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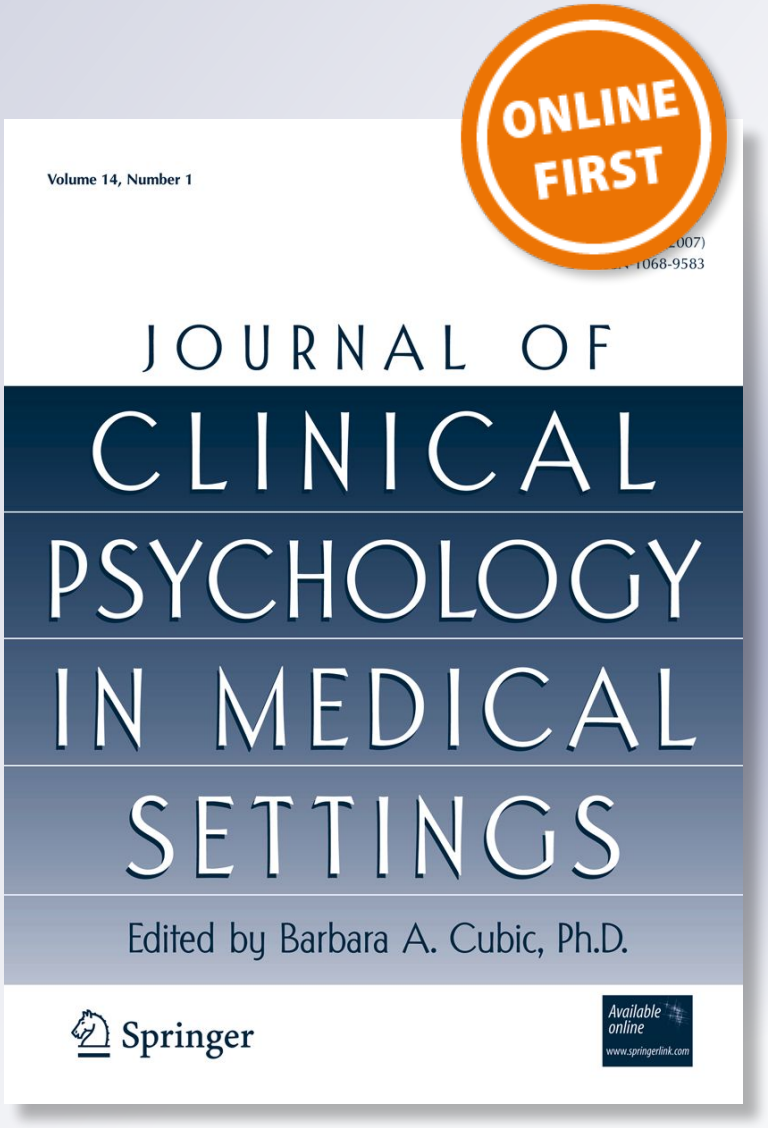

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Development of a Short Version of the Dutch Version of the Spielberger STAI Trait Anxiety Scale in Women Suspected of Breast Cancer and Breast Cancer Survivors

Jolanda De Vries · Guus L. Van Heck

Abstract The objective of the current study was to develop a short form of the Dutch version of the State-Trait Anxiety Inventory (STAI) Trait scale and to provide initial validation data in a sample of breast cancer patients and survivors. This short trait anxiety (A-Trait) scale was designed to reduce time and effort required of severely ill or handicapped patients involved in extensive assessment procedures. Another goal was to assess A-Trait with minimal overlap with content that reflects Quality of Life (QoL) and fatigue. Three groups of women either completed the original Trait scale (Groups 1 and 2) or the 10-item trait version (Group 3). In Group 1, exploratory factor analysis with the Scree test, Velicer's MAP criteria and parallel analysis as tests for factor retention, indicated a 10-item Trait version reflecting two factors: Anxiety Present and Anxiety Absent. In the other groups, confirmatory factor analysis showed that the two-factor short form provided the best fit. In all three groups Trait Anxiety was highly related to Neuroticism. The correlation between Overall QoL and General Health and the Anxiety Present short scale was lower than the correlation between Overall QoL and General Health and the full form ($Z = 2.20, p = .03$). With this short A-Trait scale it becomes possible to study the relationship between dispositional anxiety and clinically important outcome variables without inflating estimates of these relations through psychometric contamination.

Keywords Trait anxiety · State-Trait Anxiety Inventory · Validity · Health assessment

Introduction

Relative to normative samples, early stage breast cancer patients appear to have substantially higher levels of trait anxiety (Schreier & Williams, 2004). Other studies show that trait anxiety is related to acute postoperative pain (Caumo et al., 2002), psychological distress prior to surgery (Montgomery et al., 2003), as well as after surgery (Bleiker, Pouwer, Van der Ploeg, Leer, & Adèr, 2000). Furthermore, trait anxiety has been shown to be correlated negatively with total Quality of Life (QoL) before radiation therapy or chemotherapy (Schreier & Williams, 2004). In recent studies, it was found that trait anxiety predicted QoL scores up to 6 months after treatment in patients who came to an outpatient clinic on suspicion of having breast cancer (Van der Steeg, De Vries, Van der Ent, & Roukema, 2007). Therefore, it is important to assess trait anxiety in breast cancer patients, since patients scoring high on that particular personality characteristic need additional psychological support.

A commonly used questionnaire to assess anxiety is the State-Trait Anxiety Inventory (STAI); (Spielberger, Gorsuch, & Lushene, 1970). This questionnaire consists of two self-report scales: A-State and A-Trait. A-State reflects a temporary, acute anxious reaction with feelings of tension and apprehension. A-Trait refers to a relatively stable aspect of personality. Results from numerous studies consistently support the reliability and validity of these scales (e.g., Spielberger, 1983). One drawback of the STAI is its

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length (Marteau & Bekker, 1992). Questionnaires that are used in studies with severely ill patients should be as short as possible (Van Knippenberg, Duivenvoorden, Bonke, & Passchier, 1990). Patients with cancer are already stressed and, therefore, patient burden should be reduced as much as possible. Recently, Tluczek, Henriques, and Brown (2009) have stated that, although the STAI is a useful instrument, the fast-paced health care environment often precludes patients from completing the full scale, especially when the instrument is combined with other assessments. Therefore, researchers have to take patients' fatiguability and attention span into account (Langford, 2003; Saucier, 1994).

