Psychometric properties of the Type D personality measure in a Norwegian patient population

Running title: Type D in Norwegian coronary patients

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Abstract

The combination of negative affectivity (NA) and social inhibition (SI) – the Type D Personality – has been associated with poor outcomes in coronary artery disease (CAD) patients. A Norwegian translation of the standard instrument measuring Type D (DS14), was tested on 432 coronary artery bypass (CABG) and percutaneous coronary intervention (PCI) patients. Factor analysis produced two factors with high inter-item reliability. 18% were classified as Type D. Type D was associated with anxiety, depression, and passive coping. NA correlated with depression, anxiety, wishful thinking, and avoidance coping. SI correlated with depression and anxiety, and negatively with goal orientation and seeking support. Type D was related to a history of CAD and time since treatment, controlling for data on demographics, treatment, and coronary health. Discussion includes questions about cut-off levels, cultural differences, and whether the DS14 may partially reflect illness or treatment related stress.

Keywords: CABG, Coronary artery disease, Negative affect, PCI, Social inhibition, Type D Personality.

1. Introduction

Patients' emotions and behaviour have significant impact on the outcome of coronary artery disease (CAD). Depression and anxiety are independent predictors of first time myocardial infarction (Rugulies, 2002), and recurrent cardiac events, re-hospitalisation, negative treatment outcome, and mortality in CAD patients (Rutledge, Reis, Linke, Greenberg & Mills, 2006). Even though the causality has been questioned, there is strong evidence for the coexistence of negative emotions and CAD (Smith, 2001). Coping strategies characterised by avoidance, denial, and inhibition may have positive effects on emotional and psychosocial well-being, and even on mortality rates (Levine, Warrenburg, Kerns, Schwartz, Delaney, Fontana, Gradman, Smith, Allen & Cascione, 1987; Havik & Maeland, 1986; 1988), but approaching or attending strategies tend to have more favourable long term effects on emotional well-being and outcome (van Elderen, Maes, Dusseldorp, 1999; Klein, Turvey & Pies, 2007).

The combination of negative affect and social inhibition, referred to as Type D or Distressed Personality, has been reported to have particularly negative effects. Type D personality is defined as the combined effect of Negative Affectivity (NA) (the tendency to experience negative emotions) and Social Inhibition (SI) (the tendency to inhibit the expression of these emotions in social interaction) (Denollet, 2005). Type D in CAD patients is associated with a range of negative factors, such as reduced health status (Pedersen, Denollet, Ong, Serruys, Erdman, & van Domburg, 2007), reduced quality of life (Al Ruzzeh, Athanasiou, Mangoush, Wray, Modine, George & Amrani, 2005; Denollet, Vaes & Brutsaert, 2000), more cardiac symptoms, more worries (Schiffer, Denollet, Widdershoven, Hendriks, Smith, 2007) and fatigue (Smith, Michielsen, Pelle, Schiffer, Winter & Denollet, 2007), and a high risk for future depression and anxiety (Spindler, Pedersen, Serruys, Erdman & van Domburg, 2007).

Type D patients experience low levels of social support, and are less likely to engage in positive health behaviour (e.g. healthy eating, physical activities, regular medical check ups) (Williams, O'Connor, Howard, Hughs, Johnston, Hays, O'Connor, Lewis, Ferguson, Sheehy, Grealy & O'Carroll, 2008) or to seek help (Schiffer et al., 2007). Furthermore, Type D is associated with reduced treatment effects (Denollet et al., 2000), and an increased risk of cardiac morbidity and mortality (Denollet, Sys, Strobant, Rombouts, Gillebert, & Brutsaert, 1996; Denollet, 2005; Denollet et al., 2000; Denollet, 2000; Kupper & Denollet, 2007; Denollet, Pedersen, Ong, Erdman, Serruys & van Domurg, 2006; Ketterer, Denollet, Chapp, Thayer, Keteyian & Clark, 2004).

