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Prognostic value of type D personality for 10-year mortality and subjective health status in patients treated with percutaneous coronary intervention

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ABSTRACT

Objective: Given the debate around limitations and controversies in type D personality studies, we aimed to evaluate the prognostic value of 'synergistically' analyzed type D personality (interaction *z*-scores negative affectivity NA, and social inhibition SI) on 10-year mortality and on 10-year subjective health status in percutaneous coronary intervention (PCI) patients.
Methods: This prospective study comprised a cohort of 1190 consecutive patients who underwent PCI between October 2001 and September 2002 (73% male, mean age: 62 years, range [27–90] years). At baseline, type D personality (DS14), and depression/anxiety (HADS) were assessed. Primary endpoint was 10 year all-cause mortality; secondary endpoint was 10-year subjective health status (SF-36).
Results: After a median follow-up of 10.3 years (IQR 9.8–10.8), 293 deaths of any cause (24.6%) were recorded. After adjustment for significant baseline characteristics, personality categories approached and dichotomously approached type D personality were associated with 10-year mortality, $p < .05$. Synergistically approached type D personality was not associated with all-cause mortality or subjective health status at 10 years. In survivors, higher NA was associated with lower subjective health status. Type D was not associated with mortality after adjusting for continuous depression and anxiety in all approaches.
Conclusions: Synergistically analyzed type D was not associated with 10-year all-cause mortality in PCI patients whereas dichotomous type D was. However, after adjustment for depression most of the findings had disappeared. Depression played an important role in this. Type D was not associated with 10-year subjective health status.

Introduction

Type D personality, the tendency to experience negative emotions and to inhibit self-expression in social interaction [1], has been associated with mortality, an objective health outcome, in small samples ($n < 47$ number of deaths) of patients with coronary artery disease (CAD) [1–6]. In contrast, Meyer et al. [7] did not find this association between type D personality and mortality ($n = 42$) in 465 CAD patients. On the other hand, larger studies (number of deaths between 123 and 192) [8,9] also did not find this association between type D personality and mortality in mainly heart failure (HF) patients and acute coronary syndrome [10]. Coyne and de Voogd [11] commented on these findings and ascertained a decline in literature on the prognostic value of type D personality on mortality in cardiovascular disease patients; these studies had a maximal follow-up time of 7 years.

In an editorial, Smith [12] described the limitations and controversies around linking type D personality with health outcomes in CAD and HF patients. First he discussed the general tendency in literature to analyze type D personality as a dichotomized variable; high on negative affectivity (NA) and high on social inhibition (SI) versus 'all others' (high on NA/low on SI, low on NA/high on SI, and low on NA/low on SI). Besides the statistical problems with dichotomizing in general, this type of analysis may also lead to spurious associations since the risks in these three 'other' categories are presumed to be similar; a significant difference between these two groups may also be due to other patterns [12]. In a recent publication, Denollet et al. [13] reported that type D personality, analyzed as a product term of NA × SI, was associated with an increased risk of fatal and nonfatal cardiac events in CAD patients, also after adjusting for depression. However, type D personality was not associated with all-cause mortality.

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In addition, several studies reported on the prognostic value of depressive symptoms on mortality in HF patients [14,15]. Coyne and de Voogd [11] questioned whether type D personality is sufficiently distinct from other negative affect variables, especially since depressive symptoms highly correlate with the NA component of type D personality. Smith [12] reported problems on partialing depression in type D personality analyses. Although it seems to be an appropriate approach to examine the independent effect of type D personality, the consequences of multivariate statistical control of predictors that are highly correlated are serious. Since NA and depression share a great amount of variance, central aspects of NA are effectively eliminated when depression is added as a covariate. Then, the construct of original interest (equally weighted combination of NA × SI) is influenced in such a way that SI influences the construct with a considerably greater extent.

Besides these controversies around the statistical approach of type D personality and the sense and nonsense of introducing depression into these analyses, the question was raised what the clinical implication is of analyzing associations between type D personality and mortality in CAD and HF patients. Especially since in our sample, depression was associated with an increased risk of 77% for all-cause mortality, 10-year post-PCI [16]. On the other hand, Denollet et al. [13] propounded that type D assessment may provide estimates of patients' future health risk, and therefore identification of patients who may benefit from more intensive follow-up and care may be important. In this context, *subjective* endpoints following PCI gained more and more attention [17,18]. Several studies reported on subjective health status as an important subjective health outcome after PCI in clinical practice [19–21]. Therefore, assessing associations between type D personality and 10-year subjective health status (a subjective health outcome) can be of added value to the interpretation of the association between type D personality and mortality (an objective health outcome).

