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Decline in Health-Related Quality of Life 6 Months After Coronary Artery Bypass Graft Surgery

The Influence of Anxiety, Depression, and Personality Traits

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Background: Although coronary artery bypass graft (CABG) is known to improve health-related quality of life (HRQoL), this improvement does not seem to be realized in all patients who had undergone CABG surgery. **Objective:** The aim of this study was to test the direct and indirect influence of personality trait Type D on no change-deterioration trajectories HRQoL and the mediating influence of increased symptoms of anxiety and depression. **Methods:** The hypothesized influence of personality trait Type D on the relationship between increased anxiety and depression and no change-deterioration trajectories in HRQoL was tested with path analysis using structural equation modeling. **Results:** The results of the current study show that Type D personality comprised a vulnerability factor for poor patient-reported outcomes (ie, HRQoL and distress), and despite significant and clinically relevant benefits also for Type D patients after CABG, their well-being remained poorer than that of non–Type D participants at 6 months. Increased levels of anxiety largely mediated the influence of Type D personality on no change-deterioration trajectories in both physical and mental HRQoL, whereas increased symptoms of depression explained deterioration in physical and mental HRQoL without the influence of Type D personality. **Conclusion:** There is evidence that increased symptoms of psychological distress is a strong predictor of no change-deterioration trajectories in HRQoL and that this relationship is influenced by personality trait Type D. We conclude that mediating factors, especially increased anxiety and depression, should be treated adequately in post-CABG clinical routine.

KEY WORDS: anxiety, coronary artery bypass graft, depression, personality

Coronary artery bypass graft (CABG) surgery is an established procedure for the treatment of coronary artery disease (CAD), with evidence-based benefits that include symptom relief, improved health-related quality of life (HRQoL), and prolonged survival.[1–5] However, an increasing number of studies have shown that improvement in important outcomes such as clinical symptoms, HRQoL, and psychological distress seems not to be realized in all patients who had undergone CABG surgery.[6–16] Le Grande et al[11] estimated nonimprovement trajectories in HRQoL using the technique of growth curve modeling and identified, with

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logistic regression analysis, the following predictors of "nonimprover" status: (*a*) disease characteristics such as atrial fibrillation, chronic heart failure, previous myocardial infarction (MI), and higher New York Heart Association dyspnea and (*b*) psychological distress and sociodemographic variables (being female, work status, nonnative Australian).

Murphy et al[17] identified predictors of nonimprovement trajectories in symptoms of anxiety and depression in CABG patients and came to the conclusion that most get better, although for a significant minority of patients, this improvement did not occur or patients' change indicated a deterioration. Other studies estimated prevalence rates regarding HRQoL, 6 or 12 months after intervention, as percentages of CABG patients with no change or deterioration, which varied from 3% to 26.8% for physical HRQoL and from 11% to 58.4% for mental HRQoL.[3,8,15,18] In a sample of female CABG patients, 25% continued to have scores at the level of severe psychological distress.[16] The variation in prevalence estimates is due to the use of differing (*a*) methods of estimating CABG-related change over time, (*b*) methods of assessment of HRQoL and psychological distress, (*c*) techniques of statistical analysis, and (*d*) criteria for classifying patients as deteriorated, remaining stable, or improved.

Several factors were found to affect improvement in HRQoL after CABG. Lindsay et al[19] reported that patients with poor HRQoL preoperatively were less likely to experience improvement after surgery and showed that patient-related factors, such as diabetes mellitus, smoking, younger age, high alcohol intake, and high level of socioeconomic deprivation, were associated with a deteriorating HRQoL. Moreover, in a study of Welke and colleagues,[3] a body mass index of greater than 35 kg/m^2, comorbid chronic obstructive pulmonary disease, and peripheral vascular disease were associated with deterioration in HRQoL after CABG.

In the past decades, it has become obvious that psychological distress, that is, anxiety and particularly depression, is a risk factor for CAD[20] and leads to a poorer recovery process after MI.[21] Moreover, both are also considered to affect HRQoL in patients with CAD.[22–26] In a study by Lee,[27] both anxiety and depressive symptoms were strongly associated with poor physical HRQoL (explained variance, 26%) and mental HRQoL (explained variance, 39%) assessed 5 years after CABG. Mallik et al[28] found that depressive symptoms at the time of CABG surgery, particularly at the level of severe depressive symptoms, are associated with a lack of functional benefits 6 months after operation. Furthermore, more severe depressive symptoms at baseline have been shown to predict deterioration in mental HRQoL.[11] These findings indicate that CABG-related changes in HRQoL in patients with CAD may be highly influenced by mood disturbance, rather than by objective biomedical variables such as left ventricular ejection fraction or degree of angina.[22,24] In addition, in a recent longitudinal study by Kendel et al,[26] a cross-lagged analytic model was used to test a longitudinal structural path to reflect changes in depression and physical functioning, and it was concluded that an increase in depressive symptoms predicted a decrease in physical functioning, but not the other way around.