Northern Norway has a high prevalence of CAD compared to the rest of the country (Forsdahl, 2002), and depression in CAD patients is frequent both in the Northern (Sørlie, Busund, Sexton, Sexton & Sørlie, 2007) and in other regions of Norway (Bjerkeset, Nordahl, Mykletun, Holmen & Dahl, 2005). Furthermore, negative emotions, stress and neuroticism prior to surgery were associated with postoperative avoidant coping in surgical patients at the University Hospital of Northern Norway (Sørlie & Sexton, 2001). In a study of a patient information intervention, nurses reported that CABG patients made extensive use of avoidant strategies such as repressing, denying, avoiding information, passivity, and isolation (Bergvik, Wynn & Sørlie, 2008). In sum, a high frequency of negative affect and avoiding and inhibiting coping strategies are reported in CAD patients in Northern Norway. To our knowledge, combinations of negative affect and social inhibition as in the Type D, have not previously been studied in a Norwegian population.

The purpose of the study was to apply a Norwegian version of the DS14 on CAD patients from Northern Norway, test the psychometric properties, and compare the instrument with well known measures of depression, anxiety, and coping.

2. Methods

2.1. Subjects

Patients treated with percutaneous coronary interventions (PCI) (n = 350) or coronary artery bypass graft (CABG) surgery (n = 350), consecutively discharged from University Hospital in Northern Norway (UNN) between June 2005 and June 2006, were invited to participate. To reduce age-related comorbidity and cognitive impairments, patients older than 75 years were excluded. Data were collected from questionnaires sent by mail, and from the hospital records.

A total of 432 (62%) responded, 229 CABG and 203 PCI patients. The majority were men (78%), mean age 60 (range 31-75) years, living with a spouse/partner (78%), retired (66%), and ethnic Norwegians (91%). The sample included ethnic minorities of Sámi and Kven (9%). Compared with all CABG patients treated 2004-2007 (N=2595), the sample was younger (6.8 years) and with fewer women (18% versus 26%), but did not differ on the length of stay, smoking habits, or CAD related health measures such as BMI (body mass index), LVEF (Left Ventricular Ejection Fraction), NYHA (New York Heart Association Functional Classification), MI (myocardial infarction), a history of CAD, hypertension, or peripheral arterial disease.

Mean length of hospital stay was 2.4 days (range 1-10) for the PCI, and 8 days (range 3-41) for the CABG patients. The majority were elective, 20% were emergency treated. Of the

CABG patients, 14% were transferred directly from Angiographic Diagnostics to the Surgical Ward due to their poor health condition.

2.2. Measures

The Type D Scale (DS14)

DS14 (Denollet, 2005) is a 14 item measure of Negative Affect (NA) and Social Inhibition (SI). The 7 NA items cover feelings of dysphoria, worries and irritability, while the 7 SI items cover discomfort in social interactions, reticence and social poise. Items are answered on a 5 point Likert scale (0 = false, 4 = true), with NA and SI sum scores ranging from 0 to 28. Based on a median split on representative samples, a cut-off (NA≥10 and SI≥10) has previously been suggested to classify Type D (Denollet, 2005).

The NA and SI scales are internally consistent (α = .88/.86), stable over a 3 months period (r = .72/.82), and independent of mood or health status (Denollet, 2005). The DS14 has high construct validity with the NEO-FFI. NA and SI were positively correlated with the neuroticism (r = .68/.43), and negatively correlated with the extraversion (r = -.36/- .59), agreeableness (r = -.39/-.23), and conscientiousness (-.31/-.36) scales of the NEO-FFI (Denollet, 2005).

The Norwegian version was translated from the English version (Denollet, 2005) by two Norwegians speaking fluently English. A blind back-translation was done by a (bilingual) native English speaker living in Norway for more than ten years. The back-translated and the original versions were found to be identical in content on all items, with minor grammatical differences.

