Personality is associated with health status and impact of cancer among melanoma survivors

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ABSTRACT

Objective: We aimed to investigate the prevalence of Type D personality (the conjoint effects of negative affectivity and social inhibition) among melanoma survivors and to obtain insight into its effects on health status, impact of cancer and health care utilisation.

Methods: We selected all patients diagnosed with melanoma between 1998 and 2007 from three large regional hospitals in the Netherlands. In total, 699 survivors, alive in January 2008, received a questionnaire including Type D personality scale (DS14), impact of cancer questionnaire (IOC) and SF-36 and 80% responded (n = 562).

Results: Twenty-two percent of survivors (n = 125) were classified as Type D. They reported a clinically and statistically significant worse general health (57.8 versus 75.6), social functioning (73.1 versus 88.7), mental health (61.7 versus 80.6), more emotional role limitations (67.8 versus 89.4) and less vitality (54.5 versus 72.8) than non-Type D patients. Additionally, they reported a statistically and clinically relevant higher impact of cancer on body changes, negative self-evaluation, negative outlook on life, life interferences and health worry. Furthermore, they were more worried about the influence of the sun on their skin and acted accordingly. No differences were found in health care utilisation.

Conclusions: Type D personality has a distinct negative impact on health status in melanoma survivors and is an important factor to screen for in clinical practice. Giving special attention to these patients is important while they are more likely to experience a strong impact of cancer which cannot be explained by socio-demographical or clinical characteristics.

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1. Introduction

The relationship between personality and cancer has been an important topic of many studies. Major research themes were the association between personality and cancer incidence[1–7] and disease outcomes or mortality.[8–10] However, in these studies personality was defined in a number of different ways and the results were inconclusive. A personality type that has a major impact on cancer incidence, course, disease outcomes and health status has not yet been found.

A distressed personality (Type D) is defined by the combination of two personality traits; the tendency to experience negative emotions (*negative affectivity*) and to inhibit self-expression in social interaction (*social inhibition*).[11] Hence, individuals with a Type D personality are inclined to experience emotional and interpersonal difficulties across time

and situations. In the cardiovascular field, the Type D is an important research topic. Type D is recognised as an important determinant for adverse health outcomes, impaired health status and health-related quality of life (HRQL), several forms of distress (including anxiety, depression and posttraumatic stress) and a decrease in health care utilisation in patients with cardiovascular diseases.[12–18] More recently, similar results have been found in patients with a range of other diseases as well.[19–21] In addition, Type D personality was a prognostic factor for the development of cancer in men with established coronary heart disease, who were free of cancer at baseline.[22]

Although Type D has proven to have much explanatory power to select cardiovascular patients at risk for a low health status, this has not yet been studied in cancer patients. The aim of this study was to determine if melanoma survivors with a Type D personality report a comparable health status, impact of cancer and health care utilisation compared to those without a Type D personality. We hypothesised that Type D patients will report a lower health status, a more negative impact of cancer and a lower health care utilisation compared to those without a Type D personality.

2. Methods

2.1. Setting and participants

The study was conducted at the Eindhoven Cancer Registry (ECR), which records data on all patients newly diagnosed with cancer in the southern region of the Netherlands.[23] The ECR was used to select all patients diagnosed with melanoma between 1 January 1998 and 1 August 2007 from three large regional hospitals. Melanoma was defined using the ICD-0 codes: C44.0–C44.9 with morphology 8720–8790. Participants older than 85 years of age at the time of survey were excluded, as it was expected that they would have difficulty in completing a self-administered questionnaire without assistance. To avoid including deceased patients, our database was linked with the database of the Central Bureau for Genealogy, which collects data on all deceased Dutch citizens via the civil municipal registries. Data collection was performed between February and April 2008. Approval for this study was obtained from a local certified Medical Ethics Committee.

