Personality predicts quality of life six months after the diagnosis and treatment of breast disease

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Personality Predicts Quality of Life Six Months after the Diagnosis and Treatment of Breast Disease

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Background: Quality of Life (QoL) is an important outcome measure in oncology. QoL is influenced by personality traits, such as anxiety. To assess the influence of personality on QoL in women with breast cancer, a longitudinal prospective cohort study was done.

Methods: Ninety-one patients with breast cancer and 111 patients with benign diagnoses completed prior to the diagnosis and 1, 3, and 6 months after diagnosis and treatment a set of questionnaires.

Results: Overall QoL showed no significant differences between the two groups. The influence of trait anxiety was considerable for all measurement moments. Trait anxiety is accountable for up to 40.6% of the variance in QoL scores. Forty-five women in the benign group scored high on trait anxiety, and 40 women in the breast cancer group. Women with a high trait anxiety score were 3 times as likely to have a low general QoL six months after diagnosis and possible surgery, irrespective of the diagnosis (breast cancer or benign problems). When the women were divided into four groups based on the diagnosis and the score on trait anxiety, there was a significant difference in scores on general QoL between the groups on all measurement moments, with a significant lower score for the two groups with a high score on trait anxiety ($P < 0.001$).

Conclusion: Trait anxiety rather than the diagnosis breast cancer determined whether patients experienced a low QoL.

Key Words: Breast cancer—Quality of life—Anxiety—Personality.

Breast cancer is the predominant form of malignancy in women in Western Europe and the United States. In the Netherlands, one in every nine women will develop invasive breast cancer.[1]

Early detection by screening programs and improvements in chemotherapy resulted in increasing incidence and prevalence figures; so, breast cancer

has become not only a life threatening cancer but also a chronic disease for many patients.[2] Therefore, quality of life (QoL) is very important when treating breast cancer patients. QoL is defined by the World Health Organization Quality of Life group as 'an individual's perception of his/her position in life in the context of the culture and value systems in which he/she lives and in relation to his/her goals, expectations, standards and concerns'.[3]

We know that QoL and QoL-related concepts, such as subjective well-being, are influenced by culture,[4] social-economic status,[5] and personality.[6] Studies performed by Costa and McCrae among students showed that personality, and especially the personal-

ity traits extraversion and neuroticism had a significant influence on subjective well-being.[7] Trait anxiety, another personality characteristic, is also associated with QoL.[8] Despite these known influences of personality traits on QoL-related concepts, no extensive studies have been conducted on the role of personality in relation to QoL in breast cancer patients.

In the present study, the influence of personality on QoL was examined in women with an abnormality of the breast. These abnormalities were either a palpable lump or an irregularity on a screening mammography. After diagnosis, the women were divided in two groups: one with a benign diagnosis and one group with breast cancer. We expected that women in the benign group would experience an increase in QoL after hearing the diagnosis, since they did not have breast cancer. For the breast cancer group, QoL was expected to be lower compared to the benign group for all measurement moments after diagnosis. Concerning the personality characteristics, we hypothesized that women with high scores on the personality characteristics trait anxiety and neuroticism would experience a more profound decrease in QoL when confronted with the diagnosis breast cancer and its treatment, compared with women scoring low or moderate on trait anxiety and neuroticism.

METHODS AND PATIENTS

Patients

Women who were referred to the outpatient clinic of the St Elisabeth Hospital and the Maasland Hospital (patient accrual since August 2004) with a palpable lump in the breast or an abnormality on screening mammography between September 2002 and January 2005 were asked to participate in our prospective longitudinal study. Of the 320 women who visited the outpatient clinic with a problem of the breast, 203 (63.4%) completed the first set of questionnaires. One woman was subsequently excluded because she was diagnosed with locally advanced disease, resulting in 202 participants. The reasons for refusal were the length of the questionnaires and the amount of stress the women experienced, which they felt impaired their concentration while completing the questionnaires.

After written informed consent and before the first appointment with the surgeon, i.e. before the diagnosis was known, the women completed the first set of questionnaires. After this baseline measurement, a set of questionnaires was also completed 1, 3, and 6 months after diagnosis (benign group) and surgical treatment (breast cancer group). The participation in the study was not known to the treating surgeon and, therefore, did not bear any influence on the treatment and clinical follow-up.