The SCL10 Scale

This is a 10 item version of the anxiety and depression subscales of the Hopkins Symptom Check List. Items are rated on a 4-point Likert scale (1 = Not at all, 4 = Very much). Psychometrics has been empirically validated (Strand, Dalgard, Tambs, Rognerud, 2003; Tambs & Moum, 1993), with a cut-off of 1.75 of the sum score indicating general distress (Strand et al., 2003).

The Revised Ways of Coping Scale (WCQ-R)

The WCQ-R (Sørlie & Sexton, 2001) is a 26 item version of the Ways of Coping Questionnaire (Folkman & Lazarus, 1985), answered on a 5 point Likert scale (1 = Not at all, 5 = Very much). The two-factor structure with five subscales have been tested empirically: A passive coping factor with the three subscales of wishful thinking, avoidance and thinking it over, and an active coping factor with the two subscales of seeking support and goal oriented (Sørlie et al., 2001).

Coronary Health and risk factors of CAD

For the CABG patients, data from the hospital records included BMI, NYHA, LVEF, cholesterol, MI, a history of hypertension, previous coronary illness, and diabetes.

2.3. Statistical analyses

Missing values on the DS14 items were low (2.4%) and were replaced by the EM algorithm of the SPSS 14.0. The internal structure of the DS14 was tested in an exploratory factor analysis. The DS14 with the NA and SI subscales, the SCL10 with the anxiety and depression subscales, and the Ways of Coping subscales were computed as continuous variables based on

the sum scores. Type D versus Non-Type D differences were analysed by t-tests and χ^2 analyses, and correlations and linear regression analyses were used for the Type D sum score.

2.4. Ethics

All patients signed a written consent form, and the necessary permissions were obtained from the Regional Medical Ethics Committee and the Norwegian Social Sciences Data Services.

3. Results

3.1 Internal validity

Exploratory factor analysis (Principle components, Varimax rotation) of the DS14 items indicated two components (Eigenvalue > 1) explaining 57 % of the variance. All the 7 NA and all but one of the 7 SI items loaded between .57 and .83 on their respective factor. The SI-6 item ("I often feel inhibited in social interactions") loaded high on both the NA and the SI factor (.56 versus .45). All analyses were tested with and without the SI-6 item, but as removing the item produced only minor changes, we retained all original items. The scales were internally consistent (NA: α = .87 / SI: α = .83), and moderately correlated (r = .44).

(Insert Table 1: Factor loading of the DS14 items)

3.2 Type D and other measures

The NA and SI scales were computed as the sum score (0-28) of the 7 respective items (NA: $\bar{x}$ = 7.03, SD = 5.42, SI: $\bar{x}$ = 7.14, SD = 4.66, Type D sum score: $\bar{x}$ = 15.4, SD= 9.3). Using the recommended cut-off (NA $\geq$ 10 and SI $\geq$ 10), 77 (18%) were classified as Type D.

Type D and demographics, treatment and coronary health

In univariate analyses, Type D was more frequent among women (26%) than men (15.5%) ($X^2(1) = 5.69$, $p<.05$). No differences were found on age, social status, education, work status, ethnicity, type of treatment, emergency status, days at the hospital, time since treatment, NYHA, LVEF, MI, previous coronary illness, BMI, hypertension, cholesterol levels, or diabetes. In a univariate analysis of the Type D sum score as a continuous variable, the mean Type D score was higher among women than men ($\bar{x}$ = 18.2, SD = 10.0 versus $\bar{x}$ = 14.6, SD = 8.9, $p<.005$), and negatively correlated with time since treatment ($r = -.10$, $p<.05$).

In a stepwise linear regression ($F(134) = 4.34$, $p<.05$, Adjusted R squared = .046), the Type D score was higher among those with a previous history of CAD ($B = 3.37$ $p<.05$), and the score decreased by .66 per month since hospital discharge ($B = -.657$, $p<.05$). However, the model explained only 5% of the variance of Type D, controlling for age, social status, ethnicity, education, work status, emergency status, days at the hospital, NYHA, LVEF, MI, BMI, hypertension, cholesterol, or diabetes.