2.2. Data collection

Medical specialists sent their (former) patients a letter to inform them about the study and a copy of the questionnaire. The letter explained that by returning the completed questionnaire, the patient agreed to participate and consented with linkage of the outcome of the questionnaire with their disease history as registered in the ECR. The patients were reassured that non-participation would not have any consequence for their follow-up care or treatment.

2.3. Measures

2.3.1. Patient and tumour characteristics
The ECR routinely collects data on tumour characteristics, including date of diagnosis, histology, clinical stage (tumour-node-metastasis clinical classification[24]), treatment and patient background characteristics including date of birth and comorbidity at the time of diagnosis (a slightly adapted version of the Charlson comorbidity index[25]).

In addition, our patient questionnaire also included questions on sociodemographic data, including marital status, current occupation, educational level, current comorbidity and disease progression (e.g. recurrence, metastasis and new primary tumour).

2.3.2. Type D personality
Type D personality was measured with the 14-item Type D personality scale (DS14).[11] The DS14 is self-administered and takes only a few minutes to complete. The 14 items of this scale are answered on a five-point response scale ranging from 0 (false) to 4 (true). Seven of these items refer to 'Negative Affectivity' or the tendency to experience negative emotions in general (e.g. *I am often down in the dumps*). The remaining seven items refer to the patient's level of 'Social Inhibition' or the tendency to inhibit the expression of emotion in social relationships (e.g. *I am a closed kind of person*). The patients were categorised as Type D using a standardised cut-off score $\geqslant 10$ on both the negative affectivity and social inhibition subscales, following the protocol as previously established.[11] The DS14 is a valid and reliable scale with Cronbach's α of 0.88/0.86 and a test–retest reliability over a 3-month period of $r = 0.72/0.82$ for the two subscales, respectively.[11]

2.3.3. Health status
The Dutch version of the SF-36 questionnaire was used to assess the health status.[26] It incorporates two composite scales – the Physical Component Scale and the Mental Component Scale[27] – derived from eight domains: physical functioning, role limitations due to physical health problems, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems and general mental health.[28] According to standard scoring procedures, the subscales were linearly converted to a 0-100 scale, with higher scores indicating better functioning.

2.3.4. Impact of cancer
The impact of cancer was measured with the impact of cancer questionnaire (IOC). The IOC is a relatively new instrument developed to measure subtle yet important aspects of the cancer survivorship experience that long-term survivors themselves indicate are important.[29] The instrument consists of 41 items covering 10 subscales; health awareness, body changes, positive and negative self-evaluation, positive and negative life outlook, life interferences, value of relationships, meaning of cancer and health worry. Furthermore, these subscales can be used to create two overarching second-order factors inclusive of positive and negative items; the 'higher order positive scale' and 'higher order negative scale'.[30] Internal consistency for these subscales ranged from 0.67 to 0.89. All items are scored on a five-point scale through which respondents indicate their level of agreement. A higher score on a subscale means stronger endorsement of that content area; a high score on a positive scale thus means a higher positive impact of cancer, while a high score on a negative scale

means a higher negative impact of cancer. Subscale scores are created by taking the mean of all items in the subscale. While a Dutch version was not available yet, a 'forward–backward' procedure was used to translate the English language version of the IOC into Dutch.

The impact of cancer was also assessed with questions regarding the impact of melanoma on sun behaviour (e.g. activities in the sun) and attitudes towards sun exposure (e.g. worries about the influence of the sun) since diagnosis. The response categories were dichotomised in our analyses into 'less' and 'same or more'.

2.3.5.   Health care utilisation
The items concerning health care utilisation included questions on the number of visits to a general practitioner, medical specialist (including those specialists involved in cancer care) and other health care professionals. These questions were asked in a similar way as is done via the annual monitoring of the health care situation of a random sample ($n = \pm 10.000$) of the Dutch population by Statistics Netherlands (http://statline.cbs.nl).