For the A-State scale there already exist good abridged versions (Marteau & Bekker, 1992; Spielberger et al., 1970; Van Knippenberg et al., 1990). Less is available concerning trait anxiety, a study across samples of cancer patients, medical students, and patients awaiting plastic or reconstructive surgery provided evidence of the possibility of shortening the A-Trait scale of the STAI by selecting an arbitrary chosen number of eight items for inclusion on the basis of their contributions in stepwise linear regression analyses to the prediction of the 20-item total score (Van Knippenberg et al., 1990). Content analysis of the items did not play a role in the shortening procedure. Also the items available to assess trait anxiety show a clear overlap with QoL and fatigue, thereby inflating the relationship between these concepts and trait anxiety. Van Knippenberg et al. (1990) did not pay attention to such an overlap with other concepts, but merely examined whether it was possible to shorten the A-Trait scale.

Therefore, the aim of the present study was to develop a scientifically supportable abbreviated version of the STAI A-Trait scale with good reliability and validity, while paying attention to obvious item content overlap with factors that are often viewed as important outcome measures of treatment for breast cancer: QoL and fatigue.

Methods

Patients

Women visiting the outpatient clinics of the St. Elisabeth Hospital Tilburg or the Maasland Hospital Sittard (since August 2004), the Netherlands, with a palpable lump in the breast or an abnormality on a screening mammography between September 2002 and December 2005 were asked to participate in a prospective follow-up study examining the role of personality characteristics in patients' QoL scores after surgery. The study focused on women with early stage breast cancer. Therefore, women with advanced breast cancer were not asked to participate. From the patients who were referred by their general practitioner and were eligible for participation in the study ($N = 493$), 303 (61.5 %) agreed to participate. The most common reasons for not participating were the length of the questionnaires ($n = 64$) and the feeling that the amount of experienced stress would compromise concentration while completing the questionnaires ($n = 107$). Four patients were excluded from the study because they had a locally advanced carcinoma or proven systemic disease. In addition, some women did not complete the questionnaires fully or correctly. Therefore, the data from 276 women, 118 with early stage breast cancer and 158 with benign breast problems, were used in this study (Group 1). All participants gave written informed consent.

Group 2 consisted of disease-free early stage breast cancer survivors. From January 2000 to December 2001, 272 women were diagnosed with breast cancer at the Department of Surgery of the St. Elisabeth Hospital, Tilburg (The Netherlands). In December 2005, all patients were evaluated to see how they were doing. Women who were not operated, who were diagnosed with locally advanced breast cancer of tumors larger than 5 cm or who developed recurrent breast cancer or systemic disease in the 4–5 years since treatment were not included in the follow-up study. One hundred and ninety-four women were eligible for participation. However, three patients were diagnosed with dementia, nine women were deceased, and four were lost to follow-up. The remaining 178 women were all contacted by phone and asked whether they wanted to participate. Reasons for refusal were 'not interested' ($n = 10$), 'too hard/do not want to be confronted with the past' ($n = 15$), and 'other reasons' ($n = 7$). Of the 146 women who agreed to participate in the study, 139 returned completed questionnaires and signed the informed consent form (78.7 %; Group 2).

Group 3 contained women visiting the outpatient clinics of the St. Elisabeth Hospital Tilburg, the Catharina Hospital, the Jeroen Bosch Hospital, or the VieCurie Hospital, the Netherlands. Women with a palpable lump in the breast or an abnormality on a screening mammography between May 2007 and May 2009 were asked to participate in a prospective follow-up study examining predictors of QoL and health care consumption after surgery. From the patients who were referred by their general practitioner to the Department of Surgery of one of the hospitals and were eligible for participation in the study ($N = 785$), 532 (67.8 %) agreed to participate. Later, 119 patients appeared to have breast cancer and 413 had benign breast problems (Group 3). The most important reasons for not participating were the length of the questionnaires ($n = 99$) and the expectation that the amount of stress experienced would compromise concentration while completing the questionnaires ($n = 187$).

Based on the data from Group 1, we found that trait anxiety is an important predictor of QoL, depressive symptoms and fatigue in women with breast problems (Van der Steeg et al., 2007). Therefore, we wanted to reduce the number of items of the STAI trait scale to make it easy to include the questionnaire in standard clinical care. The reduction was done on the data from Group 1. However, to make sure that the selection held up in breast cancer survivors, we examined the trait scale also in Group 2. Subsequently, the selected 10-item version was tested in a subsequent group of patients with breast problems (Group 3). It is necessary to show that an abbreviated version of an existing longer questionnaire is reliable and valid. Therefore, we could not publish our short version based on Group 1 (in which patients had completed the long version of the questionnaire), but had to wait until we had more data collected, also with the abbreviated version, to be able to examine the reliability and validity of the short version. For this reason we have used three samples to develop (Group 1) and test (Groups 2 and 3) the short version of the trait anxiety scale of the STAI. From these data we can conclude with a high degree of certainty that the short version is reliable and valid.

The three studies were all separately approved by the medical ethics committee of the St Elisabeth hospital. Data from Groups 1 and 3 were also collected in other hospitals in the region and their local ethics committees gave additional approval for the studies in these other hospitals. All participants gave written informed consent.

