Preliminary Evidence for the Construct and Concurrent Validity of the DS14 in Hebrew

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Abstract

Background Type D personality is a risk indicator in cardiac patients. While both the validity and reliability of the Type D scale (DS14) have been confirmed in Western Europe, less attention has been paid to the subject in other nations.

Purpose The purpose of this study was to examine the validity of the Hebrew version of the DS14 among a sample of cardiac patients in Israel.

Method Male patients ($N=94$) hospitalized for a first acute coronary syndrome (ACS) completed the DS14 1 month after their ACS. The Brief Symptoms Inventory (BSI) scales for depression and anxiety and the Buss–Durkee Hostility Inventory-Dutch for measuring covert and overt aggressions were administered during the initial hospitalization (baseline). The BSI was administered again at the 6-month follow-up. At follow-up, patients were also asked about their participation in a formal cardiac rehabilitation program.

Results The two-factor structure of the DS14 was confirmed and the DS14 subscales were internally consistent (Cronbach's $\alpha=0.79/0.80$). Type D cardiac patients had a significantly higher mean score on anxiety, depression, and covert aggression at baseline compared to non-Type D patients. At the 6-month follow-up, Type D was associated with more anxiety, more depression, and less attendance at a formal cardiac rehabilitation program. The prevalence of Type D in the current sample (5.3%) was found to be significantly lower than elsewhere in Europe.

Conclusion Preliminary evidence suggests that it is possible to use the Hebrew version of the DS14 among Hebrew-speaking cardiac patients in future studies. However, the prevalence of the Type D personality in Israel should be further assessed.

Keywords Aggression · Anxiety · Cross-cultural validity · Depression · Rehabilitation adherence · Type D personality

Introduction

The distressed (Type D) personality is an emerging risk factor in cardiovascular diseases. It has been associated with adverse prognosis, impaired health status, and a wide range of emotional distress, such as anxiety, depression, and PTSD symptoms [1–3]. The instrument designed to measure this concept—the DS16 [4] and its updated version, the 14-item Type D Scale (DS14) [5]—has been extensively studied and has led to the establishment of the Type D personality as a meaningful psychological factor in explaining prognoses across cardiovascular disease patient groups [6, 7].

The Type D personality is defined as the consistent inclination to experience both negative affectivity (NA) and social inhibition (SI) [5]. NA denotes the tendency to experience negative emotions such as anger, hostility, depression, anxiety, and internal conflict. SI refers to restraint from disclosing feelings and opinions in social interactions in order to avoid others' disapproval [5].

The Type D construct has been studied extensively in West European countries (e.g., [5, 8–13]). However, fewer studies have been conducted on the Type D personality in

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non-Western nations, and we therefore have less information about the applicability of the Type D construct in other cultures (e.g., [14–18]). Also, no study to date has been designed to assess the validity of the DS14 among Hebrew-speaking cardiac patients. Therefore, the aim of the present study was to examine the validity of the Hebrew version of the DS14 with a sample of cardiac patients in Israel.

The validation of the Hebrew version of the DS14 in the current study was executed on several levels. First, we applied factor analysis and internal consistency analysis in order to establish the instrument's construct validity. Next, in order to establish the instrument's concurrent validity, we assessed its associations with validated scales of depression and anxiety both at the initial hospitalization (baseline) and at the 6-month follow-up, given that these scales and the DS14 measure theoretically similar constructs.

The current study applied additional validity assessment using the concept of overt and covert aggressions. Former studies have shown that Type D is associated with various measures of anger and aggression, including suppressed anger [19, 20]. In the current study, we further assessed whether the DS14 would be found to associate with the tendency to internalize anger (covert aggression), but not the tendency to externalize it (overt aggression). It was hypothesized that Type D patients, who tend to consciously inhibit their expression of emotions in order to avoid the disapproval of others [12], would show higher levels of covert aggression and lower levels of overt aggression than non-Type D patients. The associations with these measures of aggression were therefore supposed to establish an additional layer of concurrent vs. divergent validity for the DS14.

Though cardiac rehabilitation has been shown to reduce the Type D score and to improve the quality of life in Type D patients [21], no study to date has assessed Type D predictive value with regard to attending a formal cardiac rehabilitation program. The social nature of these programs—patients must exercise in groups and attend group education lectures about the illness—could be a barrier for people with Type D personality as these individuals are known to experience higher levels of perceived social alienation and to be more socially withdrawn than non-Type D individuals [22]. Therefore, attendance at a formal cardiac rehabilitation program was used as a validity criterion of the DS14, and we hypothesized that the DS14 would differentiate between patients attending a cardiac rehabilitation program and non-attendees.