Likewise, symptoms of psychological distress have been shown to be associated with personality traits, such as Type D, in patients with CAD. Type D personality[29] is defined as the specific combination of negative affectivity (NA; the tendency to experience negative emotions) and social inhibition (SI; discomfort in social interactions, reticence, lack of social poise). The Type D personality trait has been reported to have particularly negative effects on clinical outcome and HRQoL. By now, a large number of studies have investigated the influence of Type D personality trait on postoperative cardiac events, HRQoL, and increased symptoms of anxiety and depression, and evidence grows that this personality trait is strongly associated with poor clinical outcomes and HRQoL after invasive cardiovascular procedures.[30–54]

The objective of the current study was to test, using a structural equation modeling (SEM) technique, the hypothesis that the influence of Type D personality on no change-deterioration trajectories in HRQoL after CABG is mediated by increased symptoms of anxiety and depression.

Methods

Ethical approval for this study, which conforms with the principles outlined in the Declaration of Helsinki, was granted by the medical ethics committees of the University Medical Center Groningen and the HAGA Hospital in The Hague, the Netherlands.

Patients and Design

A total of 256 patients scheduled for CABG after coronary angiography were recruited from the University Medical Center Groningen and the HAGA Hospital in The Hague, the Netherlands, and were followed after CABG for 6 months. Patients with other chronic diseases such as rheumatoid arthritis, multiple sclerosis, Parkinson disease, and cognitive impairments; who were 80 years or older; or who did not speak Dutch were excluded.

Procedure

Before surgery, patients were approached to participate in the study. If they agreed, they signed an informed consent form and completed a set of self-report questionnaires. Written informed consent allowed researchers access to the patient's medical record to collect data on the medical history, risk factors, present comorbidity,

and postoperative events. Follow-up questionnaires were sent to patients 6 months after CABG. Researchers checked the questionnaires for completeness upon receipt. If a page had not been filled in, a copy was sent to the patient with a request to complete the questions, or if it concerned 1 or only a few questions, patients were interviewed by telephone.

Measures

Background Variables

Patient demographics, including age, gender, marital status, education, working status, and current smoking, were derived from patients' questionnaires. Clinical variables, such as angina, MI, hypertension, diabetes, mild renal insufficiency, left ventricular ejection fraction, and chronic pulmonary disease, were retrieved from patients' medical records, medical notes, outpatient notes, or intensive therapy unit charts. Postoperative events, including (*a*) use of inotropes (inotropes commenced on leaving theater or in the intensive care unit >3 μg/kg/min), (*b*) atrial arrhythmias (all atrial tachycardias or fibrillation requiring treatment) or ventricular arrhythmia (ventricular tachycardias or fibrillation requiring treatment), (*c*) sternal resuturing (for any reason, eg, technical failure or infection), (*d*) reexploration for bleeding (bleeding or tamponade that required surgical reexploration after initial departure from the operating theater or exploration for other reasons, eg, cardiac arrest or additional grafting), and (*e*) time spent on mechanical ventilation, were also retrieved from these same sources.

Health-Related Quality of Life

Short-Form Health Survey 36. The Short-Form Health Survey (SF-36) was sent to patients preoperatively after they were scheduled for CABG and postoperatively 6 months after CABG. The time frame (recall period) used referred to the last 4 weeks to avoid that item responses may be affected by daily or momentary fluctuations. The SF-36 is a generic measure that assesses 8 HRQoL domains, that is, physical functioning, physical role functioning, emotional role functioning, mental health, vitality, social role functioning, bodily pain, and general health. Scale scores are obtained by summing the items together within a domain, dividing this outcome by the range of scores, and then transforming these raw scores to a scale from 0 to 100. A higher score on the SF-36 subdomains represents better functioning, with a high score on the bodily pain scale indicating freedom from pain. In the current study, the scales yielded good reliability coefficients (Cronbach's α) ranging from .85 to .96 for all subscales. In this study, we used the so-called Physical Component Summary (PCS) and Mental Component Summary (MCS) scales with the scoring algorithms according to the SF-36 guidelines and reported means, standard deviations, and factor-score coefficients from the general Dutch population.[55,56] The PCS captures the individual's overall physical functioning by considering reported limitations in physical, social, and role activities; amount of pain; and level of energy, whereas the MCS reflects the respondent's overall mental functioning by considering the frequency of psychological distress and limitations in usual social and role activities due to emotional problems.[57]