Questionnaires

The STAI (Spielberger et al., 1970; Dutch version: Van der Ploeg, Defares, & Spielberger, 1980) assesses individual differences related to the state and trait anxiety constructs and consists of two scales, each containing 20 items, with 4-point rating scales (1 *Not at all* to 4 *Very*). It is a widely used measure with good reliability and validity (Spielberger et al., 1970; Van der Ploeg et al., 1970). For instance, for the A-Trait scale Cronbach's alphas ranged from .84 to .95 and the test–retest reliability correlations varied from .75 (118 days interval) to .92 (1½ h interval) (Van der Ploeg et al., 1970). In the present study, only the A-Trait scale was employed. Groups 1 and 2 completed the entire 20-item version, whereas participants in Group 3 filled in the 10-item version.

Patients also completed the Neuroticism-Extraversion-Openness-Five Factor Inventory (NEO-FFI; Costa & McCrae, 1989; Dutch version: Hoekstra, Ormel, & De Fruyt, 1996). This questionnaire measures personality in the five domains of the Five Factor Model (FFM): Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. The questionnaire consists of 60 items with 5-point rating scales (1 *Totally disagree* to 5 *Totally agree*). The internal consistency of the domains ranges from .57 (Openness) to .88 (Neuroticism) (Hoekstra et al., 2003). Test–retest correlations range from .68 (two-month interval) to .87 (six-month interval) (Hoekstra et al., 2003). The validity of the NEO-FFI is good. For instance, the NEO-FFI domain Extraversion correlated .84 with the Extraversion scale from another questionnaire (4DPT) and the NEO-FFI domain Neuroticism was highly correlated with the total CES-D score ($r = .68$) (Hoekstra et al., 2003). Patients in the Groups 1 and 2 completed the entire NEO-FFI, whereas participants in Group 3, in order to keep the number of items in a rather extensive test booklet within acceptable limits, only completed the 12-item Neuroticism scale.

The Fatigue Assessment Scale (FAS); (Michielsen, De Vries, & Van Heck, 2003) is a 10-item questionnaire to assess fatigue, using 5-point rating scales (1 *Never* to 5 *Always*). The psychometric properties appear to be good. Internal consistency varied from .88 to .90 (De Vries, Van der Steeg, & Roukema, 2010; Michielsen et al., 2003) and test–retest reliability ranged from .88 to .89 (De Vries, Michielsen, Van Heck, & Drent, 2004; De Vries et al., 2010) across samples. With regard to validity, the correlations between the FAS and another instrument for assessing fatigue, the Checklist Individual Strength (CIS); (Vercoulen, Alberts, & Bleijenberg, 1999) ranged from .60 to .76. In addition, the FAS items could be distinguished from items reflecting depressive symptoms (De Vries et al., 2004; Michielsen et al., 2003). All patients completed the FAS.

The World Health Organization Quality of Life assessment instrument (WHOQOL-100; WHOQOL group, 1995; Dutch version: De Vries & Van Heck, 1995) consists of 100 items that are divided in 24 facets covering four domains (Physical, Psychological, Social Relationships, and Environment) and an Overall QoL and General Health facet. The reliability and validity are satisfactory (De Vries & Van Heck, 1997; WHOQOL group, 1998), and the sensitivity to change is good (Bonomi, Patrick, Bushnell, & Martin, 2000; O'Carroll, Smith, Couston, Cossar, & Hayes, 2000). For instance, internal consistency ranged from .65 for the facet Physical Environment to .93 for the facet Working Capacity. In addition, participants who were healthy had significantly better scores on all facets, except the facet Physical Environment, compared with participants who were ill (WHOQOL group, 1998). In the present study, only the Overall QoL and General Health facet was employed. The internal consistency of the 4-item Overall QoL and General Health facet was .84 (WHOQOL group, 1998).

Procedure

Patients in Group 1 were asked by the nurse practitioner (NP) to participate in the study, when they first came to the hospital for suspicion of breast cancer, that is, before diagnosis was known. First, the NP explained the purpose of the study, what was expected of patients who participated, and provided written information about the study. Patients were told that participation was voluntary and that not participating in the study would not have any effect on treatment. When a patient was willing to participate, she was asked to sign an informed consent form and received the questionnaires. Patients completed the questionnaires in the hospital.

Patients who fulfilled the inclusion criteria for Group 2 received a telephone call by a surgeon assistant. This assistant explained the purpose of the study to the patients and asked them to participate. When they agreed, they received the questionnaires and an informed consent form at home.

The procedure in Group 3 was similar to the procedure in Group 1.

Statistical Procedure

The number of questions in the A-Trait scale was reduced based on analyses of the data of the group of women suspected for breast cancer (Group 1). The steps in reducing the number of items of the A-Trait scale were as follows. First, items with a correlation $\geq$.55 with the WHOQOL facet 'Overall Quality of Life and General Health' as well as the trait items correlating $\geq$.75 with the trait item that was found to have the highest correlation with the QoL facet were removed because they reflected predominantly QoL, an important outcome of treatment. Second, based on analysis of content questions with an explicit overlap with energy/fatigue (face validity) were removed, since theoretically fatigue can be a consequence of enduring anxiety. Subsequently, step 3 entailed the calculation of corrected item-total correlations, that is, scores on each item were related to scores on the remaining 14 items. The criterion for items to be retained was a corrected item-total correlation of .60 or higher. Step 4 consisted of an exploratory factor analysis (Principal Components Analysis; PCA) on the items that remained after step 3 to examine the factor structure and to explore whether further reduction of the number of questions was possible. Visual exploration of the graphical representation of the eigenvalues (Scree test; Cattell, 1966), parallel analysis, a Monte Carlo simulation technique featuring a comparison of the scree plot of the eigenvalues from the real data with the Scree plot of the eigenvalues from random data (Glorfeld, 1995; Zwick & Velicer, 1986), and analysis of the average partial correlations computed after removing the influence of the extracted components from the original correlation matrix (Minimum Average Partial test, MAP); (Velicer, 1976), were used to determine the number of factors to extract when conducting the PCA.