Methods

Patient Population and Design

The current study was part of a large-scale study investigating personal and dyadic adjustment to heart disease. The target population was defined as Jewish men with the diagnosis of first acute coronary syndrome (ACS) who agreed to participate in the study. These patients were admitted between March 2005 and July 2007 to the cardiac care unit (CCU) at the Meir Medical Center located in the central region of Israel. During this period, 2,060 patients were hospitalized in the CCU. Individuals excluded from the study included 523 women (26%); 315 Muslims (15%); 354 patients with a history of previous cardiac events (17%); 270 patients over 75 years of age (13%); 188 patients with a diagnosis other than ACS (9%); 50 patients who had comorbid conditions that could have potentially influenced either symptom presentation or mood (including severe psychiatric illness, neoplasia, acute or chronic infection or inflammatory conditions, and renal failure); 31 patients who did not have a partner (2%); and an additional 23 patients who could not be interviewed in Hebrew (1%).

Of the 305 patients (15%) eligible for the study, 111 patients agreed to participate in a large-scale study taking place in the Psycho-cardiology Laboratory of the Meir Medical Center (36%). Of this sample, 94 patients were recruited to the current study (the remaining 17 patients were recruited before the main instrument, DS14, was finalized and administered). These patients completed the study questionnaires at baseline, during hospitalization, 1 month after hospitalization ($N=94$), and 6 months after hospitalization ($N=86$). The attrition rate was 9%. Reasons for attrition included loss of contact with the patients and patients' refusal to continue to participate due to lack of time or interest.

While the patients were hospitalized in the CCU, and upon their agreement to participate, they were given the study's questionnaire. A research assistant was available to answer questions and offer help. One month and 6 months later, they were interviewed by telephone. The study was approved by the Meir Medical Center Review Board.

Measures

Demographics and Clinical Characteristics

Demographic variables included age, years of marriage, number of children, and socioeconomic and educational levels. Diagnosis upon discharge from the hospital was taken at baseline, during hospitalization. At the 6-month follow-up, patients reported on their recent history of ischemic heart disease: recurring myocardial infarction (MI), recurring percutaneous coronary intervention (PCI), or coronary artery bypass graft (CABG) surgery.

Illness Severity

At the initial examination, the severity of the patient's illness was evaluated by a senior cardiologist using two sets

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of criteria: an echocardiographic score, which assesses cardiac damage, and an angiographic score, which assesses the status of obstructed arteries and the risk of future damage. Both scores were measured on a scale ranging from 1 (normal) to 5 (extremely severe).

Personality

The DS14 was used to assess the Type D personality [5]. Items were answered on a five-point Likert scale from 0 (false) to 4 (true). The scale consisted of two seven-item subscales: negative affectivity (e.g., "I often feel unhappy") and social inhibition (e.g., "I am a closed person"). The DS14 is a valid and reliable scale with Cronbach's alphas of 0.88 and 0.86 and a test–retest reliability over a 3-month period of $r=0.72$ and $r=0.82$ for the two subscales, respectively [5]. It is important to note that in addition to negative affectivity, social inhibition is crucial in defining the Type D personality as it is the interaction of negative affectivity and social inhibition—and not the single traits by themselves—which relates to cardiac prognosis [23]. The DS14 was translated into Hebrew using Brisling's back-translation technique [24]. The same scoring system was maintained. The DS14 was administered 1 month after hospitalization.

Depression and Anxiety

To measure depression and anxiety, we used the depression and anxiety subscales of the Brief Symptoms Inventory [25]. Each participant was asked to rank the degree to which he had suffered from each symptom during the previous month on a scale ranked from 0 (not at all) to 4 (very much). We used the Hebrew translation of the subscales of depression and anxiety [26]. In the current study, the Cronbach's alphas at baseline were 0.73 and 0.73 for depression and anxiety, respectively, and at the 6-month follow-up were 0.87 and 0.84 for depression and anxiety, respectively.

