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Pedersen, S.S.; Middel, B.

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Increased vital exhaustion among type-D patients with ischemic heart disease

Susanne Schmidt Pedersen[a,*], Berrie Middel[b]

[a]*Institute of Psychology, Aarhus University, Asylvej 4, DK-8240, Risskov, Denmark*
[b]*Northern Centre for Healthcare Research, University of Groningen, Groningen, The Netherlands*

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Abstract

Objective: To investigate the prevalence of the "distressed personality" (type-D) in cardiac patients and to explore the relationships between type-D, gender, vital exhaustion and angina pectoris. **Methods:** A questionnaire was completed by 171 patients scheduled for coronary angiography (CAG) at baseline and again at 6 weeks following implementation of treatment with invasive procedures or medication. **Results:** Women were more vitally exhausted at baseline and more likely to be classified as type-D. Type-D patients scored higher on vital exhaustion independent of all other variables. Angina was related to vital exhaustion, but improvement in angina following intervention was not associated with improvement in vital exhaustion scores. **Conclusion:** Although medical interventions reduced angina, a concomitant decrease in vital exhaustion scores was not found. It is suggested that type-D may explain gender differences on distress. Clinical implications are discussed, including the importance of including personality factors in future research, as they have been shown to have independent prognostic value.

Keywords: Angina pectoris; Distress; Ischemic heart disease; Personality type-D; Vital exhaustion

Introduction

Cardiovascular research has studied the role of personality in ischemic heart disease (IHD) extensively, particularly since the discovery of the Type A Behaviour Pattern (TABP) in the 1950s [1]. Although TABP was considered a risk factor for IHD, today, the construct is surrounded by some controversy [2–6]. With the introduction of "the distressed personality" (type-D), belief in the role of personality factors in IHD may be restored [7,8]. Studies show that personality type-D is related to depression, social alienation, a higher number of reinfarctions and higher mortality rates independent of established biomedical risk factors and disease severity [7,9,10].

Personality type-D is defined as negative affectivity and the tendency to inhibit the expression of this affect in social interaction. The inhibition of expression of emotions is conscious in order to avoid the disapproval of others. Social inhibition appears to be a moderator, such that prevalence of cardiac events for individuals high in negative affectivity but low in social inhibition is less than for individuals high in both components [9]. Thus, it is the interaction rather than the two individual components that characterises personality type-D [10]. In addition, it is important to note that type-D is an attempt to emphasise the role of normal personality typologies in IHD rather than psychopathology [11].

Vital exhaustion, like personality type-D, is a risk factor that has been associated with increased morbidity and mortality. It should be noted that vital exhaustion is not a physical but a mental or psychological state, which is present when an individual complains of unusual fatigue, decreasing energy, feels dejected or defeated and suffers from increased irritability [12,13]. Although vital exhaustion is considered a short-term risk factor and predicts cardiac mortality up to the 40th month post-myocardial infarction (MI); it is a risk factor, which is on a par with hyperlipidemia [13–15]. One study has shown that vital exhaustion may decrease following medical intervention, but most patients still remained exhausted after percutaneous transluminar coronary angioplasty (PTCA) [16]. A later

* Corresponding author. Tel.: +45-89-42-49-00; fax: +45-89-42-49-01.
E-mail address: susanped@psy.au.dk (S.S. Pedersen).

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study showed that psychological intervention may be the only effective means of reducing vital exhaustion and thus the risk of new cardiac events [17].

To our knowledge, no studies have investigated the interrelationship between vital exhaustion and personality type-D. Since both type-D and vital exhaustion are related to outcome following IHD, it is of interest to investigate whether there is a relationship between the two variables, and whether type-D is a predictor of vital exhaustion. In addition, no studies have looked at gender differences on personality type-D. Other studies have shown that women suffer more frequently from exhaustion prior to MI, score higher on distress and exhaustion, and have more difficulty with emotional adjustment following IHD compared with men [14,18–21]. In addition, studies have shown that women report more symptoms of angina pectoris than men [22,23]. An underlying disposition or a particular personality typology, such as type-D, may be responsible for these general gender differences.