This study was done in the Netherlands, where every person has equal access to (specialised) health care. According to the Dutch guidelines, melanoma survivors with a Breslow of <1 mm are followed up once, survivors with a Breslow >1 will be followed up until 5 years after diagnosis and patients with a Breslow >2 will be followed up until 10 years after diagnosis (Dutch national melanoma guidelines; http://www.oncoline.nl).

2.4.   Statistical analyses

Routinely collected data from the ECR on patient and tumour characteristics enabled us to compare the group of respondents, non-respondents and patients with unverifiable addresses, using t-tests for continuous variables and chi-square analyses for categorical variables. Differences between Type D and non-Type D patients in sociodemographic and clinical characteristics, health care utilisation and the impact of melanoma on sun behaviour and attitudes towards sun exposure since diagnosis were also analysed using t-tests for continuous variables and chi-square analyses for categorical variables.

Univariate linear regression analyses were carried out to investigate the association of sociodemographic variables (age, gender, marital status, educational level and current occupation) and clinical variables (stage, Breslow, grade, primary treatment, years since diagnosis and comorbidity) with the subscale and component scales of the SF-36 and the subscales of the IOC. We controlled for these variables in the analysis of covariance (ANCOVA), which was used to compare the means of SF-36 and IOC scores between melanoma survivors with and without a Type D personality. We used Norman's 'rule of thumb' that the threshold of discrimination for changes in health status scores for a chronic disease appears to be approximately half a standard deviation.[31]

All statistical test were two-sided and considered significant if $p < 0.05$. All statistical analyses were performed using SAS (version 9.1 for Windows, SAS Institute Inc., Cary, NC).

3.   Results

3.1.   Patient and tumour characteristics: respondents versus non-respondents

Of the 699 melanoma cancer survivors, 562 (80.4%) returned a completed questionnaire (Fig. 1). A comparison between respondents, non-respondents and patients with unverifiable addresses showed that patients with unverifiable addresses were generally younger ($p < 0.001$) and diagnosed earlier (in years) ($p < 0.01$) compared to respondents and non-respondents. Furthermore, there were no significant differences between respondents, non-respondents and patients with unverifiable addresses regarding gender, Breslow, stage at diagnosis and primary treatment (Table 1).

3.2.   Patient and tumour characteristics: Type D versus no Type D

Twenty-two percent of melanoma patients in this study were classified as having a Type D personality. There were no statistically significant differences observed between melanoma survivors with and without Type D at the time of the survey in age, gender, years since diagnosis, Breslow, primary treatment, marital status, educational level, current occupation and disease progression (Table 2). Melanoma survivors with
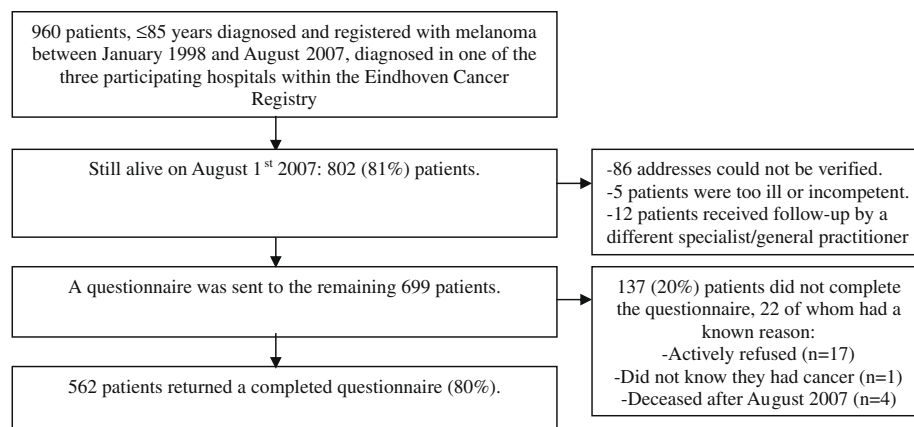

Fig. 1 – Flow-chart of the data collection process.