O'Connor's (2000) SPSS syntax files were used to conduct parallel analysis and the MAP test. This set of three criteria was used in addition to the eigenvalue $\geq$1.0 criterion, because it is known that this so-called Kaiser criterion frequently results in an overestimation of the number of factors underlying the data (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Gorsuch, 1997; Kline, 1987). Correlations were calculated between the short form and the full length A-Trait scale and the remainder form (the items that do not constitute the short form).

Confirmatory factor analysis (CFA; AMOS 4.0; Arbuckle, 1999) was used to test three competing factor models in the group of breast cancer survivors (Group 2): the original 20-item trait version (Model 1), the one-factor 10-item short form (Model 2), and the two-factor (Anxiety Present/Anxiety Absent) 10-item short form (Model 3). CFA was also performed to test the 10-item short form (Model 2) and the 2-factor short form (Model 3) in Group 3. Good fit is indicated by a non-significant Chi-square test (χ^2/df ratio under 2). Furthermore, we evaluated goodness of fit using the Comparative Fit Index (CFI); (Bentler, 1990), the Tucker-Lewis Index (TLI); (Tucker & Lewis, 1973), and the Root Mean Square Error of Approximation (RMSEA). We used the CFI instead of the 'classical' Normed Fit Index (NFI); (Bentler & Bonett, 1980) because the latter index has shown a tendency to underestimate fit in relatively small samples (Bentler, 1990). For the CFI and the TLI, values $\geq$.90 constitute acceptable fit to the data (e.g., Hu & Bentler, 1999). RMSEA coefficients $\leq$.08 represent reasonable errors of approximation in the population, while values less than .05 indicate good fit (Browne & Cudeck, 1993). A change in CFI values (ΔCFI) >.01 reflects a meaningful difference in model fit (Cheung & Rensvold, 2002).

The internal consistency was calculated using Cronbach's α coefficients for the three groups and for all three versions (full form, short form, and 2-factor short form), if applicable. A value of .70 or higher is considered as evidence of good reliability (Nunnally, 1978).

The three versions of the A-Trait scale were correlated (Pearson's correlations) with the Overall Quality of Life and FAS scores to answer the question whether overlap with measures of QoL and fatigue was reduced in the short versions. Construct validity is the extent to which the questionnaire actually assesses what it is intended to assess (Zechmeister, Zechmeister, & Shaughnessy, 2001). To provide information on this type of validity, in all three groups Pearson correlations were calculated between the three trait versions and the NEO-FFI (in Group 3 only with

the Neuroticism scale). Neuroticism was used to provide information on convergent validity, that is, the extent to which the short-form of the A-Trait scale is associated with questionnaires that measure related constructs. The other four Five Factor personality characteristics were employed to give insight in divergent validity, i.e., the extent to which the short-form of the anxiety-Trait scale is not associated with questionnaires that measure unrelated constructs. A p value <.01 was considered statistically significant. To test whether the difference between two correlations was statistically significant, Fisher Z statistics were used. Except for the CFA, all analyses were done with SPSS for Windows (version 15.0).

Results

The demographic characteristics of the two patient groups are presented in Table 1. In the group of women who were suspected of having breast cancer ($N = 276$; Group 1), 118 appeared to have early stage breast cancer. Women of Group 1, who participated in the study, were younger ($t = 3.17$, $p = .002$) and appeared to have breast cancer ($\chi^2 = 4.62$, $p = .032$) more often than the non-participants. The 38 women in Group 2, who declined participation, were comparable to the included women with respect to surgical treatment and tumor characteristics. However, women who participated in Group 2 were significantly younger ($p = .003$), received chemotherapy more often ($p = .048$), and/or radiotherapy ($p = .047$), compared with the non-participants. Participants in Group 3 only differed from non-participants with regard to diagnosis, i.e., women with breast cancer participated less often ($\chi^2 = 13.1$, $p < .001$).

Compared with women in Group 3, participants in Groups 1 and 2 more often had either a high (university degree; higher vocational) or a low (primary school; lower vocational) education level instead of a middle level (i.e., higher general secondary education, pre-university education, intermediate vocational education) ($\chi^2 = 225.80$, $p < .001$), and more often had paid work ($\chi^2 = 33.31$, $p < .001$). Furthermore, women in Group 2 had higher scores on the personality trait conscientiousness than women in Group 1, whereas women in Group 1 scored higher on trait anxiety. In addition, Group 2 was significantly older than Group 3 ($F = 5.31$, $p = .005$), which can be explained by the fact that women in this group received their diagnosis a few years earlier. The groups did not differ on the other demographic and psychological factors.

The reduction of the number of items was performed in Group 1. In the first phase of Step 1, three items ('Feel pleasant', 'Am happy', 'Am content') were removed for

Table 1 Patient characteristics

Characteristics	Women suspected of having breast cancer (Group 1; $N = 276$)	Breast cancer survivors (Group 2; $N = 139$)	Women suspected of having breast cancer (Group 3; $N = 532$)
Demographic factors			
Age: mean ± SD (range)#**	54.5 ± 11.0 (19–87)	56.6 ± 11.4 (26–85)	53.1 ± 11.7 (19–94)
Living with a partner: yes/no/missing	19.6/77.5/2.9	72.7/26.6/.7	79.1/20.5/.4
Children: yes/no	85.5/14.5	83.5/16.5	86.5/13.5
Educational level[@],**: low/middle/high/missing	34.1/44.6/16.6/4.7	40.3/42.4/17.3	13.0/72.5/.2/14.3
Paid work: yes/no[@]**	47.1/52.9	32.4/66.9/.7	57.9/41.5/.6
Personality factors (mean ± SD)			
Trait anxiety[‡]**	39.2 ± 11.4	35.4 ± 9.1	7.5 ± 5.0[!]
Neuroticism	31.0 ± 7.2	29.7 ± 7.0	27.4 ± 7.5
Extraversion	39.8 ± 5.8	40.7 ± 6.3	
Openness	36.0 ± 5.4	35.7 ± 5.7	
Agreeableness	43.3 ± 4.2	44.2 ± 4.1	
Conscientiousness[‡]*	44.8 ± 5.4	46.3 ± 5.3	