Questionnaires

Neuroticism-Extraversion-Openness Personality Inventory-Revised (NEO-PI-R) (Costa and McCrae 1989;[9] Dutch version: Hoekstra, Ormel and de Fruyt 1996):[10] The NEO-PI-R is developed to study an individual's personality. The personality is tested in the five domains of the Five Factor Model: neuroticism, extraversion, openness, agreeableness, and conscientiousness. The psychometric properties are good.[11] The NEO-PI-R was only completed at the baseline measurement.

State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch and Lushene, 1970;[12] Dutch version: van der Ploeg, Defares and Spielberger, 1980):[13] The STAI was originally developed to investigate anxiety phenomena in 'normal' adults, but has also proven useful in medical and surgical patients. It measures two types of anxiety. Trait anxiety concerns differences in individuals in the disposition to respond to stressful situations with varying amounts of stress. State anxiety is a momentary emotional condition characterized by subjective feelings of apprehension and tension, and heightened autonomic nervous system activity. This may vary in intensity and fluctuate over time.[12] The state scale (20 statements) asks persons how they feel at a particular moment in time, while the trait scale (20 statements) asks people to describe how they generally feel. The psychometric characteristics of this questionnaire are well established and considered good.[14] The trait scale was only completed at baseline measurement, whereas the state scale was completed at all measurement moments.

World Health Organization Quality of Life-100 Questionnaire (WHOQOL-100) (WHOQOL-group, 1995;[15] Dutch version: De Vries and Van Heck, 1995):[16] This questionnaire consists of 100 items that are divided in 24 facets covering four domains (Physical, Psychological, Social Relationships, and Environment) and a global QoL and general health facet. The reliability and validity are satisfactory[17] and the sensitivity to change is good.[18] This questionnaire was completed at all measurement points. In the present study, the QoL domain Environment was not used.

TABLE 1. *Demographic, personality, and psychological characteristics of the participants*

Characteristics	Benign group (n = 111)	Breast cancer group (n = 91)	P-value
Demographics			
Age : mean (sd)	52.7 (10.6)	57.7 (10.2)	0.001
Living with a partner: Yes / no / missing	85 (76.5) / 23 (20.7) / 3 (2.8)	68 (74.7) / 18 (19.8) / 5 (5.5)	
Children: yes / no / missing	84 (75.7) / 17 (15.3) / 10(9)	69 (75.8) / 13 (14.3) / 9(9.9)	
Educational level: low / middle / high / missing	39 (35.1) / 45 (40.5) / 22 (19.8) / 5 (4.5)	36 (39.6) / 36 (39.6) / 15 (16.5) / 4 (4.3)	
Paid work: yes / no / missing	57 (51.4) / 52 (46.8) / 2 (1.8)	32 (35.2) / 57 (62.6) / 2 (2.2)	0.023
Personality factors			
Neuroticism	31.5 (7.3)	30.6 (7.2)	
Extraversion	39.5 (5.9)	40.7 (5.5)	
Openness to experience	37.2 (5.1)	35.0 (5.2)	0.008
Agreeableness/Altruism	42.9 (4.2)	43.0 (3.7)	
Conscientiousness	44.1 (5.0)	44.5 (6.0)	
Trait anxiety	40.4 (12.3)	39.3 (10.1)	
Psychological factors			
State anxiety	40.1 (14.5)	49.5 (13.0)	<0.001
Depressive symptoms	15.5 (11.0)	15.8 (9.5)	
Fatigue	21.9 (8.3)	20.0 (6.9)	
Overall QOL and general health	15.0 (3.1)	15.6 (2.8)	0.031
Domain 1 Physical health	13.5 (2.8)	14.3 (2.1)	
Domain 2 Psychological health	14.5 (2.2)	14.7 (2.0)	
Domain 3 Social relationships	16.0 (3.0)	16.5 (2.2)	

Note: For the demographics, percentages are between brackets (except for age), for the personality and psychological factors mean (sd) are presented.

low = up to 10 years of education; middle = 10 to 14 years of education; high = more than 14 years of education.