Table 1 – Demographic and clinical characteristics of questionnaire respondents, non-respondents and patients who were lost to follow-up.

	Respondents n = 562 (%)	Non-respondents n = 137 (%)	Patients with unverifiable addresses n = 86 (%)	p-Value
Mean age (at the time of survey)	57.2 (SD 14.0)	56.4 (SD 15.6)	51.2 (SD 15.0)	0.0013
Mean years since diagnosis	4.6 (SD 2.6)	5.1 (SD 2.9)	5.3 (SD 2.8)	0.0105
Gender				
Male	212 (38)	54 (41)	33 (38)	
Female	350 (62)	77 (59)	53 (62)	0.76
Breslow[a]				
⩽1.0 mm	275 (49)	61 (47)	39 (45)	
1.01–2.0 mm	149 (27)	33 (25)	22 (26)	
2.01–4.0 mm	100 (18)	30 (23)	22 (26)	
>4.0 mm	32 (6)	5 (4)	3 (3)	0.64
Stage at diagnosis				
I	400 (71)	87 (66)	56 (65)	
II	108 (19)	32 (24)	22 (26)	
III	42 (8)	8 (6)	6 (7)	
IV	–	–	–	0.71
Treatment				
Surgery	556 (99)	128 (98)	85 (99)	
Sentinal Node	113 (20)	22 (17)	21 (24)	
Lymphadenectomy	27 (5)	7 (5)	4 (5)	
Systemic therapy	3 (0.5)	1 (0.8)	–	
Radiotherapy	3 (0.5)	–	–	
Other	29 (5)	7 (5)	4 (5)	0.81

[a] According to the American Joint Committee on Cancer (AJCC) classification.

Type D were more likely to report comorbid conditions at the time of questionnaire compared to melanoma survivors without Type D (p < 0.0001). The most frequently mentioned comorbid conditions among patients with and without Type D were hypertension (24% versus 23%; p = 0.88) and arthrosis (30% versus 18%; p < 0.005).

3.3. Health status

The analysis of covariance revealed that Type D patients reported statistically significant lower scores on all SF-36 scales compared to patients without a Type D personality after adjustment for differences in age at the time of survey, gender, marital status, educational level, Breslow and comorbidity when necessary (Table 3). These differences were considered clinically relevant (>1/2 SD difference) for the subscales general health (57.8 versus 75.6), vitality (54.5 versus 72.8), social functioning (73.1 versus 88.7), role limitations emotional (67.8 versus 89.4), mental health (61.7 versus 80.6) and the mental component summary (43.8 versus 54.0).

3.4. Impact of cancer

Analysis of covariance showed that Type D patients reported statistically significant higher scores on all IOC subscales, except for the subscales 'Psychological: Positive Self-Evaluation' (p = 0.80) and 'Existential: Positive Outlook' (p = 0.22), after adjustment for differences in age at the time of survey, years since diagnosis, gender, marital status, educational level, stage, Breslow, primary therapy and comorbidity when necessary (Table 4). These differences were also clinically relevant

for the subscales body changes, negative self-evaluation, negative life outlooks, life interferences, health worry and higher order negative scale.

Type D patients more often reported fewer holidays to sunny destinations since diagnosis than non-Type D patients (73% versus 66%; p < 0.01) (Table 4). In addition, Type D patients reported undertaking less daily activities in the sun (36% versus 20%; p < 0.001) and spending less leisure time outdoors (23% versus 11%; p < 0.0001). Type D patients were also more worried about the influence of the sun on their skin compared to non-Type D patients (61% versus 48%; p < 0.01). No statistically significant differences were found between Type D and non-Type D patients regarding worries about their partner or children's skin (if applicable), seeking shade, wearing protective clothing or using sunscreen.

3.5. Health care utilisation

No differences were found between patients with and without Type D in the number of visits to a general practitioner (85% versus 83%; p = 0.38) and medical specialist (84% versus 81%; p = 0.55) in the past 12 months. Furthermore, melanoma survivors with or without Type D, only sporadically (0–3%) used the following additional care services after cancer treatment: psychologist, social worker, pastoral care, physiotherapist, CAM, oncology nurse and contact with other cancer survivors.