Overt and Covert Aggressions

Overt aggression and covert aggression were measured by the Buss–Durkee Hostility Inventory-Dutch (BDHI-D) [27, 28]. This instrument's construct, discriminant, convergent, and divergent validities were found satisfactory, with reliability coefficients of 0.77 and 0.78 for overt aggression and covert aggression, respectively [28]. Each patient was asked to rank his agreement regarding each statement on a dichotomous scale consisting of (1) true and (0) false. Example items of overt aggression (16 items measuring the tendency to express verbal or physical aggression) were "When I am mad, I sometimes slam the doors" and "When

people yell at me, I yell back." Example items of covert aggression (19 items tapping the emotional and cognitive components: hostility, irritability, suspicion, and anger) were "I am irritated a great deal more than people are aware of" and "I often feel like a powder keg ready to explode." The BDHI-D was translated into Hebrew using Brisling's back-translation technique [24]. Cronbach's alphas in the current sample were 0.75 for each scale after omitting items 2 and 18, which decreased internal consistency. This instrument was administered during hospitalization.

Rehabilitation Attendance

At the 6-month follow-up, patients were asked whether they participated in a formal rehabilitation program subsequent to their initial ACS. It is important to note that the Meir Medical Center facilities include a well-established cardiac rehabilitation clinic to which inpatients are systematically referred [29].

Statistical Analyses

In keeping with Pedersen et al. [14], exploratory factor analysis with varimax rotation was used to examine the factor structure of the DS14. The internal consistency of each subscale was demonstrated by Cronbach's alphas. The chi-square test was applied to estimate the prevalence of the Type D personality in the current sample and to assess the difference in the distributions of the illness severity variables and the categorical socio-demographic variables between the two groups (Type D vs. non-Type D). The chi-square test was also used to assess the distribution of Type D and non-Type D patients with regard to rehabilitation attendance at the 6-month follow-up. Pearson correlations were applied to demonstrate concurrent and divergent validity by examining the correlations between the NA and SI subscales and the theoretically relevant variables (depression, anxiety, covert aggression, and overt aggression). Pearson correlations were also applied to assess the association among the demographic and illness severity variables and the dependent variables (depression, anxiety, covert aggression, and overt aggression). Multivariate analysis of variance was conducted for calculating the mean differences between Type D and non-Type D patients with regard to the continuous demographic variables (age and years of marriage). Two analyses of variance with covariates (MANCOVA) were conducted for calculating the mean differences between Type D and non-Type D patients with regard to (1) the study variables as measured at baseline (depression, anxiety, and aggression) and (2) the study variables as measured at the 6-month follow-up (depression and anxiety). The covariates in theses analyses were those demographics and illness severity variables

which were found to correlate significantly with the dependant variables of each MANCOVA. SPSS 17.0 for Windows was used for data analyses.

Results

Sample Characteristics

Patients ranged in age from 39 to 74 years ($M=56.27$, SD=7.64). All patients were married, half (50.5%) had more than 12 years of formal education ($M=13.94$ years, SD=3.28), and the majority of patients (63%) described themselves as having a good to very good economic status. The majority of the patients (85.1%) had experienced an acute MI, without severe damage to the heart and without serious obstruction of the arteries. Six months after their first ACS, only two patients had experienced repeat acute coronary events (2.4%), only seven had undergone another PCI (8.2%), no patient had gone through CABG, and only one patient had died. Overall, the current sample was found to be representative of the demographics of Jewish male patients who typically participated in the region's cardiac rehabilitation clinic [30].

Structural Validity of the DS14—The Hebrew Version

A principal component factor analysis with varimax rotation conducted on the DS14 items revealed the expected two factors (eigenvalues > 1), explaining 49.11% of the total variance. Items' loadings, factors' internal consistencies, and variance explained are presented in Table 1. As can be seen in Table 1, the DS14 was found to consist of two discreet factors, one consisting of items representing NA and the other consisting of SI items. In addition, the factors' internal consistencies were satisfactory. Therefore, the DS14 was found to show good construct validity within the current sample.

To assess the distribution of the Type D personality in the Israeli sample, the standardized cutoff of ≥10 on both subscales was used [2]. This method led to a very low percentage of the Type D personality in the current sample (5.3%, $n=5$). To proceed with a meaningful statistical analysis, we used a more flexible criterion in which a patient's score had to be ≥10 on one scale and above the median on the other (NA=4.5, SI=4.0). This criterion was based upon the cutoff of the former instrument, DS16 [4]. Applying this cutoff criterion now revealed a distribution of 21 patients (22.3%) who were classified as Type D personality and 73 patients (77.7%) who were not classified as such.