Type D and depression and anxiety

As expected, the DS14 and the SCL10 were highly correlated. Both of the DS14 subscales, and particularly the NA correlated with the depression and anxiety scales. Using the recommended cut-off levels, the DS14 and the SCL10 were highly concordant as 74% of those classified as Type D had SCL10 scores above the cut-off level indicating mental distress, and 93% of those scoring below the cut-off level on the SCL10 also were classified as non-Type D (χ^2 (1) = 67.1, $p<.001$).

Type D and coping

The Type D sum score correlated with passive coping, and particularly the NA with the wishful thinking and the avoidance coping sub-scales. For the SI, small, though significant correlations were found with the avoidant coping subscale, and negative correlations with active coping, including the goal oriented and seeking social support sub-scales.

(Table 2: Type D correlations with mental distress and coping)

4. Discussion

The Norwegian DS14 has acceptable psychometrics properties, with two moderately correlated factors with high internal consistency. The DS14 was consistent with well-known measures of negative affect and avoidant and inhibiting coping. The DS14 correlated with the SCL10, and discriminated well between depressive and non-depressive patients. The NA was associated with anxiety, depression and passive coping (wishful thinking and avoidance coping). SI was associated with low levels of active coping (goal orientation and seeking social support). The associations were stronger for the NA scale, indicating that Negative Affect is the major component of the DS14.

The 18% prevalence of Type D was low compared to the 27-31% in cardiac patients and the 19% in the general population reported by Denollet (2005). However, prevalence rates vary in the literature, from 18,6% in Dutch MI patients (de Jonge, Denollet, van Melle, Kuyper, Honig, Schene & Ormel, 2007), to 38,6 % in healthy UK individuals (Williams et al., 2008), and 53% in Belgian hypertensive patients (Denollet, 2005). Our sample had completed invasive treatments (PCI and CABG), while the majority of other studies included non-invasive treated patients. As invasive treatments are highly effective in removing symptoms,

we may speculate if the higher prevalence of Type D in other studies is stress-related due to more severe coronary symptoms, such as angina. Other studies (Denollet, 2005;de Jonge, 2007) have reported Type D to be stable and independent of stress, and argued that Type D is a stable trait, rather than a state. However, the associations we found with emotional distress assessed by the SCL10, and the negative correlation with time since discharge, indicate a certain influence of stress on Type D. However, conclusions cannot be drawn from our cross-sectional data. To our knowledge, no prospective studies have addressed the potential effects of invasive versus non-invasive treatments on Type D.

Denollet et al (2005) reported a high (53%) prevalence of Type D in hypertensive patients, while we found no Type D - hypertension associations in our study. Of the 121 patients with a history of hypertension, only 21.5% were Type D, compared to the 18% in the whole sample. Hypertensive patients did not differ from non-hypertensive patients on the DS14 sum score. However, hospitalised CAD patients with a history of hypertension may not be comparable to the broader group of hypertensive patients consulting their GP and treated with medications. The differences may also reflect general methodological problems related to the diagnosis of hypertension (Campbell, Culleton & McKay, 2005).

The differing Type D prevalence rates may also reflect cultural differences. Particularly, the SI items explicitly refer to social situations expected to be culturally dependent. Expressions such as “I often feel inhibited in social interactions” and “I am a closed kind of person“ may have a range of different connotations and usage depending on culture, even though they pass the two-ways translation procedure of the literal meaning. Differences in Social Inhibition may also reflect potential cultural differences in the social acceptance of expressing negative emotions. However, Pedersen et al (Pedersen & Denollet, 2004), using a prior version (DS16)

reported relatively higher Type D rates (24-25%) than ours, in both post MI patients and healthy controls in Denmark. These results may weaken the cultural differences hypothesis, as Denmark may be considered culturally quite comparable to Norway.