4. Discussion

Twenty-two percent of melanoma patients in this study were classified as having a Type D personality. This is within the

Table 2 – Sociodemographic and clinical characteristics of melanoma survivors.

	Type D n = 125 (%)	Non-Type D n = 437 (%)	p-Value[a]
Age at the time of survey (mean (SD))	58 (15)	57 (13)	0.24
Age at the time of survey			
⩽45 years	29 (23)	93 (21)	
45–54 years	27 (22)	100 (23)	
55–64 years	29 (23)	116 (27)	
⩾65 years	40 (32)	128 (29)	0.91
Gender			
Male	39 (31)	173 (40)	
Female	86 (69)	264 (60)	0.07
Years since diagnosis			
<1 years	6 (5)	25 (6)	
1–2	45 (36)	122 (28)	
3–4	28 (22)	121 (28)	
⩾5 years	46 (37)	169 (39)	0.18
Stage at diagnosis			
I	92 (74)	308 (70)	
II	22 (18)	86 (20)	
III	7 (6)	35 (8)	
IV	4 (3)	8 (2)	0.64
Breslow[b]			
⩽1.0 mm	64 (51)	211 (48)	
1.01–2.0 mm	34 (27)	115 (26)	
2.01–4.0 mm	19 (15)	81 (19)	
>4.0 mm	5 (4)	27 (6)	0.38
Primary treatment			
Surgery	124 (99)	432 (99)	
Sentinal node	20 (16)	93 (21)	
Lymphadenectomy	3 (2)	24 (5)	
Systemic therapy	0 (0)	3 (1)	
Radiotherapy	1 (1)	2 (0)	
Other	3 (2)	26 (6)	0.50
Comorbidity[c]			
None	47 (38)	196 (45)	
1	41 (33)	132 (30)	
2⩾2	37 (30)	109 (25)	<0.0001
Co-morbid conditions (most frequent)			
1. Hypertension	29 (24)	97 (23)	0.88
2. Arthrosis	36 (30)	75 (18)	0.005
Disease progression (self-report)[d]	12 (10)	67 (15)	0.10
Marital status			
Married	89 (71)	327 (75)	
Never married	14 (11)	41 (9)	
Divorced/widowed	22 (18)	67 (15)	0.85
Education level			
Primary school	31 (25)	130 (30)	
Secondary school	54 (43)	188 (43)	
College/university	26 (21)	77 (18)	
Unknown	14 (11)	38 (9)	0.57
Current occupation			
Employed	60 (48)	239 (55)	
Unemployed	65 (52)	195 (45)	0.16

[a] p-Value was adjusted for age at the time of survey, years since diagnosis, gender, marital status, educational level, stage, Breslow, primary therapy and comorbidity at the time of questionnaire when necessary.
[b] According to the American Joint Committee on Cancer (AJCC) classification.
[c] Adapted Charlson comorbidity index; assessed by self-report at the time of questionnaire.
[d] Recurrence, metastasis and new primary tumour.

Table 3 – Health status among melanoma survivors according to Type D personality.

SF-36	Mean (SD)		p-Value[a]
	Type D n = 125	Non-Type D n = 437	
Physical functioning	77.8 (26.7)	86.7 (21.0)	<0.0001
Role limitations physical	72.4 (39.3)	87.7 (28.6)	<0.01
Bodily pain	72.1 (27.3)	83.2 (20.4)	<0.0001
General health	57.8 (23.2)	75.6 (20.1)	<0.01[b]
Vitality	54.5 (21.1)	72.8 (17.9)	<0.001[b]
Social functioning	73.1 (24.1)	88.7 (18.2)	<0.0001[b]
Role limitations emotional	67.8 (42.2)	89.4 (26.9)	<0.0001[b]
Mental health	61.7 (19.5)	80.6 (15.0)	<0.0001[b]
Physical component summary	47.8 (10.8)	51.8 (8.4)	<0.01
Mental component summary	43.8 (11.1)	54.0 (7.6)	<0.0001[b]