TABLE 2. *Clinical characteristics of the included and non-included patients*

Clinical characteristics of the breast cancer group	Included patients (n = 91)	Non-included patients (n = 46)
Age: mean (sd)	57.7 (10.2)	58.8 (8.7)
Not operated	2	0
Diameter of tumor		
Less than 1 cm	15 (16.4)	13 (28.3)
1 – 3 cm	55 (60.4)	26 (56.5)
More than 3 cm	14 (15.4)	6 (13.0)
Missing	5 (7.8)	1 (2.2)
Degree of differentiation		
Well	14 (15.4)	13 (28.3)
Intermediate	32 (35.2)	8 (17.4)
Poor	26 (28.6)	15 (32.6)
DCIS	10 (11)	4 (8.7)
Missing	7 (7.7)	6 (13.0)
Axillary lymph nodes		
Metastases: yes / no *	28 (34.1) / 54 (65.9)	12 (28.6) / 30 (71.4)
Adjuvant therapy		
Chemotherapy: yes / no	29 (31.9) / 62 (68.1)	13 (28.3) / 33 (71.7)
Hormonal therapy: yes / no	32 (35.2) / 59 (64.8)	17 (37.0) / 29 (63.0)
Radiotherapy: yes / no	39 (42.8) / 52 (57.2)	22 (47.8) / 24 (52.2)

Note: Percentages are between brackets.

* Not all patients received removal of axillary lymph nodes.

Demographic Questionnaire

Patients were asked to complete some questions concerning age, marital status, education, and social-economic status.

Medical Records

Data concerning medical history, tumor size on mammography and after pathological examination, differentiation degree of the tumor, number of (af-

fected) lymph nodes, and adjuvant treatment were obtained from the medical records of the included patients.

Statistical Procedure

Frequencies were used to present demographic information on the patients before diagnosis. Student t-tests and chi-square tests were used to compare: (i)
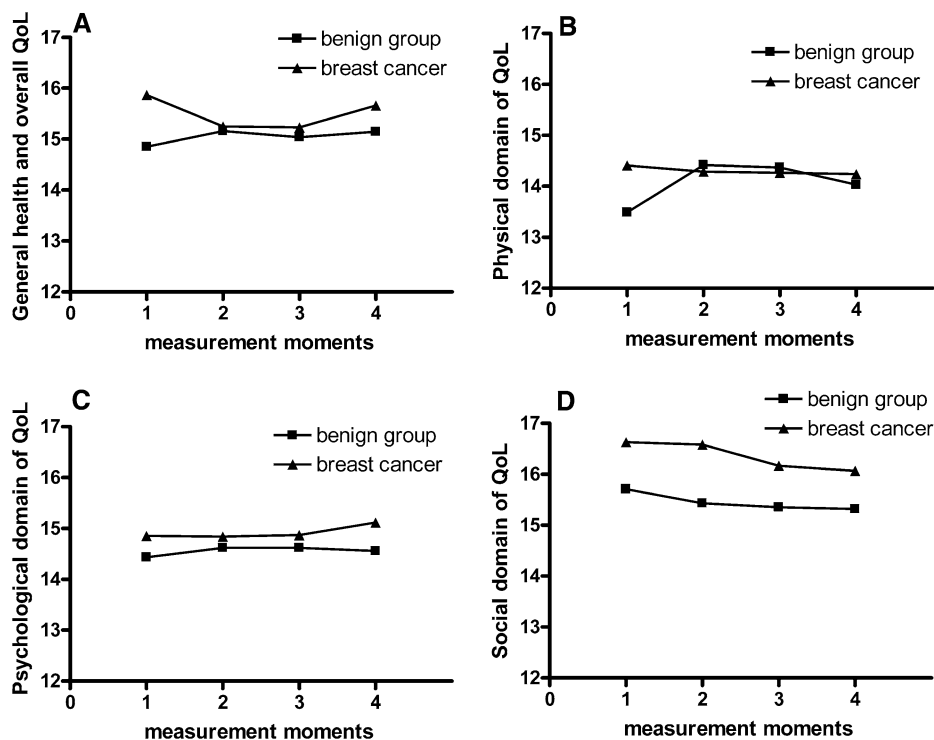
FIG. 1. A Scores on overall QoL and general health for benign patients and patients with breast cancer before diagnosis and 1, 3, and 6 months after diagnosis (benign group) or surgical treatment (breast cancer group). Scores are represented in estimated general. **B** Scores on the physical domain of QoL for benign patients and patients with breast cancer before diagnosis and 1, 3, and 6 months after diagnosis (benign group) or surgical treatment (breast cancer group). Scores are represented in estimated general means. **C** Scores on the psychological domain of QoL for benign patients and patients with breast cancer before diagnosis and 1, 3, and 6 months after diagnosis (benign group) or surgical treatment (breast cancer group). Scores are represented in estimated general means. **D** Scores on the social domain of QoL for benign patients and patients with breast cancer before diagnosis and 1, 3, and 6 months after diagnosis (benign group) or surgical treatment (breast cancer group). Scores are represented in estimated general means.