The aims of the study were: (1) to investigate the relationships between gender, angina pectoris, type-D and vital exhaustion, respectively; (2) to explore whether there was any change in scores on vital exhaustion and self-assessed angina following medical intervention; and (3) to explore whether type-D was a predictor of vital exhaustion, independent of sociodemographic variables and angina pectoris. Women were expected to score higher on vital exhaustion and angina pectoris compared with men. Type-D patients were expected to score higher on vital exhaustion and angina pectoris compared with non-type-D. Since no studies have looked at whether men or women are more prone to be categorised as personality type-D, this part of the study was explorative. Scores on self-assessed angina and vital exhaustion were expected to decrease following medical intervention.

Methods

Patient selection

Consecutive patients following a coronary angiography (CAG) were: (1) scheduled for PTCA; (2) scheduled for coronary artery bypass graft (CABG) surgery; or (3) conservatively treated, i.e., no operative intervention, but treatment with pharmacotherapy. The patients were recruited from January to December 1999 from Groningen University Hospital, the Martini Hospital, Groningen and the Weezenlanden Hospital in Zwolle, the Netherlands. Patients with other incapacitating diseases, with cognitive impairments, aged 75 or older, or who did not speak Dutch, were excluded. Ethical approval was obtained from the ethics committee at each participating hospital. Patients were assessed twice, at baseline and again after 6 weeks — for those treated with pharmacotherapy — and after 6 weeks to 3 1/2 months — for those who underwent PTCA or CABG. The latter delay in follow-up assessment was due to hospital waiting lists, but all patients were assessed at 6 weeks follow-up following implementation of treatment.

Of the 398 patients screened for inclusion in this study, 139 (34.9%) did not return the first mailed questionnaire. Prior to assessment at follow-up, 42 (16.2%) of the remaining 259 patients dropped out. The reasons for not responding at follow-up were death ($n=7$), absence of ischemia with CAG ($n=9$), refusal to participate ($n=9$), being too ill at follow-up ($n=3$), change of address without forwarding address ($n=3$) and no response ($n=11$). Thus, analyses are based on 217 (83.8%) of the 259 patients, mean (S.D.) age of 60.6 (9.43), and with a range of 25–75 years — for whom data were available both at baseline and at follow-up. Sixty-one (28%) of the 217 patients were females, mean (S.D.) age of 61.41 (9.59), and 156 (72%) were males, mean (S.D.) age of 60.26 (9.38).

To ensure that patients who dropped out at follow-up did not deviate systematically from the study group, their baseline characteristics were compared with those who completed the follow-up questionnaire. This comparison showed no statistically significant differences in mean age, mean level of education, mean scores on health status scales, prevalence of type-D personality, males vs. females and invasively treated vs. pharmacologically treated patients.

Procedure

Patients returned questionnaires at baseline accompanied by written informed consent. We could not test the probability of systematic differences between nonresponders and the study sample, because no information was accessible without written informed consent from the patients, who did not return the first questionnaire (34.9%).

After receipt of the questionnaire, it was routinely checked for completeness. If questions or pages were not filled out, either a copy was sent with a kind request to complete the questions or, in cases of one question, patients were interviewed by telephone. The completeness of the item response was monitored by a computer program both at baseline and at follow-up. Thus, we effectively reduced the nonresponse on questions, and, consequently, on scales.

Measures

Sociodemographic variables included gender, age, marital status, education, occupational status and living arrangement. Living arrangement was defined as living alone or together with someone. A self-report version of the New York Heart Association (NYHA) classification scale was used to assess the severity of angina pectoris. The patient selected one of four classes, with class IV denoting angina in a resting state, and class I denoting no angina even during severe physical exertion. Personality type-D was assessed with the 16-item Personality type-D Scale, which measures negative affectivity and social inhibition [8]. Negative