Note: Demographic characteristics are presented in percentages. [!] Mean ± SD of the short form; * $p < .05$; ** $p < .01$; [#] Group 2 significantly different from Group 3; [@] Group 1 differs from the other groups; [‡] Group 1 significantly different from Group 2

In a historical control group of 1,390 healthy females, representative of the Dutch female population (NEO-FFI manual; Hoekstra et al., 1996) the following means and Standard deviations were obtained: 32.2 (8.2), 40.3 (6.6), 36.3 (6.3), 45.1 (5.0), and 45.3 (5.6) for Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness, respectively). Compared to this control group, all three groups scored significantly lower on Neuroticism ($p = .001$, $p = <.0001$, $p = <.0001$ for Group 1, Group 2, and Group 3, respectively). Compared to the control group, Groups 1 and 2 scored significantly lower on Agreeableness ($p = .000$, $p = .011$, respectively). Group 2 had a higher score on Conscientiousness ($p = .028$)

reasons of correlating substantially ($r = .55$) with the WHOQOL facet 'Overall Quality of Life and General Health' (.58, .58, .57, respectively). Then, one additional item ('Feel satisfied') was removed, because, besides a sizeable correlation of .53 with 'Overall Quality of Life and General Health', it correlated very high with the removed items 'Feel pleasant' and 'Am content': .80 and .75, respectively. Furthermore, one item ('Feel rested') was removed because of conceptual overlap with energy/fatigue, which was reflected in a negative correlation of −.63.

Five additional items were removed due to the fact that they contributed to a lesser extent to the intended homogeneity of the scale as reflected in relatively lower corrected item-total correlations. The corrected item-total correlations in Group 1 are presented in Table 2. The 10 items that met the criterion ($r \geq .60$) were selected.

Visually locating the elbow, that is the point where the eigenvalues form a descending linear trend, in the graph of the eigenvalues (Scree plot) was rather difficult, due to the fact that there was no natural break point in the data where the curve flattens out. The eigenvalue ≥1.0 criterion resulted in two factors; Factor 1, Anxiety Present (6 items; Nervous and restless, Difficulties piling up, Worry too much, Disturbing thoughts, Thoughts bother me, Tension or turmoil) and Factor 2, Anxiety Absent (four items; Calm cool collected, Feel secure, Feel at ease, Steady mood). Results from the parallel analysis with 1000 random datasets containing 558 participants and 10 variables indicated that the eigenvalues of Factor 1 (5.12) and Factor 2 (1.16) were significantly higher than expected by chance. This was not the case for the third component of the PCA (eigenvalue = .71). The random data eigenvalues were 1.21, 1.15, and 1.10 for the first three roots, respectively. The MAP test also confirmed the 2-factor solution. Factor 1 explained 51.2 % of the total variance in the set of 10 items and Factor 2 another 11.6 %, making a cumulative percentage of 62.8. Table 3 contains the rotated (Varimax) factor loadings.

The correlation between the full-length 20-item A-Trait scale and the 10-item short form was .97, whereas the association between the short form and the remainder form was .89. The internal consistency of the short form was .90. The Cronbach's α coefficients were .85 and .86 for the short form Anxiety Present and Anxiety Absent scores, respectively. The analyses for patients with a benign breast problem and patients with breast cancer separately showed that the internal consistency as well as the correlation between the full-length and the short form were similar in both subgroups.

Subsequently, the data from the survivor group (Group 2) were used to test three models of the STAI Trait scale with CFA (see Table 4). The one-factor model of the short form (see Fig. 1) was superior to the model with the complete set of all 20 items, because it only required two correlations of error terms ('Worry too much' with 'Feel at ease'; 'Feel secure' with 'Feel at ease). The CFI could be increased to .95 ($\chi^2(30) = 51.60$, $p = .01$; TLI = .93; RMSEA = .07) by adding three additional correlations between error terms ('Nervous and restless' with 'Steady mood'; 'Calm, cool, collected' with 'Steady mood'; 'Disturbing thoughts' with 'Feel secure'). In contrast, the model of the original 20-item version required even nine

Table 2 Corrected item-total correlations for the STAI Trait scale for the group of women suspected of having breast cancer (Group 1; $N = 276$) and the two sub-groups, i.e., the women who appeared to have breast cancer ($n = 118$), and patients with benign breast problems ($n = 158$)

Items (item number)	Women suspected of breast cancer *r*	Subgroup that appeared to have breast cancer *r*	Subgroup that appeared to have benign problems *r*
Nervous and restless (22)	.67	.67	.64
Misfortunes (24)	.39	.43	.44
Feel like a failure (25)	.57	.41	.59
Calm, cool, collected (27)	.77	.74	.81
Difficulties piling up (28)	.64	.64	.68
Worry too much (29)	.60	.53	.62
Disturbing thoughts (31)	.63	.66	.63
Lack self-confidence (32)	.37	.39	.44
Feel secure (33)	.69	.62	.68
Feel at ease (34)	.79	.80	.78
Steady mood (35)	.69	.70	.69
Thoughts bother me (37)	.63	.63	.65
Take disappointments keenly (38)	.54	.52	.61
Steady person (39)	.55	.56	.56
Tension or turmoil (40)	.63	.66	.65

Table 3 Rotated factor loadings for the set of 10 A-Trait items

Item no.	Item	Factor 1	Factor 2
9	Thoughts bother me	.78	−.17
5	Disturbing thoughts	.75	−.23
10	Tension or turmoil	.73	−.24
4	Worry too much	.71	−.19
1	Nervous and restless	.68	−.32
3	Difficulties piling up	.59	−.36
7	Feel at ease	−.27	.88
6	Feel secure	−.13	.87
8	Steady mood	−.33	.68
2	Calm cool collected	−.51	.64

correlations between error terms to reach a CFI of .89 [χ^2 (159) = 297.31, $p < .001$; TLI = .87; RMSEA = .08]. This model could not be improved further. However, the one-factor short form model could be further improved by splitting the 10-items into two factors, an Anxiety Present and an Anxiety Absent factor (see Fig. 2). Without any correlations between error terms, this two-factor short form model had a CFI of .97 [$\chi^2(34) = 75.79$, $p < .001$; TLI = .97; RMSEA = .05].