In the current study, the PCS and MCS yielded a Cronbach's α of .87 and .86, respectively, whereas Trip et al[58] recently found similar estimates in a Dutch sample (Cronbach's α of .92 and .9, respectively). Test-retest reliability of the PCS and MCS was good, with intraclass correlations of 0.82 for the PCS and 0.73 for the MCS.[58] The SF-36 was administered both before surgery and at 6-month follow-up.

Type D (Distressed) Personality

Type D Scale. Type D personality was assessed with the 14-item Type D Scale (DS14).[29] The DS14 consists of the subscales NA (7 items; eg, "I often feel unhappy") and SI (7 items; eg, "I find it hard to start a conversation"). These 14 items are answered on a 5-point Likert scale from 0 (false) to 4 (true). Seven items tap NA and 7 items tap SI (score range, 0–28 for each subscale). Type D caseness is defined by a high score on both subscales, as determined by a standardized cutoff score of 10 or higher. Type D personality characterizes those who tend to experience increased negative emotions and who do not express these emotions in social interactions. A cutoff score greater than or equal to 10 on both subscales denotes those with a Type D personality.[37] In the current study, the NA and SI scales yielded Cronbach's α coefficients of .90 and .87, respectively.

These estimates of internal consistency (reliability) are in line with other studies, with Cronbach's α values of .89 and .88 for the NA and the SI subscales, respectively.[29,59] The DS14 was administered only at baseline. It has been confirmed in many studies that Type D personality is a vulnerability factor for postoperative symptoms of anxiety and depression, poor HRQoL, morbidity, and mortality. Type D personality has been shown to be stable over time and neither to be influenced by indicators of disease severity nor cardiac events, such as CABG.[60]

Anxiety and Depression

Hospital Anxiety and Depressive Symptoms. The Hospital Anxiety and Depressive Symptoms (HADS) is a self-report measure for assessing anxiety and depressive symptoms.[61] The scale consists of 2 subscales, a 7-item anxiety and 7-item depression scale, which were measured at baseline and at 6 months follow-up. Both 7-item scales are answered on a 4-point Likert scale from 0 to 3, with a score range of 0 to 21, and both require that patients describe how they have been feeling in the past week. Higher scores reflect more symptoms. In

the current study, the HADS is a reliable questionnaire that performs well in assessing the separate dimensions of anxiety and depression, with Cronbach's α values of .88 and .86, respectively, which are close to the internal consistency estimates in other studies.[62]

Statistical Methods

To examine differences between responders and nonresponders, we used the χ^2 test (Fisher exact test when appropriate) for categorical variables, and for continuous variables, Student *t* test was used. The clinical relevance of differences in HRQoL and symptoms of anxiety and depression between patients who were classified as Type D and as non-Type D was estimated with effect sizes (ESs) for independent samples at baseline and at 6 months after CABG. Effect sizes are used to classify the magnitude of mean differences by Cohen cutoff points in terms of trivial difference (ES <.20), small difference (ES ≥.20, <.50), moderate difference (ES >.50, <.80), or large difference (ES ≥.80).[63] Effect sizes were calculated only for statistically significant differences because it makes no sense to estimate clinical relevance of a result that may be based on random variation.

To test the theoretical model against the observed data, we used SEM. Structural equation modeling is a multivariate technique for testing the tenability of this model. The general structural equation model incorporates both the measurement model (eg, confirmatory factor analysis) and the structural path components (eg, regression analysis). In the measurement model, each latent variable needs to be represented adequately by the respective observed variables. The structural model concerns the direct and indirect relationships between Type D personality, change in anxiety and depression, and change in physical and mental HRQoL, all latent variables.