affectivity (neuroticism) is the tendency to experience distress, whereas social inhibition is the tendency not to express this affect in social interactions. The inhibition of expression is conscious in order to avoid the condemnation of others. Each item is rated according to a five-point Likert scale from *false* (0) to *true* (4). The scale yields four personality types, but only those, who score high on both negative affectivity and social inhibition determined by a median split, are classified as type-D. It is important to note that type-D is an attempt to emphasise the role of normal personality typologies in IHD rather than psychopathology. Vital exhaustion, which is defined as mental fatigue, demoralisation and increased irritability, was assessed by the 21-item Maastricht Questionnaire [12]. Each item is rated according to a three-point scale (*No* = 2; *?* = 1; *Yes* = 0), and a scale score is obtained by summing the answers. Thus, the minimum score is 0 and the maximum 42, a high score indicating a severe level of vital exhaustion. The mean (S.D.) score in a healthy population is 8.8 (8.7). At both assessment times, the respondent was asked to report how they felt at the time of assessment. Vital exhaustion and angina pectoris were assessed both at baseline and postintervention. Since type-D is considered a personality trait, and, thus, is not expected to change between baseline and follow-up, the construct was only assessed at baseline. The present study was part of a larger study that sought to develop a new instrument for measuring change in quality of life in cardiac patients. Hence, no information on disease severity and other biomedical risk factors were available.

Statistical analyses

Prior to statistical analyses, marital status, personality type-D, living arrangement and working status were recoded into dichotomous variables. For comparison between two groups, we used *t* tests for independent samples, and chi-square tests. *t* Tests were used when the dependent variable was continuous, whereas chi-square tests were used when the dependent variable was categorical. For multiple comparisons, we used ANOVA with a Bonferroni post hoc test to avoid capitalization on chance by using, e.g., single *t* tests. To quantify differences in vital exhaustion between groups, we calculated the effect size using Cohen's thresholds for independent samples: $(\text{mean}_1 - \text{mean}_2/\text{S.D.}_{\text{pooled}})$. An effect size of 0.20 is considered small, 0.50 moderate and >0.80 large [24]. Differences on vital exhaustion and angina pectoris between baseline and intervention according to gender, type-D and non-type-D, were analysed with paired *t* tests. Two univariate analyses were run to investigate whether type-D was a predictor of vital exhaustion at baseline and postintervention, respectively. In the first univariate analysis, we controlled for gender, age, marital status, living arrangement, education, occupational status and baseline NYHA scores. In the second analysis, we controlled for the same variables, although we had replaced baseline NYHA scores with NYHA scores postintervention, and added the treatment variable. All statistical analyses were performed using SPSS 9.0 for Windows.

Results

Descriptive statistics

Men were more likely to have a partner, to live together with someone, to have higher education and to be in employment compared with women. Additional sociodemographic characteristics are presented in Table 1.

At baseline, 210 patients reported symptoms of angina pectoris with 10 (5%), 95 (44%), 46 (21%) and 59 (27%) in NYHA classes I–IV, respectively. Postintervention, 199 patients reported symptoms of angina with 49 (23%), 92 (42%), 29 (13%) and 29 (13%) in NYHA classes I–IV, respectively. At follow-up, 64 (29%) patients had undergone a CABG, 71 (33%) a PTCA and 82 (38%) were being treated with pharmacotherapy.

The mean (S.D.) score on vital exhaustion for the total sample was 21.46 (10.94) at baseline and 18.13 (11.41) after medical intervention. Of the total sample, 171 (79%) patients had a valid score on vital exhaustion at both baseline and postintervention. At baseline, 128 of these 171 (75%) patients had a score of ≥ 14 vs. 101 (59%) postintervention, a cutoff score used by Appels et al. [17] to denote the vitally exhausted. Sixty-six (30.4%) were categorised as type-D.

Table 1
Sociodemographic characteristics

	N (%)
Marital status	
Married	170 (78)
Cohabiting	15 (7)
Partner, not cohabiting	2 (1)
Unmarried	6 (3)
Divorced	7 (3)
Widow/widower	16 (7)
Living arrangement	
Alone	28 (13)
With others	185 (85)
Education[a]	
Grade 6	44 (20)
Technical school (grade 7–9)	61 (28)
Junior high school (grade 7–9)	34 (16)
Junior high school including professional education	33 (15)
High school/A-levels	6 (3)
College education (4 years)	22 (10)
University education (5+ years)	7 (3)
Working status	
Working	57 (26)
Not working	147 (68)

[a] These categories are used by the Dutch National Institute for Statistics (CBS) to classify educational level.