[a] p-Value was adjusted for age at the time of survey, years since diagnosis, gender, marital status, educational level, stage, Breslow, primary therapy and comorbidity at the time of questionnaire when necessary.
[b] Clinically relevant difference.[31]

Table 4 – The impact of cancer on melanoma survivors according to Type D personality.

	Type D n = 125(%)	Non-Type D n = 437(%)	p-Value
IOC[a,b]			
Physical: health awareness	3.38 (0.91)	2.99 (0.92)	<0.0001
Physical: body changes	2.38 (0.83)	1.84 (0.69)	<0.0001[c]
Psychological: positive self- evaluation	2.76 (0.67)	2.72 (0.76)	0.80
Psychological: negative self-evaluation	2.18 (0.70)	1.72 (0.58)	<0.0001[c]
Existential: positive outlook	3.14 (0.78)	3.06 (0.89)	0.22
Existential: negative outlook	2.86 (0.87)	2.14 (0.83)	<0.0001[c]
Social: life interferences	2.17 (0.78)	1.68 (0.66)	<0.0001[c]
Social: value of relationships	3.02 (0.90)	2.78 (0.93)	<0.02
Meaning of cancer	2.91 (0.72)	2.71 (0.79)	<0.01
Health worry	3.16 (0.95)	2.57 (0.93)	<0.0001[c]
Higher order positive scale	3.04 (0.61)	2.84 (0.70)	<0.01
Higher order negative scale	2.55 (0.66)	1.99 (0.58)	<0.0001[c]
Less activities in the sun (yes)[d]			
Less sun and beach holidays?	88 (73)	255 (66)	<0.01
Less occupation/daily activities?	43 (36)	83 (20)	<0.001
Less leisure time outdoors?	28 (23)	48 (11)	<0.001
Anxiety (yes)[e]			
Own skin?	74 (61)	205 (48)	<0.01
Skin of partner (if applicable)?	43 (37)	118 (29)	0.10
Skin of children (if applicable)?	56 (48)	158 (39)	0.07
Protection (yes)[f]			
Seeking shade	76 (63)	254 (59)	0.49
Protective clothing (e.g. long sleeves and hats)	54 (45)	162 (38)	0.20
Use of sunscreen lotion	79 (65)	279 (65)	0.99

[a] p-Value was adjusted for age at the time of survey, years since diagnosis, gender, marital status, educational level, stage, Breslow, primary therapy and comorbidity at the time of questionnaire when necessary.
[b] A higher score on a subscale means stronger endorsement of that content area; a high score on a positive scale thus means a higher positive impact of cancer, while a high score on a negative scale means a higher negative impact of cancer.
[c] Clinically relevant difference.[31]
[d] Compared to the period before your melanoma diagnosis, are you less involved in the following activities in the sun?
[e] Compared to the period before your melanoma diagnosis, are you more worried about the influence of the sun?
[f] Compared to the period before your melanoma diagnosis, do you protect your skin more against the sun?

range of Type D prevalence in the normal population, which ranges from 13% to 24%.[11,32,17] Among people with cardiovascular disease, these numbers are more elevated; between 27% and 31%.[12,14,33,34]

Type D patients reported a statistically significant and clinically relevant lower health status measured by the SF-36. Because this is the first study to investigate the effect of Type D on health status among cancer survivors, comparison with

other studies is not possible. However, it is known from the literature that the Type D personality construct is associated with a lower health status among cardiovascular patients. For example, Type D was associated with a lower health status pre- and post-cardiac rehabilitation in a study among 368 coronary artery disease patients.[35] In addition, Type D patients were more than twice as likely to report a poor physical health status and were more than five times as likely to report a poor mental health status one year post coronary artery bypass grafting surgery.[36] Also, Type D personality was associated with more than a three to sixfold increased risk of impaired health status in 186 heart transplant recipients 7 years following transplantation.[18]