Within the structural model, longitudinal change was estimated through the latent variables. Therefore, to estimate intraindividual change as the difference between baseline and follow-up, the path coefficients were fixed at 1 and -1[64] and were ordered in a trajectory of scores from remaining stable and ending by deterioration. Type D personality was estimated with the indicators of NA and SI, and the resulting latent Type D personality disposition is a linear combination of patients' scores on both subscales.[29] Residual correlations between NA and SI, between changes in anxiety and depression, and between changes in physical and mental HRQoL were allowed, as they belonged to the same measure and were assessed simultaneously. To allow for mutual comparisons between the path coefficients, the completely standardized solution was used. For judging the model fit, we used multiple criteria as suggested by Bentler and Bonett.[65] These criteria were (*a*) nonsignificant χ^2, indicating that a nonsignificant proportion of variance in the data remains unexplained (a ratio of χ^2 to the degrees of freedom less than 3 generally indicates a good model fit[66]); (*b*) root mean square error of approximation (RMSEA) less than 0.06, indicating a good fit to the data[67]; (*c*) standardized root mean square residual less than 0.05, indicating good model fit[68–70]; (*d*) comparative fit index (CFI) greater than 0.97, indicating good fit with a value[71]; and (*e*) adjusted goodness of fit index greater than 0.95, indicating good fit.[69] Both CFI and RMSEA were used because it has been argued that they provide more stable and accurate estimates than several of the other fit indices.[71,72] All bivariate and multivariable statistical analyses were performed using SPSS 19 for Windows.

Results

An overview of patient selection for the current study is presented in Figure 1. A postal follow-up survey was sent out to 256 patients, both at baseline and 6 months after CABG. The response rate at baseline was 77.3% (198/256). Participants and nonparticipants did not differ except for gender ($\chi^2 = 4.85$, $df = 1$; $P = .03$), with 33.3% female patients who did not respond to the invitation to the study as compared with 21.2% women who did respond. Moreover, between the study sample and nonresponders, there was no statistically significant difference ($P = .15$, $df = 286$) with regard to age (mean age sample, 64.8 ± 9.96 years; mean age nonresponders, 66.7 ± 11.22 years). Compared with the study sample, dropouts at follow-up did not differ on gender ($\chi^2 = 1.63$, $df = 1$, $P = .20$), marital status ($\chi^2 = 1.81$, $df = 1$, $P = .18$), and Type D personality ($\chi^2 = 1.73$, $df = 1$, $P = .31$); no statistically significant differences ($df = 196$; $P = .45$) were found on age (mean age dropouts, 66.1 ± 10.09 years; mean age participants, 64.59 ± 9.95 years) and symptoms of depression (mean dropouts and participants, 4.5 ± 3.6 vs 4.2 ± 3.5) and anxiety (mean dropouts and participants, 7.1 ± 4.2 vs 6.8 ± 4.1).

Given that we used a prospective design that included only patients with complete questionnaire data at baseline and 6-month follow-up, our analyses were finally based on 168 patients.

Table 1 presents the demographic characteristics, preoperative medical variables, and postoperative events of the study sample. The mean age of the study sample was 64.89 ± 9.95 years, 78.3% (see Table 1) were men, 79.3% were married or living with a partner, 61.9% had elementary schooling, and 72.2% were not working. Of all patients, 11.6% had a Type D personality and 7.3% were smokers. In relation to clinical characteristics, 27.1% were high-risk patients according to the EuroSCORE, 67.7% had a New York Heart Association class of III or IV, and 58.1% had a history of angina. Concerning postoperative events, 32.6% of patients had developed atrial arrhythmias and 32% needed inotropic support.