The variations in Type D also raise questions about the cut-off level, and if there is a need to adjust the cut-off levels for specific populations, i.e. according to gender, age, various clinical conditions, and culture. Emons et al (Emons, Meijer & Denollet, 2007) tested the DS14 by using Items Response Theory, and found the items to be most informative at the higher end of the scale. They argued that these higher ranges of the scale are of particular interest, as they have the potential to distinguish different manifestations of Type D, such as medium versus high risk identification. Thus, we may expect a high DS14 sum score to be a stronger predictor of outcome than the suggested cut-off level. This also demonstrates how information is lost when computing a continuous variable into categorical data. Thus, we recommend that future studies apply the DS14 sum score rather than an arbitrary cut-off.

In sum, the Norwegian version of the DS14 has good psychometric properties, and is concordant with other measures associated with the concept of Type D. The Type D was relatively independent of demographics, treatment and coronary health, except for a history of CAD and time since treatment. We have discussed the potential influence of stress, type of treatment (invasive versus non-invasive), cultural differences, and problems associated with using a cut-off level rather than the continuous measure of DS14. We compared the Type D measure with measures of mental distress and coping. It has been argued that Type D is a stable personality trait (Denollet, 2005). As mental distress and coping are expected to be less stable than personality measures, these measures should not be interpreted as identical to personality traits. However, given the associations we found with Type D and mental distress

and coping, we may conclude that the DS14 reflect variations in negative affect and social inhibition tendencies. Whether Type D is a stable personality trait or it reflects a tendency to use certain coping strategies, a series of studies have shown that the combination of negative affect and social inhibition has strong negative impact on the recovery from CAD. However, the relatively lower prevalence of Type D in our sample raises questions about the relevance of the Type D for the Norwegian patients, and it remains to see whether Type D is a significant predictor of negative prognosis in CAD patients in the northern Norwegian context. Given the relatively high rates of CAD in Northern Norway, it is also important that future studies include samples of the general population in a prospective design, to test the predictive value of Type D on the incident of CAD in this region.

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Table 1: Factor structure of DS14

Items of the DS14	Factor loading	
	NA	SI
(13) I am often down in the dumps	**.784**	.165
(4) I often feel unhappy	**.767**	.109
(7) I take a gloomy view of things	**.765**	.209
(9) I am often in a bad mood	**.753**	.188
(5) I am often irritated	**.737**	-.001
(12) I often find myself worrying about something	**.685**	.218
(2) I often make a fuss about unimportant things	**.647**	.025
(6) I often feel inhibited in social interactions	.561	**.450**
(1) I make contact easily when I meet people (reversed)	.038	**-.838**
(14) When socializing, I don't find the right things to talk about	.302	**.744**
(3) I often talk to strangers (reversed)	.150	**-.711**
(8) I find it hard to start a conversation	.259	**.718**
(10) I am a closed kind of person	.451	**.632**
(11) I would rather keep other people at a distance	.429	**.567**

DS14, Type D Scale. NA, Negative Affect. SI, Social Inhibition.
Principal Component Analysis, Varimax Rotation with Kaiser Normalization.
NA bold type (Cronbach's α =.87) and SI bold type (Cronbach's α =.83).

Table 2: Type D correlations with mental distress and coping

	DS14 sum score	NA	SI
SCL10	**.57** ***	**.71** ***	**.28** ***
Anxiety	**.58** ***	**.70** ***	**.29** ***
Depression	**.49** ***	**.63** ***	**.22** ***
Coping (WoC-R)			
Active coping	n.s.	n.s.	**-.13** **
Seeking support	n.s.	n.s.	**-.14** **
Goal oriented	n.s.	n.s.	**-.10** *
Passive coping	**.32** ***	**.42** ***	**.13** *
Wishful thinking	**.34** ***	**.43** ***	**.16** ***
Avoidant coping	**.28** ***	**.35** ***	**.14** **
Thinking it over	n.s.	**.18** ***	n.s.

DS14, Type D Scale-14. NA, Negative Affect, SI, Social Inhibition, SCL10, 10 items Hopkins Symptom Check List, WoC-R, Revised Ways of Coping Questionnaire
* p<.05 ** p<.005 ***p<.001