TABLE 3. *Analysis of variance in scores on the separate domains of QoL and overall QoL for the benign group and the breast cancer group*

Dependent variable	Independent variable	R^2	βeta
Overall QoL, benign group	Trait anxiety	.395	−.628
Model: F(regression, residual) = 37.19 *P* < 0.001			
Overall QoL, breast cancer group	Trait anxiety	.087	−.295
Model: F(regression, residual) = 5.26 *P* = 0.026			
QoL physical domain, Benign group	Trait anxiety	.393	−.627
Model: F(regression, residual) = 36.9 *P* < 0.001			
QoL physical domain, breast cancer group	Trait anxiety	.243	−.493
Model: F(regression, residual) = 17.68 *P* < 0.001			
QoL psychological domain, benign group	Neuroticism	.406	−.637
Model: F(regression, residual) = 39.0 *P* < 0.001			
QoL psychological domain, breast cancer group	Trait anxiety	.176	−.420
Model: F(regression, residual) = 11.77 *P* = 0.001			
QoL social domain, benign group	Trait anxiety	.210	−.459
Model: F(regression, residual) = 15.20 *P* < 0.001			
QoL social domain, breast cancer group	Trait anxiety	.177	−.421
Model: F(regression, residual) = 11.85 *P* = 0.001			

Note: Regression analysis of the individual domains of QoL 6 months after diagnosis and treatment (T4).

the patients with benign and breast cancer diagnosis on baseline characteristics and (ii) the participants and non-participants. The predictors of overall QoL and the separate domain scores six months after surgical treatment were found using the scores on QoL, and the domains as dependent variables and the

TABLE 4. *Scores on trait anxiety and neuroticism for the participants*

	Benign group (n = 111)	Breast cancer group (n = 91)
Trait anxiety Low score	59 (53.2)	48 (52.7)
Trait anxiety High score	55 (46.8)	43 (47.3)
Neuroticism Low score	77 (69.4)	72 (79.1)
Neuroticism High score	24 (30.6)	19 (20.9)

Note: based on the cut-off scores from the separate manuals: low score on trait anxiety is decile 1 to 7; high score on trait anxiety is decile 8 and higher; low score on neuroticism is stanine 1 to 5; high score on neuroticism is stanine 6 and higher. Percentages are between brackets.

personality characteristics (high or not) as independent variables in a regression analysis. General linear model for repeated measures was used to examine scores on QoL over time: (i) in patients with benign problems or breast cancer, (ii) in patients high or not on trait anxiety, and (iii) a combination of diagnosis (benign or breast cancer) and trait anxiety (high or not). Oneway Anova's were used to examine QoL differences between groups at one particular measurement time. The statistical significance of the decreases or increases over time in scores on QoL was tested with paired sample t-tests. All analyses were performed with the Statistical Package for Social Sciences (SPSS version 11.0).

RESULTS

After diagnosis, the participating women were divided in two groups: women with a benign diagnosis (n = 111) and women with breast cancer (n = 91).