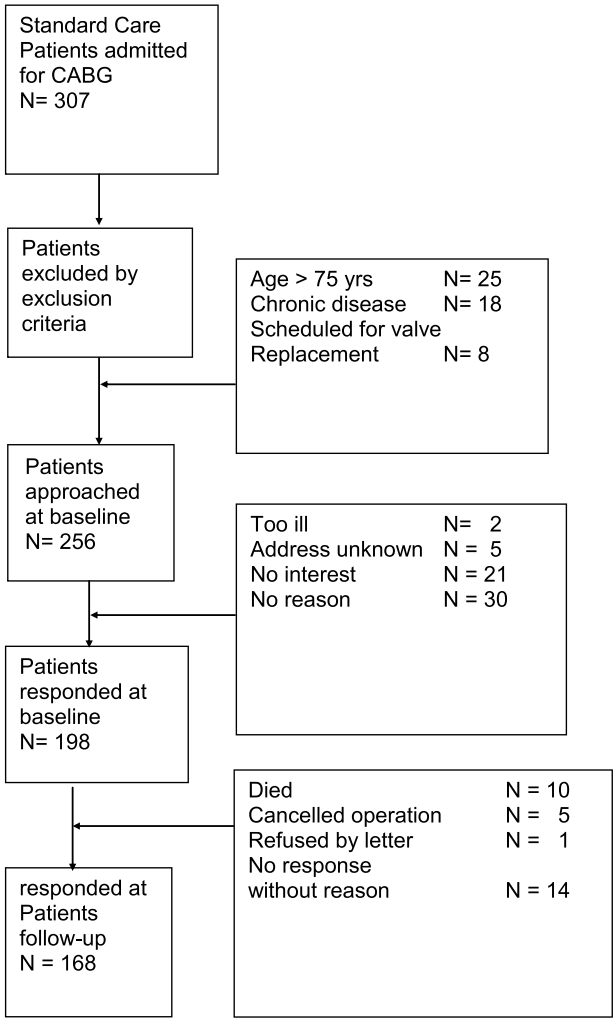

FIGURE 1. *Overview of patient selection for the current study.*

On average, all patients improved significantly in all domains of HRQoL, except for the domains of bodily pain and physical functioning, and showed a decrease in symptoms of psychological distress. However, patients with Type D personality, despite significant and clinically relevant improvements 6 months after CABG, experienced poorer HRQoL and more symptoms of anxiety and depression compared with non–Type D patients. Thus, both at baseline and 6 months after CABG, differences between Type D and non–Type D patients in physical functioning, social role functioning, emotional role functioning, mental health, vitality, and general health were statistically significant and substantial (ESs > .50). The PCS and MCS scores showed similar results: Type D patients had, after CABG-related improvement, poorer postoperative physical and mental health status compared with non–Type D patients. Furthermore, at baseline as well as 6 months after CABG, Type D patients had, on average, substantially (ESs > .80) more symptoms of depression and anxiety, despite an average reduction in these symptoms in both groups 6 months after CABG (Table 2).

The hypothesized influence of personality trait Type D on the relationship between increased anxiety and depression and no change-deterioration trajectories in HRQoL was tested using SEM.

Figure 2 depicts the results of the path analysis, showing the direct and mediated paths between Type D personality as well as CABG-related changes in mental and physical HRQoL. As a priori hypothesized in our model, increased symptoms of anxiety and depression predicted no change-deterioration trajectories in both mental and physical HRQoL. We further hypothesized that increased symptoms of anxiety and depression should both mediate the influence of Type D personality on change-deterioration trajectories of mental and physical HRQoL 6 months after CABG.

Figure 2 shows the results of the path model: Type D personality directly led to a decrease in mental HRQoL (β = −.16**) but Type D did not directly influence change in physical HRQoL (β = NS).

It can be seen that increased levels of anxiety largely influenced directly no change-deterioration in both physical (β = –.55**) and mental (β = –.58**) HRQoL. Furthermore, increased symptoms of depression explained also no change-deterioration in both physical (β = –.38**) and mental (β = –.33**) HRQoL. Type D personality accounted for a significant increase in symptoms of depression (β = .23**) and anxiety (β = .21**). However, only increased symptoms of anxiety and depression mediated the influence of Type D personality on no change-deterioration trajectories in mental HRQoL and explained 65% of the variance. As no direct influence was found between Type D personality and change in physical HRQoL, change in anxiety and depression did not mediate the influence of this personality trait. Therefore, these characteristics explained a substantially lower percentage (25%) of the variance of this change in physical HRQoL.

For this model, the χ^2 statistic (5.79, P = .45) indicated that a nonsignificant amount of variance in the data remained unexplained and, relative to degrees of freedom (6), was less than 2. The RMSEA indicated a good fit (<0.06; .003), as did the standardized root mean square residual (<0.05; .039). The CFI value of 1.00 exceeded the 0.97 value and the adjusted goodness of fit index was greater than 0.95. Taken together, these results suggest that the hypothesized model fitted the data well.

Discussion

The results of the current study show that Type D personality comprises a vulnerability factor for poor patient-reported outcomes (ie, HRQoL and distress), and despite significant and clinically relevant benefits also for Type D

Symbol ** represents that these values are statistically significant.