Again the internal consistency and correlations between the various versions of the STAI Trait scale were examined, but now for Group 2. The correlations between the short form, on the one hand, and the full and remainder forms, on the other hand, were .96 and .83, respectively. The correlations between the full form, on the one hand, and the Anxiety Present and Anxiety Absent factors of the short form, on the other hand, were .84 and −.85, respectively. For the remainder form and scores for Anxiety Present and Anxiety Absent, these correlations were .69 and −.76, respectively. The internal consistency of the short version was .85. For the two-factor short version, the Cronbach's alphas for the subscales Anxiety Present and Anxiety Absent were .81 and .80, respectively.

The CFA of the short form in Group 3 revealed that the one-factor 10-item model (Model 2) had a very unfavourable χ^2 statistic ($\chi^2(35) = 454.18$, $p < .001$);, a very poor CFI of .70, a TLI of .62 that remains far from the level that represents an acceptable fit; and an unsatisfactory RMSEA of .18). After allowing five correlations between error terms (e6–e7; e2–e8; e4–e5; e6–e8; e7–e8), the CFI increased to .95 (χ^2 (30) = 94.29, $p < .001$; TLI = .93; RMSEA = .07). The two-factor short form model presented in Fig. 2 (Model 3) did not need any correlations between error terms in order to have a CFI of .97 (χ^2 (34) = 71.95, $p < .001$; TLI = .97; RMSEA = .05).

The internal consistency of the one-factor short form was .85. For the 2-factor short form the internal consistency for the Anxiety Present scores was .82 and for the Anxiety Absent scores .83.

Pearson correlations were calculated between the three trait versions (full and short form, and 2-factor short form) and the NEO-FFI personality factors (see Table 5). In all three groups Trait Anxiety was highly related to Neuroticism. In the Groups 1 and 2, in which participants completed the entire NEO-FFI, Trait Anxiety scores had moderate or small associations with scores on the Extraversion, Agreeableness, and Conscientiousness measures. Inconsistent findings were found between Trait Anxiety and Openness to Experience: no relationship in one sample and a small association in another sample. There seemed to be a difference between both groups with regard to their scores on Openness to Experience, Agreeableness, and

Table 4 Results from the confirmatory factor analyses

	χ^2	*df*	χ^2/df	CFI	TLI	RMSEA	Comparison	ΔCFI
G2								
M1+	297.31	1,159	1.87	.89	.87	.08	M1+ vs. M2+	.04
M2+	66.56	1,33	2.02	.93	.90	.08	M1+ vs. M2 ++	.06
M2++	51.60	1,30	1.72	.95	.93	.07	M2++ vs. M3+	.02
M3	45.14	1,33	1.37	.97	.97	.05		
G3								
M2	454.18	1,35	12.98	.70	.62	.18	M2 vs. M3	.27
M2+	94.29	1,30	3.14	.95	.93	.07	M2+ vs. M3	.02
M3	71.95	1,34	2.12	.97	.96	.05		

χ^2 Chi-square, *CFI* Comparative Fit Index, *TLI* Tucker–Lewis Index, *RMSEA* Root Mean Square Error of Approximation, *ΔCFI* Difference in CFI values

G2 = Group 2; G3 = Group 3; M1+ in G2 = Model 1 with nine added parameters representing the correlations between item residuals; M2+ in G2 = Model 2 with 2 added parameters representing the correlations between item residuals; M2++ in G2 = M2 with five added parameters representing the correlations between item residuals; M3 in G2 = M3 without added parameters representing the correlations between item residuals; M2 in G3 = M2 without added parameters representing the correlations between item residuals; M2+ in G3 = Model 2 with five added parameters representing the correlations between item residuals; M3 in G3 = Model 3 without added parameters representing the correlations between item residuals

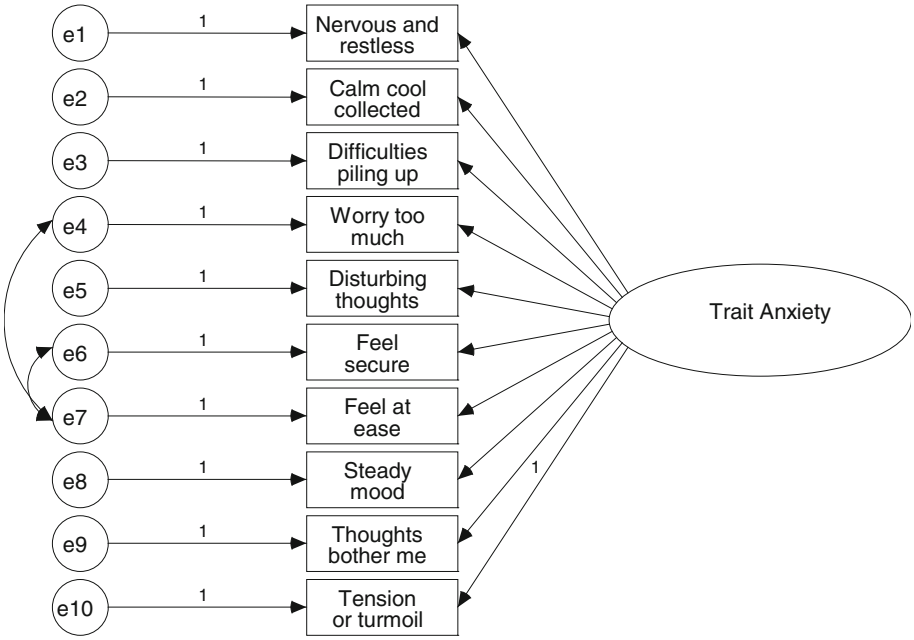

Fig. 1 The 1-factor model for the 10-item version of the A-Trait scale. e1–e10 are error terms belonging to the respective items