Concerning the demographic factors, the benign group was significantly younger ($P = 0.001$) and was more often employed ($P = 0.023$) compared to the breast cancer group. The baseline psychological factors showed a significant higher score on state anxiety ($P < 0.001$) for the breast cancer group and also a significantly better overall QoL and general health ($P = 0.031$) (Table 1). In both groups, the majority of the patients lived with a partner and had one or more children. With regard to personality factors, women with benign problems scored higher on Openness to Experience than breast cancer patients ($P = 0.008$). Concerning the remaining personality factors, there were no significant differences.

There was no difference between the non-included and included group concerning the number of patients with breast cancer. The clinical characteristics of the breast cancer patients did not statistically differ between included and non-included women (Table 2). Also, no statistical significant differences appeared for adjuvant treatment, i.e., radiotherapy and/or chemotherapy and/or hormonal therapy between the breast cancer patients who did or did not participate (Table 2).

Concerning the first hypothesis, a non-significant increase in general QoL was seen for the benign group. The distinct decrease in general QoL for the breast cancer group (hypothesis 2) is also not statistically significant. The scores on overall QoL and the QoL domains for the benign and breast cancer groups are shown in Fig. 1a–d. The differences in scores between the two groups on the psychological and social domain of QoL were obvious in favor of the breast cancer group (Fig. 1c and 1d), but at no point significant.

When analyzing the impact of the personality traits on QoL, we found that QoL was strongly predicted by trait anxiety six months after surgical treatment. Trait anxiety explained up to 40.6% of the variance in QoL scores (Table 3). The predictive value of trait anxiety, however, was stronger for the benign group in contrast to the breast cancer group. When psychological factors such as fatigue and depressive symptoms were added to the regression analysis, they showed a strong correlation to the scores on QoL and the separate domains for the breast cancer group.

A high score on trait-anxiety had a profound and negative influence on patients' QoL. The chance that patients with a high score on trait anxiety experienced a low general QoL at six months post-surgery was 5.9 (OR 5.9; 95% CI = 2.007–17.093; $P = 0.001$).

The percentage of patients with high or low scores on neuroticism and/or trait anxiety did not differ between both patient groups. In each group, a high number of women scored high on these personality characteristics (Table 4).