TABLE 1 Patient Characteristics

Patient Characteristics	n	%
Age, mean ± SD, y	64.89 ± 9.95	
Male gender	155	78.3
Married/living with partner	157	79.3
Educational level		
Elementary schooling	120	61.9
Secondary schooling	38	19.6
Higher schooling	26	13.4
College education/university	10	5.2
Work: working	55	27.8
Type D: yes	23	11.6
Smoking: yes	12	7.3
EuroSCORE		
Low risk	64	35.4
Medium risk	68	37.6
High risk	49	27.1
Preoperative clinical characteristics		
NYHA functional class		
I	21	11.1
II	40	21.2
III	82	43.4
IV	46	24.3
Left ventricular ejection fraction		
>50%	135	78.5
30%–50%	36	20.2
<30%	7	3.9
Preoperative medical history		
Chronic obstructive pulmonary disease	18	10.1
Previous cardiac surgery	5	2.8
Pulmonary hypertension	6	3.4
History of angina	115	58.1
Hypertension	66	33.3
Previous myocardial infarction	43	21.7
Renal insufficiency	9	4.5
Diabetes	36	18.2
Postoperative events		
Overall LOS, mean ± SD, d	10.50 ± 6.96	
Hospital delay, mean ± SD, d[a]	2.08 ± 4.70	
Readmission rate	27	16.3
Discharge destination		
Home	152	85.9
Extended care facility	25	14.1
Perioperative events		
Atrial arrhythmia	58	32.6
Ventricular arrhythmia	6	3.4
Use of inotropes	57	32.0
Reexploration for bleeding or tamponade	14	7.9
Time spent on mechanical ventilation		
0–6 h	58	32.6
6–12 h	53	29.8
12–24 h	32	18.0
>24 h	35	19.7

Abbreviations: LOS, length of stay in hospital; NYHA, New York Heart Association.
[a]Time between admission and operation.

patients after CABG, their well-being remains poorer than that of non–Type D patients 6 months after treatment.

Both indicators of psychological distress are considered to have a negative effect on HRQoL in patients with CAD,[23,24,73,74] with depressive symptoms having a greater influence compared with ejection fraction and ischemia.[24] Similarly, in CABG patients, others have also found that higher scores for depression were predictors of no improvement in MCS.[11] In addition, depressive symptoms have been shown to have a negative effect on HRQoL regardless of successful medical and surgical treatment.[75]

Most importantly, our findings offer new insights as our model tested the role of Type D personality as predictor of change in anxiety, depression, and physical and mental HRQoL in contrast with many studies that

TABLE 2 Health-Related Quality of Life and Symptoms of Anxiety and Depression Stratified by Type D Personality

	Type D	N	Mean	SD	P	Effect Size
Baseline						
Short-Form Health Survey 36						
Physical functioning	No	175	59.07	25.00	.001	0.73
	Yes	23	40.86	24.38		
Social role functioning	No	175	68.57	26.29	.01	0.59
	Yes	23	53.06	26.31		
Physical role functioning	No	175	39.95	41.05	.21	–
	Yes	22	28.40	37.23		
Emotional role functioning	No	175	65.71	41.89	.01	0.64
	Yes	23	39.13	39.76		
Mental health	No	175	72.30	17.25	.001	1.50
	Yes	23	45.39	22.77		
Vitality	No	175	58.65	22.68	.001	1.01
	Yes	23	36.73	11.14		
Bodily pain	No	175	65.98	24.58	.26	–
	Yes	23	59.82	23.34		
General health	No	175	55.12	19.41	.001	0.84
	Yes	23	39.08	15.95		
Physical Component Summary	No	175	55.03	20.65	.01	0.64
	Yes	23	42.13	17.40		
Mental Component Summary	No	175	66.31	21.50	.001	1.03
	Yes	23	44.58	17.71		
Hospital Anxiety and Depression Scale						
Symptoms of depression	No	175	4.84	3.82		
	Yes	23	10.04	4.33	.001	1.20
Symptoms of anxiety	No	175	6.07	4.07		
	Yes	23	11.52	4.65	.001	1.32
6 mo after CABG						
Short-Form Health Survey 36						
Physical functioning	No	147	76.56	21.98	.01	0.76
	Yes	23	59.68	23.97		
Social role functioning	No	147	80.35	22.80	.01	0.62
	Yes	23	61.39	17.28		
Physical role functioning	No	147	63.77	40.66	.27	–
	Yes	23	52.63	44.01		
Emotional role functioning	No	147	79.13	36.22	.03	0.52
	Yes	22	59.64	46.58		
Mental health	No	147	78.77	16.50	.001	0.98
	Yes	22	62.31	19.15		
Vitality	No	147	67.62	19.57	.001	0.98
	Yes	23	48.42	19.58		
Bodily pain	No	147	80.23	21.93	.51	–
	Yes	22	76.73	22.02		
General health	No	147	65.86	19.71	.03	0.51
	Yes	23	55.89	19.16		
Physical Component Summary	No	147	71.61	21.19	.01	0.61
	Yes	23	58.74	20.33		
Mental Component Summary	No	147	76.47	19.89	.01	0.67
	Yes	23	62.69	20.64		
Hospital Anxiety and Depression Scale						
Symptoms of depression	No	147	3.16	3.50	.01	0.81
	Yes	23	5.90	5.05		
Symptoms of anxiety	No	147	3.34	3.45	.001	0.91
	Yes	23	6.53	3.88		