This is the first study that reports the effect of personality on the impact of cancer, as measured by the impact of cancer questionnaire. Having had melanoma had a greater impact on body changes, negative self-evaluation, negative life outlook, life interferences, health worry and the higher order negative scale of the IOC in Type D patients compared to non-Type Ds. In addition, Type D patients were more worried about the influence of the sun on their skin and were more likely to adjust their life style than non-Type D patients. A higher impact of cancer on Type D patients can possibly be explained by the fact that negative affectivity is one of the main characteristics of Type D, which implies that these patients have the tendency to experience negative emotions in general. This can perhaps also explain why we did not find a difference in the positive IOC subscales (e.g. positive self-evaluation and positive outlook) but did find major differences in the negative ones (e.g. negative self-evaluation and negative outlook). Additionally, negative affectivity might cause Type D patients to estimate their chances of disease progression somewhat higher than non-Type D patients, which causes them to act accordingly by avoiding the sun more frequently. This could be viewed as a positive consequence of having a Type D personality that deserves further research.

A study among heart failure patients found that Type Ds experienced more cardiac symptoms but less often reported these symptoms to their cardiologist compared to non-Type Ds.[13] However, in the current study, no differences were found between those with or without Type D in the number of visits to a general practitioner. This seems plausible because in the Netherlands, almost everyone visits his/her general practitioner at least once a year so differences are hard to find.[37] Furthermore, no differences were found between survivors with and without Type D in the number of visits to a medical specialist. This may be explained by the fact that there are guidelines on the number of follow-up visits for melanoma patients.[37] In contrast to the study among heart failure patients in which patients should contact the cardiologist or nurse in case symptoms arise. This places the responsibility of making an appointment with the patient, not the cardiologist, and therefore leaves more room for someone's personality to interfere with his or her health care utilisation.

This study has some limitations that should be noted. Although information was present concerning the initial cancer and treatment characteristics of the non-respondents and patients of whom the addresses could not be verified, whether non-respondents declined to participate in the study because of poor health remains unknown. In addition,

although Type D personality is a stable construct,[38] the cross-sectional design of our study limits the determination of causal association between Type D personality, health status and impact of cancer as baseline health status and impact of cancer of patients at diagnosis is not known. Therefore, future longitudinal studies with baseline data on Type D personality would be useful in exploring this association between Type D personality and health status, and the subsequent adaptation process to cancer.

Nevertheless, this is the first study that confirms that Type D is not only associated with a lower health status among cardiovascular patients but also plays a major role in cancer patients. One of the strengths of our study, as compared with many previous survivorship studies, is the high response rate that facilitates generalising the results to the larger population of long-term melanoma survivors. In addition, we evaluated a broad spectrum of possible confounding factors, including age at the time of survey, years since diagnosis, gender, marital status, educational level, stage, Breslow, primary therapy and comorbidity at the time of questionnaire. Our results are intriguing and warrant further research with a larger group of melanoma survivors followed over a longer period of time.

Our study provided insight into the role of Type D personality on health status and impact of cancer among melanoma survivors 1/2–10 years after diagnosis. The Type D scale has proven to be a useful screening tool in melanoma survivors to identify subgroups at risk for impaired health status and impact of cancer. Giving special attention to those patients is important while they are more likely to experience a worse health status and stronger impact of cancer than non-Type D patients which can-not be explained by socio-demographical or clinical characteristics. Type D might not just be a personality profile that decreases health status among cardiovascular patients but is more a vulnerability factor for a lower health status in general. So although not the focus of our paper, it demonstrates that personality could play a major role in the clinical care for cancer patients. More research on Type D personality among cancer survivors is therefore warranted.

Conflict of interest statement

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