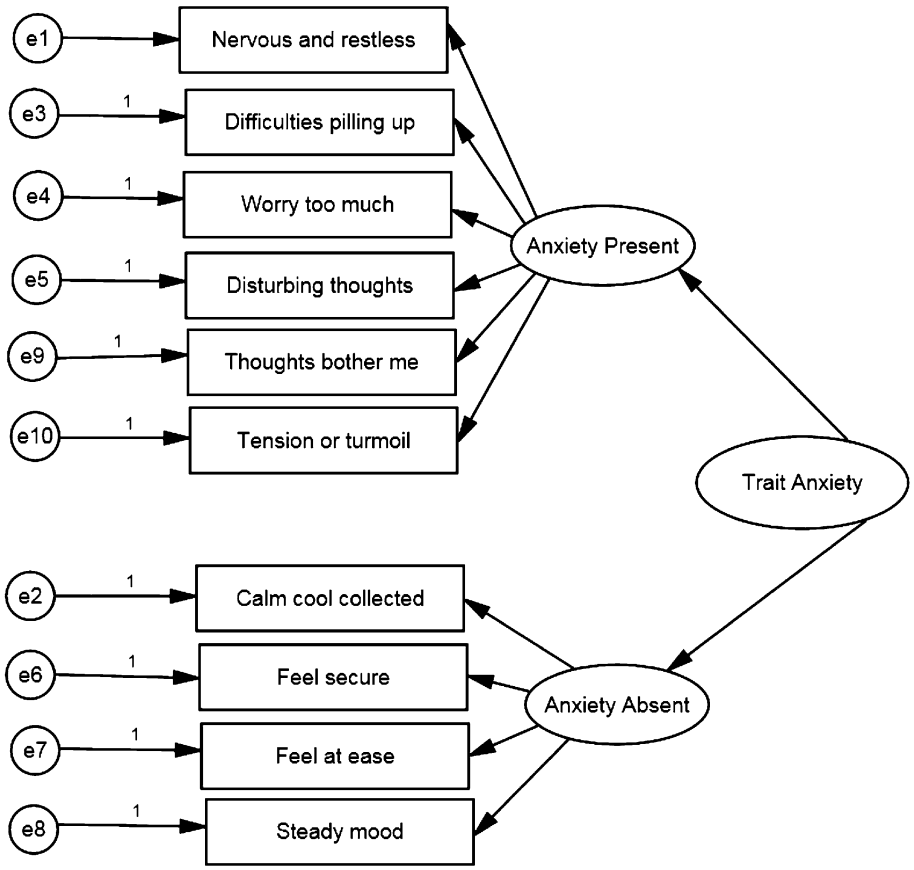

Fig. 2 The 2-factor model for the 10-item version of the A-Trait scale

Conscientiousness. However, these differences were only statistically significant with regard to Conscientiousness scores ($p = .04$). The correlations between Trait Anxiety scores, on the one hand, and ratings on the Fatigue and Overall QoL and General Health measures, on the other hand, were highest for the original full scale, lower for the short form, and lowest for the 2-factor short form (see Table 5). The correlation between Overall QoL and General Health (WHOQOL-100) and the Anxiety Present scale of the 2-factor short form was significantly lower than the correlation between Overall QoL and General Health and the full form ($Z = 2.20$, $p = .03$). For the correlation

Table 5 Correlations between the STAI Trait (original 20-item, 10-item, and 2-factor 10-item scale) and the personality factors (NEO-FFI), fatigue (FAS), and the facet Overall QoL (WHOQOL-100) for the group of women suspected of having breast cancer (Group 1; $N = 276$), the group of disease-free breast cancer survivors (Group 2; $N = 140$), and another group of women suspected of having breast cancer (Group 3; $N = 532$)

Personality factors, fatigue, and Overall QoL & General Health	Original STAI Trait scale		10-item STAI Trait scale			2-factor 10-item STAI Trait scale		
	Group 1	Group 2	Group 1	Group 2	Group 3	Group 1 AP, AA	Group 2 AP, AA	Group 3 AP, AA
Neuroticism	.71	.66	.69	.63	.73	.65, −.67	.63, −.45	.69, −.53
Extraversion	−.38	−.37	−.34	−.32		−.27, .37	−.26, .29	
Openness to experience	−.06	.14	−.08	.13		−.08, .05	.10, −.12	
Agreeableness	−.29	−.18	−.29	−.18		−.29, .24	−.14, .18	
Conscientiousness	−.29	−.12	−.27	−.08		−.20, .32	−.05, .09	
Fatigue	.65	.69	.61	.64	.56	.57, −.56	.57, −.57	.54, −.40
Overall QoL & General Health	−.65	−.68	−.60	−.60	−.50	−.49, .63	−.51, .55	−.45, .40

AP Anxiety Present, *AA* Anxiety Absent

All correlations above the absolute value .25 are significant at $p < .01$

between the Anxiety Absent scale of the 2-factor short form and the full form we found a trend ($Z = 1.74$, $p = .08$). The difference between the other correlations did not reach p-values below .10.