Abbreviation: CABG, coronary artery bypass graft surgery.

used these outcomes assessed at follow-up. The findings of the present study highlight the probability that increased symptoms of anxiety and depression mediate only the relationship between Type D personality and no change-deterioration trajectories in mental and physical HRQoL 6 months after CABG. Hence, Type D directly increased anxiety, depression, and no change-deteriorated mental, but not physical, HRQoL.

The present study was based on the growing evidence for declining HRQoL among a significant minority

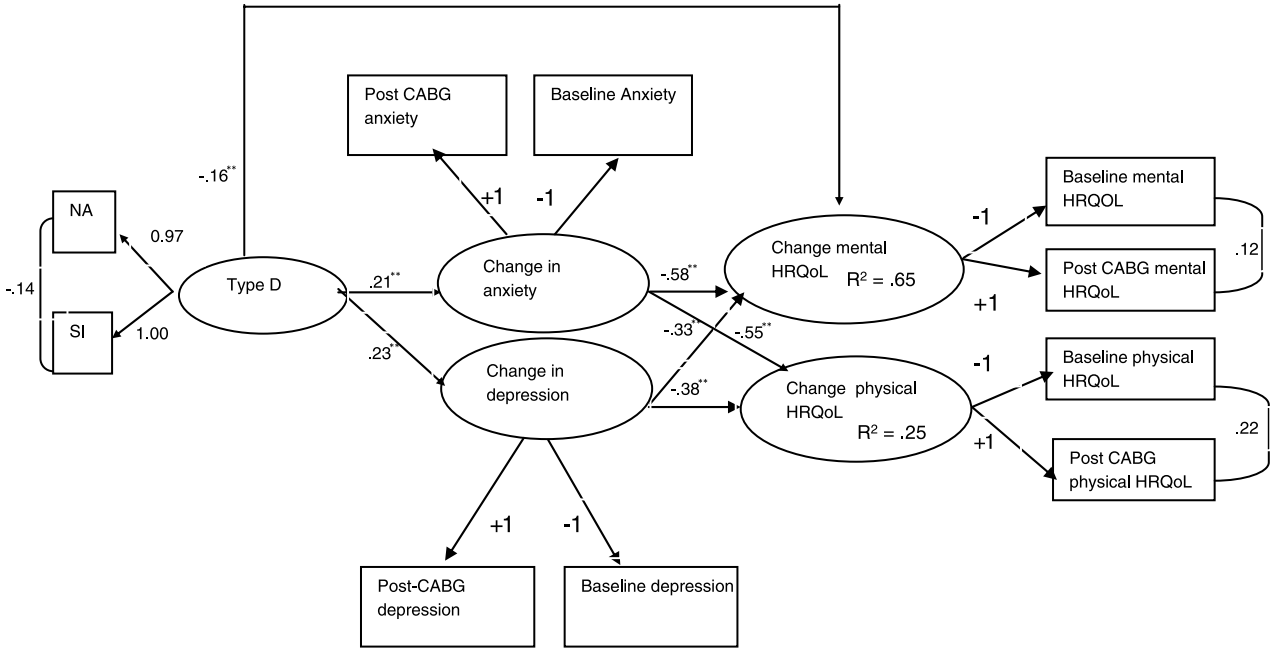

FIGURE 2. *Path model of Type D as predictor of increased anxiety and depression as precursors of no change-deterioration trajectories in mental and physical HRQoL 6 months after CABG. Depicted coefficients are all statistically significant at the P = 0.05 level (N = 166, χ^2 = 5.79, df = 6, P = .45, AGFI = 0.96, CFI = 1.00, SRMR = 0.039, RMSEA = 0.003). AGFI indicates adjusted goodness of fit index; CABG, coronary artery bypass graft surgery; CFI, comparative fit index; HRQoL, health-related quality of life; NA, negative affectivity; RMSEA, root mean square error of approximation; SI, social inhibition; SRMR, the standardized root mean square residual.*

of patients who underwent CABG[8–15,23] and the need to investigate explanatory factors.