Table 2
Mean values on vital exhaustion at baseline and postintervention according to gender and type-D/non-type-D[a]

	Vital exhaustion baseline						Vital exhaustion postintervention					
	Mean	S.D.	*t*	*df*	Mean difference	*P*[b]	Mean	S.D.	*t*	*df*	Mean difference	*P*[b]
Gender												
Males ($n=130$)	20.40	11.01					17.68	11.27				
Females ($n=41$)	25.41	9.83	−1.750	169	−3.59	.010	21.27	12.04	−2.607	169	−5.01	.082
Typology												
Type-D ($n=49$)	28.20	10.16					24.80	10.91				
Non-type-D ($n=122$)	18.95	10.09	−5.411	169	−9.25	.001	16.02	10.83	−4.780	169	−8.77	.001

[a] Analyses are based on patients who had a valid score on vital exhaustion at both baseline and postintervention.
[b] *t* Test for independent samples (two-tailed).

Relationship between angina pectoris and vital exhaustion

ANOVAs showed that there were statistically significant mean differences on vital exhaustion between NYHA classes at baseline [$F(3, 190)=7.861$, $P=.001$], as well as at postintervention [$F(3, 173)=15.883$, $P=.001$]. Bonferroni post hoc tests revealed that the differences were statistically significant between class II and III [mean difference (S.D.) = −5.68 (1.96); 95% CI: −10.91–0.45], and between classes II and IV [mean difference (S.D.) = −7.94 (1.79); 95% CI: −12.71–3.17] on vital exhaustion at baseline, respectively. At follow-up, statistical significant differences were found between classes I and III [mean difference (S.D.) = −14.44 (2.66); 95% CI: −21.54–7.35], I and IV [mean difference (S.D.) = −13.69 (2.55); 95% CI: −20.49–6.89], II and III [mean difference (S.D.) = −10.49 (2.48); 95% CI: −17.11–3.87] and II and IV [mean difference (S.D.) = −9.73 (2.36); 95% CI: −16.03–3.43] on vital exhaustion, respectively. Therefore, we investigated whether an improvement in NYHA class was associated with a concomitant improvement in scores on vital exhaustion between baseline and follow-up. However, no significant between group differences were found [$F(5, 155)=1.819$, $P=.112$]. Subsequently, we recoded change over time in NYHA class into three categories of improved, stable and deteriorated to investigate whether this would lead to any between group differences. Again, we found no support that a change in NYHA class was associated with a concomitant improvement in vital exhaustion scores [$F(2, 155)=2.146$, $P=.121$].

Comparisons between genders

Of the 66 categorised as type-D, 25 (41%) were women compared with 41 (26%) men. Women were, thus, more likely to be classified as type-D compared with men [$\chi^2(1, N=217)=4.48$, $P=.03$]. As predicted, women scored significantly higher on vital exhaustion at baseline than men, but not postintervention (see Table 2). The effect sizes for differences between men and women on vital exhaustion at baseline and at follow-up were 0.48 and 0.20, respectively. According to Cohen's [24] thresholds, these effect sizes range from moderate to small, respectively. There was no difference between men and women on angina at baseline [$\chi^2(3, N=193)=3.63$, $P=.30$] and postintervention [$\chi^2(3, N=193)=4.82$, $P=.19$]. Paired *t* tests showed that men [$t(129)=3.59$, $P=.001$, mean difference (S.D.) = 2.72 (8.64)] and women [$t(40)=3.92$, $P=.001$, mean difference (S.D.) = 4.15 (6.77)] were significantly less vitally exhausted after medical intervention than at baseline. Both men [$t(143)=5.87$, $P=.001$, mean difference (S.D.) = 0.51 (1.05)] and women [$t(48)=4.55$, $P=.001$, mean difference (S.D.) = 0.59 (0.91)] reported less symptoms of angina postintervention than at baseline.

Comparisons between type-D and non-type-D

As expected, patients classified as type-D scored significantly higher on vital exhaustion at baseline and following intervention, respectively (see Table 2). The differences between type-D and non-type-D on vital exhaustion at baseline and at follow-up were large with effect sizes of 0.82 and 0.80, respectively [24]. There was no difference between type-D and non-type-D on baseline angina scores [$\chi^2(3, N=193)=6.63$, $P=.085$], whereas type-D scored higher on angina postintervention compared with non-type-D [$\chi^2(3, N=193)=12.59$, $P=.006$]. Paired *t* tests showed that type-D [$t(48)=2.85$, $P=.006$, mean difference (S.D.) = 3.41 (8.38)] and non-type-D [$t(121)=3.94$, $P=.001$, mean difference (S.D.) = 2.93 (8.21)] were considerably less

