 in the intervention group and 5 in the control group) during the follow-up period. None of the patients experienced a (recurrent) myocardial infarction.

### Discussion

The results of this study show that Type A behavior can be reduced in coronary patients through a relatively short intervention program aimed at behavior change and risk reduction. The reductions that were found in Type A behavior may have favorable consequences for the prognosis of coronary patients, since this factor has been associated with increased risk of a coronary incident [4,5]. Moreover, it seems that the reductions can be achieved in a relatively short period of time.

Caution is warranted, however, because the favorable reductions we found in Type A behavior were not reflected in the psychomotor characteristics of the behavior pattern. Therefore, the possibility that intervention patients gave socially desirable answers to the questions concerning Type A behavior cannot be completely ruled out.

Type A behavior was reduced not only in the intervention group, but in the control patients as well. In our study, several factors may account for this decline. First, patients after AMI or after a CABG probably try to change their behavior spontaneously to reduce the risk of a recurrent event. The interview to assess Type A behavior at baseline, which was repeated at follow-up, may have made patients more aware of their own behavior, which subsequently stimulated behavior change. After each interview, the interviewer gave a short summary of the major contents of each part of the interview, including the results of the Structured Interview assessment. Second, the reduction in the control group might partly be the result of contamination of treatment. Patients of both groups were able to communicate with each other during the collective weekly physical therapy sessions that formed a part of their usual care treatment, thus, information about the program could have been exchanged.

No favorable effects were found on depression. Percentage of patients with major depression as classified by the SCID even declined in the control group at postintervention

but not in the intervention group. This negative finding dissipated at 9-month follow-up. Moreover, in accordance with previous studies, among the dropouts a higher percentage of patients were depressed than among the nondropouts [28,29]. Since depression constitutes a risk for future cardiac events, this is an alarming observation for which a solution has not yet been found [30–32].

Although no significant effects were found in the total study group for vital exhaustion and depression as measured with the BDI, it should be noted that the intervention focused more directly at modifying Type A behavior than at altering depression and vital exhaustion, which were addressed more indirectly. Specific attention for vital exhaustion and depression might have increased favorable intervention effects.

#### *Comparison with relevant studies*

In a review on risk factor modification through non-pharmacological interventions in coronary patients [17], three major randomized clinical trials were found evaluating an intervention aimed at Type A behavior modification [11–13]. All three studies reported significant reductions of Type A behavior after a lengthy, time-consuming intervention. One of these studies reported a significant reduction in BDI scores for the treatment group compared with the control group as well [11]. The considerable advantage of our program over previous trials is that the patients were offered a relatively short intervention, which is easily applicable in general health care settings. In our study, overall Type A behavior decreased after 9 months by 1.4 S.D. in the intervention group, whereas the control group showed a decrease of 0.6 S.D. The RCPP showed comparable reductions in VSI scores of Type A behavior after comprehensive Type A behavioral counseling during 4.5 years [13].

In a meta-analysis published by Dusseldorp et al. [33], the effects of psychoeducational health education and stress management programs for coronary heart patients were examined. In this meta-analysis, no effects of psychoeducational programs were found in regard to depression. Several large studies were included in this meta-analysis [34,35]. The results of the study presented in this paper do not differ from the majority of these previous studies. To reduce depression in patients with CAD, we may need to adapt the contents of our interventions.

#### *Limitations of the study*

Baseline scores on psychological variables in our study group were generally low. The total study population scored 5.3 on the MIVE. Although this is higher than the mean score of 3.6 observed in healthy males, it is considerably lower than a score of 8 or higher, at which point persons are said to be exhausted [25]. The mean BDI score for depression in our study was 7.5, while persons scoring 10 or higher are considered depressed. Hence, in these patients,

little improvement could be expected, and positive intervention effects might have been found if patients had been more distressed at baseline. This is indeed suggested by the positive interactions that were found with intervention effects and baseline measurements in post hoc analyses (not presented). In these post hoc analyses, higher scores of vital exhaustion and depression were associated with larger favorable effects of the intervention. Subanalysis with exhausted patients showed that, for this group, the intervention had a significant favorable impact on vital exhaustion. Future intervention studies should focus on more distressed study populations.

This study was not conducted around one primary outcome measure, but we used multiple outcomes. Multiplicity of outcomes increases the risk of some false-positives. In a study such as this, more than one measure of outcome is relevant, however, which is illustrated by the fact that most studies on cardiac rehabilitation programs use multiple outcome measures. Moreover, if we correct the positive results for Type A behavior and its components for multiplicity of outcomes, significant results are still found for the favorable reduction in overall Type A behavior after 9 months, and for the favorable reductions in cognitive hostility scores at postintervention, as well as for the reduction in cognitive time-urgency scores at postintervention and at 9-month follow-up.

Due to the design of the study, it is impossible to indicate which elements or components of the intervention attributed to the positive results. We could not control for nonspecific aspects of the intervention, such as attention and the mutual support given by the participants. We merely wanted to study whether a short intervention can be effective in reducing detrimental psychological factors in CAD patients. Consequently, the study was designed with two arms only: intervention and usual care. No separate arm, for example, was formed by an intervention without attention to Type A behavior. Therefore, we cannot say that especially this part of the intervention resulted in the reduction of Type A behavior.

Another weakness is formed by the absence of a thorough registration of exercise habits. It is possible that changes in exercise have contributed to the beneficial effects of the study. However, we consider that to be an unlikely explanation because all patients were stimulated to exercise as part of the standard physical rehabilitation program that all patients received.

Despite these limitations, the results of this intervention study indicate relatively large and persistent reductions in Type A behavior, although this is not reflected in the patients' psychomotor characteristics of Type A behavior. No main effects of the intervention are seen in scores of vital exhaustion and of BDI depression. The higher reduction in the percentage of patients with major depression that was found at postintervention in the control group compared with the intervention group, however, should make us cautious of advising the intervention to the general population of AMI and CABG patients under the age of 70.

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