Considering the predictive value of trait anxiety for QoL, the influence of this personality trait on general QoL and the QoL domains was assessed (Fig. 2a–d). Women with high scores on trait anxiety had significant lower overall QoL scores on all measurement moments ($P < 0.001$), irrespective of their diagnosis (benign or breast cancer), compared to women with not-high scores on trait anxiety. The scores on the domains physical health, psychological health, and social functioning were also significantly lower for the women with high scores on trait anxiety ($P < 0.001$ for each domain). However, comparing the two groups high on trait anxiety, the breast cancer patients had apparent higher QoL
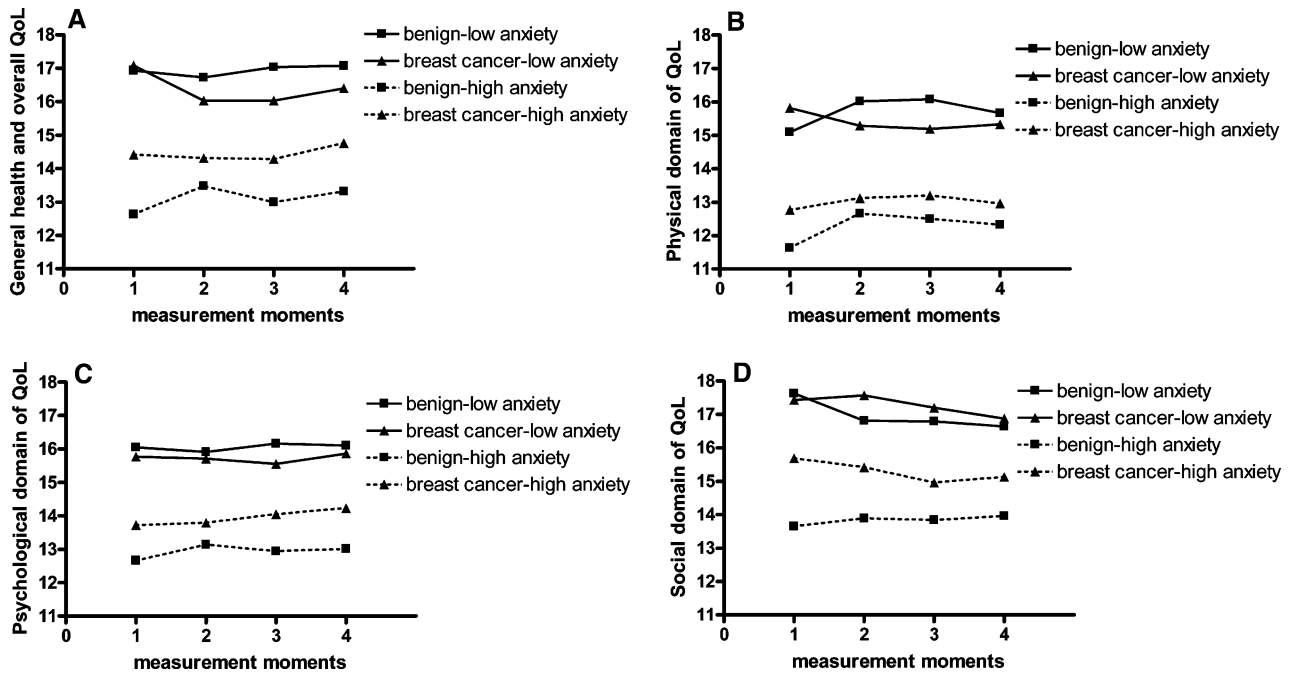
FIG. 2. **A** Scores on overall QoL and general health for four groups of patients, i.e. benign patients with high trait anxiety, benign patients low on trait anxiety, breast cancer patients with high trait anxiety, and breast cancer patients low on trait anxiety before diagnosis and 1, 3, and 6 months after diagnosis (benign patients) and surgical treatment (breast cancer patients). Scores are represented in estimated general means. **B** Scores on the physical domain of QoL for four groups of patients, i.e. benign patients with high trait anxiety, benign patients low on trait anxiety, breast cancer patients with high trait anxiety, and breast cancer patients low on trait anxiety before diagnosis and 1, 3, and 6 months after diagnosis (benign patients) and surgical treatment (breast cancer patients). Scores are represented in estimated general means. **C** Scores on the psychological domain of QoL for four groups of patients, i.e. benign patients with high trait anxiety, benign patients low on trait anxiety, breast cancer patients with high trait anxiety, and breast cancer patients low on trait anxiety before diagnosis and 1, 3, and 6 months after diagnosis (benign patients) and surgical treatment (breast cancer patients). Scores are represented in estimated general means. **D** Scores on the social domain of QoL for four groups of patients, i.e. benign patients with high trait anxiety, benign patients low on trait anxiety, breast cancer patients with high trait anxiety, and breast cancer patients low on trait anxiety before diagnosis and 1, 3, and 6 months after diagnosis (benign patients) and surgical reatment (breast cancer patients). Scores are represented in estimated general means.

scores than their benign counterparts on general QoL and each of the separate domains on all measurement moments, although not statistically significant.

The logistic regression analysis showed no influence of medical factors such as received chemotherapy and/or radiotherapy on the QoL scores.

DISCUSSION

The aim of this study was to determine the influence of different personality traits on QoL in women with an abnormality of the breast. We anticipated that fear of cancer when confronted with an abnormality of the breast would have a profound impact on QoL before diagnosis. After diagnosis, we expected that QoL in the benign group would improve, whereas, the QoL of the breast cancer group would stay low. This was not

confirmed. Especially, trait anxiety appeared important in determining patients' QoL.

It is known that common psychological reactions during detection, diagnosis, and treatment of cancer are anxiety and depression.[19] Although we know that being recalled for further investigation of an abnormal screening mammogram is a stressful experience for many women,[20] only one study[21] has examined the short-term effects on feelings of distress in women recalled after breast cancer screening. That study showed that after a recall visit, depressive symptoms and state of anxiety decreased in women without breast cancer, compared with women who were referred for surgical biopsy. We expected the same pattern with regard to QoL.