Table 3
Predictors of vital exhaustion at baseline

Variable	Sum of squares	*df*	*F*	*P*[a]
Gender	94.842	1	1.047	.308
Age	124.583	1	1.375	.243
Marital status	163.910	1	1.809	.181
Living arrangement	525.758	1	5.802	.017
Education	10.795	1	0.119	.730
Work status	184.071	1	2.031	.156
Baseline NYHA	1360.573	1	15.014	.001
Type-D	1276.142	1	14.082	.001

[a] Univariate analysis of variance.

Table 4
Predictors of vital exhaustion at follow-up

Variable	Sum of squares	*df*	*F*	*P*[a]
Gender	52.200	1	0.496	.483
Age	92.375	1	0.877	.351
Marital status	188.937	1	1.794	.183
Living arrangement	328.566	1	3.119	.079
Education	20.746	1	0.197	.658
Work status	8.339	1	0.079	.779
Follow-up NYHA	3231.812	1	30.683	.001
Treatment	9.019	1	0.086	.770
Type-D	574.315	1	5.453	.021

[a] Univariate analysis of variance.

vitally exhausted postintervention than at baseline. Medical intervention had also led to a significant decrease in self-assessed symptoms of angina for both typologies [$t(55) = 3.33$, $P = .002$, mean difference (S.D.) = 0.46 (1.04) for type-D and $t(136) = 6.54$, $P = .001$, mean difference (S.D.) = 0.56 (1.01) for non-type-D].

Type-D as a predictor of vital exhaustion

We used univariate analyses to find out whether personality type-D was an independent predictor of vital exhaustion at baseline and postintervention. As presented in Table 3, the results showed that type-D was a predictor of vital exhaustion at baseline when controlling for all other variables (see Table 3). Type-D patients were at increased risk of suffering from vital exhaustion at baseline (OR = 6.35; 95% CI: 3.01–9.69) compared with non-type-D.

Similarly, type-D was a predictor of vital exhaustion postintervention, when controlling for all other variables including treatment (see Table 4). Type-D patients were also at increased risk of suffering from vital exhaustion postintervention (OR = 4.74; 95% CI: 0.73–8.75) compared with non-type-D.

Discussion

Our results indicate that the patients in this study were considerably exhausted with 75% at baseline and 59% postintervention scoring ≥ 14, which is a cutoff score that has been used by Appels to denote the vitally exhausted. These prevalences are similar to those found by Appels et al. [17]. The total mean vital exhaustion score was also comparable to that of other studies [16,25]. Medical intervention resulted in an overall decrease in vital exhaustion scores, and a similar decrease was found, when looking at men and women separately. A previous study also found a decrease in scores on vital exhaustion following PTCA, although remaining stenosis was associated with a less decrease in vital exhaustion scores [16].

As predicted when looking at gender differences, women scored significantly higher on vital exhaustion at baseline compared with men, although, surprisingly, at follow-up, this difference was no longer significant. Perhaps women felt more reassured postintervention, because they were under medical supervision and receiving treatment. When looking at mean differences on vital exhaustion, this explanation seems likely, as women experienced a greater change between baseline and follow-up vital exhaustion compared with men. Alternatively, the power was too low to detect any difference, which may have been present. No significant differences were found between men and women on symptoms of self-assessed angina at baseline and at follow-up, respectively, which was contrary to our hypothesis and the findings of other studies [22,23]. Again, the power may have been too low to detect a difference.

As expected, at follow-up, men and women reported a decrease in self-assessed symptoms of angina pectoris. Alleviation of symptoms of angina can be achieved either through pharmacologic therapy or interventional therapy, such as PTCA or CABG, which all of the patients had undergone at follow-up. Thus, the results indicate that therapy in general has been successful in reducing symptoms of angina pectoris in this sample. However, although NYHA class was associated with scores on vital exhaustion both at baseline and at follow-up, improvement in angina following intervention did not lead to a concomitant decrease in vital exhaustion scores.