Considering these recently described limitations and controversies in type D personality studies, we aimed to evaluate the prognostic value of 'synergistically' analyzed type D personality on 10-year mortality and on 10-year subjective health status in a large, relatively homogenous sample of percutaneous coronary intervention (PCI) patients. As proposed by Smith [12], a synergistically approached analysis of type D means, entering continuous main effects of NA and SI including their interaction term. To be able to compare our findings with existing literature, we also analyzed the influence of dichotomized type D personality on all-cause 10-year mortality. Furthermore, all type D personality analyses were also adjusted for depression and anxiety.

Methods

Participants and procedure

The study sample consisted of a prospective cohort of consecutive patients with severe ischemic disease treated with PCI at the Erasmus MC, Rotterdam, the Netherlands between October 2001 and September 2002. The cohort was part of RESEARCH. The design of the RESEARCH study has been published elsewhere [22]; it evaluated the efficacy and safety of sirolimus-eluting stent implantation in interventional cardiology, therefore no exclusion criteria were applied regarding patients entering the registry.

Since the risk for restenosis is increased in the first 6 months post-PCI [23], the baseline assessment was performed at 6 months post-PCI to ensure that patients were in a stable condition. At baseline, all living patients were asked to complete standardized psychological questionnaires. For 10 years, all patients were prospectively monitored for adverse clinical events (with all-cause mortality as primary endpoint). As secondary outcome, subjective health status was assessed in patients who survived at 10-year post-PCI.

At time of enrolment, this study was not subjected to the Dutch Medical Research Involving Human Subjects Act. Then, approval from the local research ethics committee to conduct this prospective follow-up study was not required. At 10-year follow-up our local research ethics committee was approached and judged that this study was indeed not subjected to the Dutch Medical Research Involving Human Subjects Act (MEC-2013-262). Moreover, the study was conducted according to the Helsinki Declaration [24]. All patients consented for participation in this study.

Measures

Demographical variables (including age and gender) were collected at baseline. Clinical variables were obtained from the Cath lab electronic clinical database. Clinical data from patients discharged to referring hospitals were obtained from reviewing the hospital records. Subjective health status was assessed at baseline and at 10-year follow-up. Survival status at 10-year follow-up was obtained from the municipal civil registries.

Clinical variables included: indication for PCI, previous myocardial infarction (MI), previous coronary artery bypass graft (CABG), previous PCI, smoking, hypertension, high cholesterol, and diabetes mellitus (see Table 1). Hypertension was defined as blood pressure >140/90 mm Hg or being treated for hypertension. Diabetes mellitus was defined as being treated for diabetes.

Type D personality (the tendency to experience negative emotions and to inhibit self-expression in social interaction) was assessed with the 14-item type D scale (DS14). The DS 14 is composed of two subscales, negative affectivity (NA) and social inhibition (SI). Each subscale consists of 7 items, scored on a 5-point Likert scale (from 0 to 4; subscale maximum score 28). A cut-off score of 10 and higher on each subscale is used to assess type D personality [25]. The internal consistency of the Dutch DS14 is good [26].

Depression and anxiety were assessed with the 14-item Hospital Anxiety Depression Scale (HADS), consisting of 2 subscales, with each 7 items scored on a 4-point Likert scales (from 0–3; subscale maximum score 21). A cut-off score of 8 and higher on each subscale represents clinically relevant levels of anxiety and depression [27]). The HADS has been proven a valid and reliable instrument to detect symptoms of anxiety and depression [27,28].

Subjective health status was assessed with the SF-36 Health Survey questionnaire. The SF-36 questionnaire assesses 8 health status scales: role limitations due to emotional functioning, mental health, vitality, social functioning, physical functioning, role limitations due to physical problems, bodily pain and general health. These subscales can be combined, through weighted calculation, into two component summary scores: Mental Component Score (MCS) and Physical Component Score (PCS) with mean 50 and SD = 10. A higher score represents a better functioning; a high score on the bodily pain scale indicates the absence of pain [29]. Good reliability and validity have been reported, with Cronbach α ranging from 0.65 to 0.94 for all subscales [30]. The Dutch version of the SF-36 questionnaire has been validated and achieved similar results [31].

Primary endpoint

The primary endpoint was defined as all-cause mortality. Deaths between PCI and baseline assessment, 6 months post-PCI, were excluded ($n = 54$). The median follow-up for all-cause mortality was 10.3 years (IQR 9.8–10.8) with range [0.8–12.1].

Secondary endpoint

The secondary endpoint was defined as subjective health status in patients who were alive at 10 years follow-up. The median follow-up duration for subjective health status was 10.7 years (IQR 10.12–11.24) with range [7.4–12.5].