These findings led us to using SEM to investigate an a priori hypothesized model that posits that certain inherent traits (ie, personality characteristics or temperament) predispose no change-deterioration in anxiety and depression as mediators in the relationship between Type D personality and no change-deterioration trajectories in both mental and physical HRQoL 6 months after CABG. However, Type D was directly associated with no change-deterioration in anxiety, depression, and mental, not physical, HRQoL. Therefore, we must conclude that the influence of Type D personality on physical HRQoL was not mediated by increased symptoms of psychological distress, but that not-changed/deteriorated anxiety and depression exposed direct effects on not-changed/deteriorated mental and physical HRQoL. Moreover, these findings are in line with the results of other studies showing that Type D personality trait has an effect on poor clinical outcomes and HRQoL among patients with CAD or undergoing invasive cardiovascular procedures.[43,48,76–80] The Type D personality construct is currently the topic of an ardent debate in the literature, to the extent that some advocate that the construct should be abandoned.[81–84] However, some of the studies that are mentioned as evidence for such abandonment are underpowered studies focused on mortality as a dichotomous characteristic, and such studies seem not valid for this longitudinal study and for the SEM technique that allows testing only unidirectional effects among multiple continuous dependent and independent variables. Therefore, SEM is more appropriate for our study than standard multiple regression technique is because it allows simultaneous assessment of the strength and direction of the interrelationships.

Höfer et al[85] used SEM to test a conceptual model of HRQoL in CADs. This conceptual model was originally developed in 1995 by Wilson and Cleary,[86] who proposed a relationship between biomedical, individual, and environmental factors and HRQoL. After testing this model, Höfer et al confirmed their expectation that depression and anxiety symptoms exerted the most significant effect on HRQoL. Others using preoperative distress also confirmed that distress levels before surgery were the most predominant predictor of deterioration in HRQoL.[2,87]

Strengths and Limitations

The limitations of the study arise mainly from the fact that we lost approximately 15% of the study sample at follow-up, and a longer follow-up of up to 1 year would have provided more information on the progression of psychological distress and HRQoL.[22,85]

Nevertheless, the external validity of the study was not severely biased, as there was no statistically significant difference between the study sample and nonresponders with regard to age. However, compared with the study sample, nonresponders differed on gender,

What's New and Important

- Many patients experience improvement in HRQoL after CABG but not all. The results of this study demonstrate that Type D personality, or the tendency to experience negative emotions) is an important factor predicting failure to improve after CABG.

with 33.3% female patients who did not respond to the invitation to the study as compared with 21.2% women who did respond. Moreover, compared with the study sample, dropouts at follow-up did not differ neither on gender, marital status, nor age.

Implications for Practice

The results of the current study have some implications for clinical practice and future research. Undoubtedly, undergoing CABG is a major life event with a significant psychological and emotional effect on patients and their families; although patients expect to improve after surgery, our study showed that despite the fact that most patients experienced benefits in HRQoL after CABG, a subgroup reported no change or deterioration over a 6-month period. Patients at risk for deterioration or no change in HRQoL were not only those with no change-deterioration in psychological distress levels but also those with a Type D personality disposition. These findings have implications for clinical routine as identifying patients at risk of deterioration after CABG comprises the main goal of secondary prevention. It is essential to be able to recognize subgroups of patients in whom personality trait and higher levels of anxiety and depression may cause deterioration in HRQoL after surgery. The concision of the scale makes it particularly suitable to use as a screening instrument in clinical practice and to incorporate in research protocols.[29] However, helping patients with Type D personality trait to experience an improvement in HRQoL requires not only the identification of those patients but also adjustment of the factors that mediate deterioration or no change, that is, increased level of anxiety and depression. This can be also achieved by early screening, diagnosis, and incorporating the management of psychological distress in the treatment and follow-up protocols. Management of these patients may also include cognitive behavioral therapy,[46] which, according to Freedland et al,[88] "demonstrated to have durable effects on depression remission compared to supportive stress management and usual care."

Knowledge of these factors is important to early identify patients at risk, which would enable healthcare professionals to provide them with optimal and prompt care, more emotional and psychological support before and after surgery, to help them cope more effectively with the postoperative period, which would subsequently improve their HRQoL and decrease the risk of mortality and morbidity.[89,90] Cooperation between all healthcare personnel involved in patients' care, including nurses, psychologists, psychiatric specialist with cardiac surgeons, and cardiologists, is imperative to improve clinical practice and research base, which might lead to better patient outcomes. We hope that this collaboration will alleviate the detrimental impact of Type D personality trait, anxiety, and depression on post-CABG HRQoL through early identification, referral, and management.

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