In accordance with our hypothesis, type-D patients scored higher on vital exhaustion compared with non-type-D at both assessment times. These differences were substantial. Type-D patients also reported more symptoms of angina pectoris than non-type-D, although only at follow-up. Thus, these results indicate that type-D is a valid marker of distress, including somatic symptoms. This has also been suggested by Denollet et al. [7], who propose that personality factors, such as type-D, are in part responsible for individual differences on distress.

With regard to our explorative hypothesis, we found that women were more likely to be classified as type-D compared with men, despite the relatively low number of females included in the sample. A study focusing on type-D as a long-term predictor of mortality found similar results, although looking at gender differences on type-D was not an objective of the latter study: 14 (40%) of 35 women vs. 71 (27%) of 268 men were classified as type-D [10]. This higher prevalence of type-D among women is interesting, when looking at studies that have investigated gender differences in relation to adjustment and psychopathology following IHD. These studies have found that women generally have higher distress scores, and more difficulty with emotional adjustment following IHD compared with men [18–21]. Thus, if as the present study showed, women are more likely to be categorised as type-D, this typology may be an important explanatory factor in gender differences on measures of depression, exhaustion and adjustment.

In order to test whether type-D was a predictor of vital exhaustion, we ran univariate analyses, controlling for all

other variables. The analyses showed that personality type-D is a significant predictor of vital exhaustion, when controlling for all other variables including treatment. It is noteworthy that type-D is a predictor of vital exhaustion, even when controlling for angina pectoris, since angina has a potentially biasing effect on vital exhaustion scores [26]. The results of this study lend further credence to the notion that personality characteristics may be responsible for individual differences in emotional distress. Based on our results, however, we cannot conclude with certainty that personality type-D plays a role in the reporting of somatic symptoms, such as angina pectoris.

The current study should be interpreted with caution, as it was part of a larger study that sought to develop a new instrument for measuring change in quality of life in cardiac patients. For this reason, the selected patients were on a waiting list for cardiac catherisation, which may have influenced scores on response variables, and hence limit the generalisability of the results. In addition, due to limitations inherent in the design, it cannot be ruled out that disease may affect the prevalence of type-D and scores on vital exhaustion. Furthermore, the nonresponse of 35% of the patients screened for inclusion in the study may limit the generalisability of the results. No medical parameters were included to determine severity of cardiac disease, and we had no access to information on cardiac history prior to CAG. Studies have shown, however, that type-D and vital exhaustion impact on prognosis independent of disease severity and other biomedical risk factors [7,10,27]. The number of women included in the study was relatively low compared with that of men. Despite this limitation, the results indicated that women are at greater risk of being classified as personality type-D.

Neuroticism has been associated with increased somatic complaints and symptom reporting [28]. Since the type-D construct is confounded by negative affectivity, also known as neuroticism, type-D patients may score higher on distress. On the other hand, Costa found a negative relationship between neuroticism and established CHD, and a positive relationship between neuroticism and ''pseudoangina,'' respectively [28]. Although we cannot exclude the possibility that neuroticism has confounded our results, neuroticism is perhaps more likely to play a role in the symptom reporting of noncardiac populations.

In conclusion, we suggest that personality type-D may explain gender differences on psychological outcome following IHD, although further research would have to replicate this by including a larger sample of women, and clinical measures of disease severity. The results of the present study also indicate that future research should not only place emphasis on single personality traits, but also on their interaction, and the potential role that such interactions play in outcomes following IHD. Finally, the results suggest that type-D is a marker of distress, and that individual differences may have a greater impact on vital exhaustion than invasive and pharmacologic interventions. In turn, this has implications for secondary prevention, since there is increasing evidence that psychosocial variables impact on morbidity and mortality independent of disease severity. In addition, a recent study showed that type-D may moderate the effects of medical treatment and rehabilitation [29]. Hence, psychological assessment and intervention — in addition to medical interventions — may be the only means with which to reduce morbidity and mortality in cardiac patients. An intervention study with the purpose of reducing vital exhaustion and subsequent cardiac events indicates that such attempts are successful [17]. Consequently, future intervention studies should investigate the possibility of reducing the impact of type-D, since this taxonomy has been associated with increased morbidity and mortality in patients with IHD independent of disease severity. In addition, if type-D serves as a marker for distress, the type-D scale could serve as a screening instrument for patients at risk in clinical practice.

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