Table 1 Items' loadings, explained variance, and internal consistencies of the DS14—the Hebrew version

Item no.	SI	NA
9	0.16	**0.83**
13	0.08	**0.80**
5	0.01	**0.77**
4	0.05−	**0.67**
7	0.13	**0.64**
12	0.12	**0.60**
2	0.09−	**0.40**
8	**0.80**	0.11−
1	**0.77**	0.03−
10	**0.73**	0.18
11	**0.72**	0.01−
6	**0.61**	0.30
14	**0.58**	0.34
3	**0.51**	0.09−
Explained variance (%)	23.83	25.28
Cronbach's alpha	0.80	0.79

Concurrent and Divergent Validity of the DS14—The Hebrew Version

First, to control for confounding, we assessed the differences between Type D and non-Type D patients with regard to demographic and illness severity variables including age, socioeconomic status, education level, echocardiogram score, angiogram score, number of re-hospitalizations, and number of recurrent PCIs. No significant differences were found between the study's groups with regard to these variables. Pearson correlations analyses revealed that anxiety at baseline was significantly associated with patients' age ($r=-0.23$, $p<0.05$), years of marriage ($r=-0.20$, $p<.05$), and years of education ($r=-0.29$, $p<0.01$). Depression at baseline was significantly associated only with economic status ($r=-0.28$, $p<0.01$). At follow-up, patients' anxiety was significantly associated only with years of education ($r=-0.25$, $p<0.05$), and patients' depression was found to significantly associate with patients' years of education ($r=-0.23$, $p<0.05$) and patients' economic status ($r=-0.24$, $p<0.05$). Additionally, no associations were found between the two measures of illness severity with regard to the study variables.

When examining the concurrent and divergent validities of the DS14, NA was significantly correlated with baseline measures of both depression ($r=0.52$, $p<0.001$) and anxiety ($r=0.51$, $p<0.001$). NA also correlated significantly with baseline levels of both covert aggression ($r=0.49$, $p<0.001$) and overt aggression ($r=0.31$, $p<0.01$). SI was not

Table 2 Mean differences between Type D patients and non-Type D patients with regard to baseline and follow-up measures of depression, anxiety, and aggression, adjusted for demographics

Variables		Type D M (SD)	Non-type D M (SD)	F	η^2
Baseline $df=(1,85)$	Depression[a]	1.52 (0.56)	1.21 (0.24)	13.61***	0.14
	Anxiety[a]	1.80 (0.61)	1.43 (0.39)	10.37**	0.11
	Covert aggression[a]	0.38 (0.21)	0.23 (0.16)	11.46***	0.12
	Overt aggression[a]	0.35 (0.19)	0.33 (0.22)	0.22	0.003
Follow- up $df=(1,81)$	Depression[b]	1.57 (0.83)	1.21 (0.36)	7.53**	0.09
	Anxiety[b]	1.85 (0.96)	1.37 (0.52)	7.82**	0.09

*$p<0.05$; **$p<0.01$; ***$p<0.001$

[a] Adjusted for age, years of marriage, years of education, and economic status

[b] Adjusted for years of education and economic status

significantly correlated with any of these scales. Table 2 presents the mean differences between Type D patients and non-Type D patients with regard to baseline levels of depression, anxiety, and aggression, adjusted for age, years of marriage, years of education, and economic status. Type D patients were found to be significantly more depressed and anxious than non-Type D patients. Whereas no differences were found between Type D patients and non-Type D patients with regard to overt aggression, Type D patients scored significantly higher on the covert aggression scale ($F(4,82)=4.90$, $p<0.001$, $\mu^2=0.19$).

Table 2 also presents the mean differences between Type D patients and non-Type D patients with regard to the 6-month follow-up levels of depression and anxiety, adjusted for years of education and economic status. The same trend as at baseline was detected: Type D patients were found to be significantly more depressed and anxious than non-Type D patients 6 months after their initial ACS ($F(2,76)=5.00$, $p<0.01$, $\mu^2=0.03$).

Criterion Validity of the DS14—The Hebrew Version

Finally, the chi-square test showed a significant difference between Type D and non-Type D patients in the utilization of a formal cardiac rehabilitation program ($\chi^2(1)=3.88$, $p<0.05$). Whereas most of the non-Type D patients joined a formal cardiac rehabilitation program (69.2%), only 45% of the Type D patients did so.