When the breast cancer patients were compared with the benign patients, a distinct trend could be observed in the QoL scores of the breast cancer patients. Their general QoL diminished after hearing

the diagnosis and then slowly climbed up again, whereas the overall QoL scores for the benign patients stayed in the same range. We expected, however, an increase in QoL for the benign patients since they did receive good news. Perhaps it takes more than six months to overcome the anxiety brought on by the abnormality in the breast.

Although recent publications concerning QoL in breast cancer patients appeared to be Health Status studies after evaluation,[22] they were analyzed to see whether the scores on QoL for the benign group could have been expected. None of these studies, however, compared breast cancer patients to benign patients so no information is available regarding the development of QoL over time in patients with a benign diagnosis. Only one additional study was found that compared compatible groups of breast cancer patients and patients with benign breast problems, however not in a prospective longitudinal setting.[23]

Based on the normal distribution of high and low scores on trait anxiety in a healthy population, scores can be divided in deciles, meaning that 10% of the normal population would score in that range.[24] High scores were determined decile 8–10, implicating that 30% of a given population would score high. In our study population, however, half of the women scored high on trait anxiety. The scores for neuroticism were comparable to those expected in a normal population. The distribution of high scores on trait anxiety did not differ between the breast cancer group and the benign group. Perhaps this unexpected distribution of scores is a study bias introduced by asking women to participate, but none of the other characteristics differed between the included and non-included patients; therefore, this rationalization is not very probable. So far, we have no sound explanation for this phenomenon.

Since previous studies among students have shown that an individual's personality influences his/her behaviour and QoL-related concepts, we used the worldwide acknowledged Five-Factor-Model (FFM) to judge personality. The FFM consists of Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness.[25] Neuroticism is an important and extensive domain. It weighs emotional instability against emotional stability. Extraversion concerns the degree in which energy, orientation, and attention are focused on the outside world in contrast to the inner world. Openness refers to an open attitude towards other people, beliefs, and experiences. Agreeableness represents one's orientation towards experiences, goals, and interests of other people.

Conscientiousness refers directly to the conscience as a guiding and analyzing instrument for one's own behaviour.[10] Anxiety can be considered a part of the domain neuroticism, but can also be defined individually. Trait anxiety refers to the tendency to respond to situations perceived as threatening with a rise in anxiety intensity.[12] Only neuroticism and especially trait anxiety played a role in predicting patients' QoL six months after diagnosis and surgical treatment. QoL did not change much over time when the breast cancer group and the benign group were divided in subgroups on the basis of their trait anxiety scores, women with high scores on trait anxiety scored low on QoL irrespective of diagnosis. Women who did not score high on trait anxiety scored considerably higher on QoL. One study was found that examined the influence of anxiety on QoL and established a negative correlation between high trait anxiety and state anxiety and overall QoL. However this effect was only studied in women who received adjuvant treatment for breast cancer and there was no baseline measurement before diagnosis was known.[26]

Breast cancer patients experienced a decrease in overall QoL and physical health domain compared with benign patients, but the breast cancer patients not high on trait anxiety experience a better QoL than benign patients high on trait anxiety on all measurement moments. This may imply that the diagnosis breast cancer has less impact then expected and the personality profile is more important for the QoL development of these women. One might even argue that in women high on trait anxiety, breast cancer screening may induce more stress than a benign diagnosis will resolve.

Further studies with longer follow-up are needed to analyze the effect of passing time on QoL for both patients with a benign diagnosis and breast cancer patients. The correlation of psychological factors such as fatigue and the presence of depressive symptoms with the scores on general QoL also needs further research. The association may be explained by the impact of, for instance, adjuvant treatment on daily life.

From the results of this study it can be concluded that personality, in particular, trait anxiety has a very profound impact on QoL. Therefore, we feel it is important to include the personality of the patient in the treatment plan. It is feasible that women complete a short questionnaire at the start of the diagnostic process to see whether they have a high trait anxiety. If so, psychological support by professionals is needed to teach these patients to cope with fear and, in this case, with fear for breast cancer.

ACKNOWLEDGMENTS

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