In order to establish cut-off scores for the 10-item short form and the Anxiety Present scale of the short form, the cut-off score for high trait anxiety of the original version (i.e., a score above 43) was divided by 2.0 and 3.3, respectively. For the 10-item short form this resulted in a cut-off score of 22. So, scores of 22 or higher indicate high trait anxiety. This cut-off score appeared to provide approximately the same percentage of patients scoring high on trait anxiety as the percentage found with the original 20-item version in both Group 1 (36.9 and 36.6 %, respectively) and Group 2 (19.1 and 19.9 %, respectively). For the 6-item Anxiety Present scale, a cut-off score above 13 was taken as a starting point. As already mentioned, in Group 1 36.6 % of the patients scored above the cut-off value. Using the cut-off score of 13 for the 6-item scale, 23.9 % of the patients scored above this value. With a cut-off score of 12, this percentage was 27.2 %, and for a cut-off score of 11 the percentage was 38.4 %. Because we did not want to overestimate Trait Anxiety level, we chose the cut-off value of 12. In Group 2, 19.9 % of the patients scored high on Trait Anxiety using the 6-item Anxiety Present scale with a cut-off score of 12. This percentage was the same as for the original version. In Group 3, 18.3 % had a score higher than 12.

Discussion

The aim of the present study was to develop an abridged version of the Dutch STAI Trait Anxiety scale with good psychometric qualities, while paying attention to obvious item content overlap with QoL, well-being, and fatigue.

The obtained 10-item short version reflects the same construct as the original 20-item version, indicated by a very high correlation between both versions. This short version has good content validity and can be used adequately to assess trait anxiety, thereby reducing patient burden and minimizing response bias. Using CFA, a good fit was found for the short version, whereas this was not the case for the original 20-item version.

Furthermore, scores on the 10-item version of the Trait Anxiety scale demonstrated excellent reliability. The Cronbach's α values were above the .70 threshold.

It was found that the STAI Trait Anxiety scale has two subscales: Anxiety Present and Anxiety Absent. This is in line with a number of studies examining the structure of the questionnaire (e.g., Hishinuma et al., 2000; Shek, 1988; Spielberger et al., 1980). The Anxiety Absent scale contains items that reflect not directly the opposite of anxiety, but predominantly more general positive feelings ('Feel at ease', 'Steady mood', and 'Calm, cool, collected'). This indicates that, when screening for trait anxiety, it may be sufficient to focus on the Anxiety Present questions.

Although the 10-item short version appears very useful, the 6-item Anxiety Present scale within the 10-item short version had even a better fit, while scores on this 6-item measure showed similar reliability and validity coefficients compared with the 10-item version. Therefore, we would advocate for the use of the 6-item Anxiety Present scale in standard care because it even further reduces patient burden, while minimizing response bias.

Compared with the original trait form, the short forms, both the 10-item version and the 2-factor version, had similar relations with the five basic personality characteristics of the FFM. The substantial relationship between scores on Trait Anxiety and Neuroticism supports convergent validity, because within the FFM Trait Anxiety is

one of the facets of Neuroticism (Costa & McCrae, 1989). For the Extraversion, Agreeableness, and Conscientiousness scales, the correlation with Trait Anxiety were moderate or small, replicating earlier findings with the full 20-item Trait Anxiety scale (Canals, Esparó, & Fernández-Ballart, 2002; Gomez & Gomez, 2005), while no relation was found with self-ratings on the Openness scale. This provides convincing evidence of divergent validity.

Although the associations between scores on the 10-item short form and the measures of Overall Quality of Life and Fatigue were slightly less than for the original form, these differences were not statistically significant. The associations between the 6-item Anxiety Present scale and Overall Quality of Life and Fatigue measures were even less than the relations found in case of the 10-item short form. The differences in correlations between the original version and the 6-item Anxiety Present scale were statistically significant for associations with scores on the Overall Quality of Life assessment instrument.

We have reported cut-off scores for the short versions. These cut-off scores have to be conceived of as preliminary cut-off scores. Future research with an independently identified criterion group of high-scorers on A-Trait and a large randomly selected community-based sample will be helpful in the selection of more permanent cut-off scores.

The administration time gained when patients only completed the 10-item version instead of the original 20-item version was on average 7 min. Although this does not seem much, in clinical practice, where doctors do not have much time for each patient, these 7 min are important. The possible further reduction from 10-items to 6-items can result in an additional time gain of 3 min, which is relevant for clinical practice.

The 10-item trait version was developed among women who were suspected of having breast cancer and examined in women who were diagnosed with breast cancer 4–5 years ago and did not have a recurrence during that time. The usefulness of the short version of the trait anxiety scale for men, the general population, or patients with other diseases needs to be examined in future studies. Based on the finding by Foot and Koszycki (2004), no differences are expected between males and females.

It could be argued that at the time of assessment the participants in the present study experienced relatively high state anxiety, due to the fact that they were facing a life-threatening illness. Research on affective priming (e.g., Bower, 1991; Forgas, 2001) point at the possibility that negative thinking patterns are mood state dependent. It is conceivable that individuals, when in an anxious mood state, are more likely to recall more frequent anxiogenic memories and consequently report a higher Anxiety-Trait score compared with persons experiencing euthymic states. So, perhaps this has caused some response bias. However, we do not think that such a possible response bias has played a decisive role in the shortening of the Anxiety-Trait scale. There is some reason to expect higher total Anxiety-Trait scores, but there are no grounds to assume that the correlations with Overall QoL, item-total correlation, and the PCA factor pattern have been affected by affective priming. This does not imply, however, that future research on other populations would not be desirable. Future research on other study samples will be necessary to scrutinize the generalizability of the present study's findings.

In conclusion, we developed a short form of the STAI A-Trait scale that reflects the original form and has a good reliability and validity, while reducing confounding with the concepts 'QoL', 'well-being', and 'fatigue'. The 6-item Anxiety Present scale has even a better structure fit than the 10-item version and has similar reliability and validity, while reducing patient burden and facilitating implementation of the questionnaire even further.

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