Discussion

The main goal of the present study was to assess the validity of the Type D construct in a sample of Hebrew-speaking male cardiac patients. Surprisingly, the incidence of Type D found in the current sample—namely, 5.3%—was significantly lower than that which has been reported in other studies. For example, European studies have identified rates of between 21% and 34% in Europe [5, 10–12]. In England and Ireland, the existence of the Type D personality in the general population was even higher, 38.5% [9]. There was also a high incidence of the Type D personality among Chinese heart patients, 31.4% [16].

The rate established in the current study may be low for a number of reasons. First, the cultural characteristics of Israel might play a role in this low rate, with Jewish Israelis being less socially inhibited in nature and more likely to show their emotions than people from other cultures. Israeli society is characterized by openness and is conceived to be a no-mask culture ("what you see is what you get"). Since Israel's inception, the Israeli ethos has cherished values of spontaneity, informality, and authenticity. Israelis are known for their direct, frank, no-holds-barred way of talking. Issues which are conceived to be private in other cultures, such as one's salary, are part of the daily conversation among Israeli acquaintances [31–33]. This tendency may have led to the decreased scores in the social inhibition component of Type D.

Second, the low incidence rate of the Type D personality in the current study may have also resulted from the characteristics of the sample. Specifically, the exclusivity of men as participants may have contributed to this low rate. Supporting this notion, Pedersen and Middel [34] found in their study that whereas 41% of the women were classified as Type D, only 26% of the men were classified as such. The reason for this finding may be that women are more likely than men to report symptoms of depression, resulting in a lowering of their NA dimension scores [35]. Finally, because Type D patients have been shown to have fewer social ties and to experience less social support than non-

Type D patients [36], the current sample, consisting of only married patients, may have suffered a selection bias of underrepresentation of Type D men.

Nevertheless, the two-factor structure and the internal consistency of the DS14 were replicated in this population, and although we applied a more lenient criterion for diverging type Ds from non-Type Ds, the concurrent validity of the DS14 was confirmed against measures of depression, anxiety, and covert aggression. In the current sample, the Type D personality was found to be associated with measures of depression and anxiety at follow-up. These findings are in line with many documented studies showing that the Type D personality is associated with elevated levels of depression, anxiety, and anger [37–40]. In addition, whereas NA was associated with both overt aggression and covert aggression and SI was not, Type D patients were found to be high only on covert aggression. This finding strengthens Denollet's assertion [23] that it is the interaction between high SI and high NA which is crucial, rather than the existence of either one by itself.

Finally, Type D patients were less likely to join a cardiac rehabilitation program, which is social in nature. The lower attendance of patients with Type D personality in rehabilitation programs is consistent with other findings of poor self-management in such patients [41]. It supports and confirms previous findings of inadequate consultation behavior in CHF patients [42, 43] and poor health-related behaviors in healthy populations [9]. This tendency may help explain the poorer prognosis for these patients.

The present study's limitations should be noted. First, the 36% participation rate may have resulted in a non-representative sample of participants and may therefore limit the extent to which one can generalize from these findings. Second, as mentioned earlier, the current study was a part of a large-scale study designed to investigate both personal and dyadic adjustment to heart disease. As a consequence, its population was a priori defined as married male patients. The rationale behind solely targeting men was that the average female cardiac patient is older and therefore more likely to be widowed and not have the social support provided by marriage [44], and no dyadic dynamics could be investigated. As a consequence, the findings of the current study are exclusive to men only. Third, this study aimed to validate the DS14 in the Hebrew language. Israel comprises a majority (75.4%) of Jewish citizens; the remainder consists of Muslims and other minorities [45]. Based on the vast cultural differences between the Jewish majority and the Arab minority in Israel [33]—differences which may be relevant to the prevalence of Type D in each sector—the current preliminary study focused on the majority to be better able to generalize from the findings. Nevertheless, an additional investigation of the prevalence

of Type D in a sample of healthy controls in Israel as has been done in other cultures [10, 12, 18] is warranted; validation of the DS14 for Arabic speakers is also needed. Finally, only further studies can offer conclusive evidence as to whether the low rates of Type D personality found in the current study are the result of a sample error or whether they indeed capture a unique cultural characteristic of the Jewish–Israeli society.

In summary, the associations found between the DS14 and measures of depression, anxiety, aggression, and tendency to enroll in a cardiac rehabilitation program strengthen our view that the Hebrew translation of the DS14 is a valid instrument. However, further studies are required in order to more deeply assess the prevalence of the Type D personality in Israel, both in clinical samples as well as in the general population.

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