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Anger in Health, Benign Breast Disease and Breast Cancer: A Prospective Case–Control Study

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Abstract. *Background: The State-Trait Anger Expression Inventory 2 (STAXI-2) is a psychometric instrument measuring anger experience and expression. Associations between the STAXI-2 and risk of breast cancer (BC) are rarely considered together in a prospective study. Patients and Methods: A total of 117 women with breast symptoms referred for breast examination were selected and assessed before any diagnostic procedures. Results: Twenty-four patients with BC, 44 with benign breast disease (BBD) and 49 healthy individuals (HHS) were included. Scores for parameters state anger/feel like expressing anger physically (SANGP) were significantly higher in the HHS group (HHS vs. BBD: p=0.027; HHS vs. BC: p=0.025). BC patients showed a trend to lower scores in almost all scales of STAXI-2, except for the scales trait anger/angry temperament (TANGT), anger expression-in (AX-I), and anger control-out (AC-O), that were higher than the two other groups' scores. Conclusion: The results of this study do not support a specific link between STAXI-2 and breast cancer risk.*

The interplay among psychosocial factors, psychiatric comorbidity, and chronic emotional distress as possible associated features or co-factors in the onset, course, and clinical expression of breast cancer (BC) has gained attention in research strategies pursued by different specialties. Among psychosocial factors, inadequate family functioning and conflicting relationships, maladaptive coping styles ("hopelessness-helplessness" and "anxious preoccupation"), and dysfunctional emotional control have been indicated as possible predictors of psychopathological symptoms in patients with BC (1-4). Regarding psychiatric comorbidity, women with BC had higher levels of anxiety, depression and general psychopathological symptoms compared with unaffected individuals (5-7).

Regarding emotional distress, research shows that negative emotions and emotional repression can influence immune responses and hormonal levels, possibly contributing to the mechanisms underlying the regulation of carcinogenesis, with higher cancer incidence and faster progression (8, 9). Among negative emotions, anger suppression in particular was a predictor of higher levels of symptoms related to immune function and cardiovascular arousal (*e.g.*, mouth sores and heart palpitations) during chemotherapy for BC, also influencing maladaptive coping styles (10).

Anger is a negative emotion conceptualized either as a "state" condition, reactive to unpleasant or frustrating events, or as a "trait" feature, which represents a stable component of personality. Within this conceptual frame, a reliable measure of anger experience and expression, the State-Trait Anger Expression Inventory – Second edition - STAXI-2, has been developed (11). To the best of our knowledge, this psychometric instrument has been rarely used in BC research, and therefore the present prospective study was designed to evaluate the role of STAXI-2 in a sample of women with breast symptoms referred for breast examination to the University Hospital of Messina, Italy.

Patients and Methods

Participants. Women with breast symptoms referred for breast examination to the Department of Radiological Sciences of the University Hospital of Messina, from January 2012 to December 2012, were consecutively selected and enrolled in the study.

Women were asked to participate in the study and were interviewed by a psychiatrist before any diagnostic procedures, so neither the interviewer nor the patient knew the diagnosis at the time of the interview. The interviews were recorded, and ratings were completed before the final diagnosis.

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Key Words: Breast disease, anger, STAXI-2, breast cancer risk.

Table I. *Clinicodemographic features of the study participants.*

	BC (n=24)	BBD (n=44)	HHS (n=49)	*p*-Value
Age (years), mean±SD	52.2±6.2	48.5±11.1	49.1±7.8	0.258[b]
Age at menarche (years), mean±SD	12.4±1.1	12.4±0.9	12.5±1.1	0.832[b]
Family history of BC, number (%)	1 (4%)	4 (9%)	9 (18%)	0.162[a]
Use of oral contraceptives, number (%)	6 (25%)	14 (32%)	17 (35%)	0.704[a]
Smoking, number (%)	8 (33%)	10 (23%)	10 (20%)	0.464[a]

BC: Breast cancer; BBD: benign breast disease; HHS: healthy breasts. [a]ANOVA; [b]χ^2-test.

All participants provided written informed consent after a full explanation of the study design which had been approved by the local Ethic Committee (Prot. E 37/11- 23.05.2011).

Measures. All subjects were assessed by the following psychometric instruments: STAXI 2 (11): A 57-item self-report inventory which measures the intensity of anger as an emotional state (state anger; SANG), how the individual is disposed to angry feelings as a personality trait (trait anger), and anger expression and control. The SANG consists of 15 items measuring how intensely an individual experiences anger during either the testing period, or a time or situation specified by the examiner and consists of three subscales: state anger/feeling angry (SANGF), state anger/feel like expressing anger verbally (SANGV), and state anger/feel like expressing anger physically (SANGP). The Likert scale for SANG ranges from 1 (not at all) to 4 (very much so). Trait anger (TANG) comprises 10 items measuring an individual's proneness to experiencing angry feelings. The Likert scale for this measure ranges from 1 (almost never) to 4 (almost always). Two subscales are used to comprise the TANG: trait anger/angry temperament (TANGT) and trait anger/angry reaction (TANGR). The final part of this inventory measures the ways in which an individual expresses and controls anger. These scales consist of 32 items using the same Likert scale as for the TANG. The following make up this final part of the STAXI-2: the anger expression-out (AX-O) scale, the anger expression-in (AX-I) scale, the anger control-out (ACO) scale, the anger control-in (AC-I) scale, and the anger expression index (AX). The STAXI has been validated on a variety of normal and clinical populations and both the original and the Italian version has good psychometric properties. The internal consistency of the STAXI TANG scale for our sample was acceptable (alpha=0.82)

Hamilton Rating Scale For Depression (HDRS) (12): The HDRS is a 17-item semi-structured interview that assesses depressive symptoms such as depressed mood, health concerns, loss of interests, insomnia or psychomotor retardation. The items were rated on 3- or 5-point scales and scores on the scale can range from 0 to 53, with a higher score indicative of a higher level of depression. Scores ranging from 0 to 7 suggest no or minimal symptoms of depression, 8-17 indicate mild depression, 18-25 suggest moderate depression, and scores of 26 and above are associated with severe depression. The internal consistency of the scale in this study was acceptable (alpha=0.79).

Paykel Life Events Scale (13): This was used to measure subjective stress. The scale is a 63-item instrument and covers a comprehensive range of recent life events, their timing and severity for the subject with scores from 1 to 20. It has two time frames for evaluation: (i) life events that occurred during the six months before the assessment; (ii) those that occurred before the past six months.

Statistical analysis. Data obtained from the study underwent checking and quality control and, subsequently, descriptive and inferential statistical analysis. Continuous data are expressed as the mean±SD (standard deviation) and significant differences among groups was assessed using the one-way analysis of variance (ANOVA) with *post hoc* comparisons (Bonferroni); non-continuous data are expressed as percentages and the comparison among the study groups was performed by using the χ^2-test. The significance level for the test was $p<0.05$. The statistical analysis was performed with Statistical Package for the Social Sciences – SPSS 16.0 software (SPSS Inc, Chicago, IL, USA).

Results

A total of 117 women agreed to participate in the study. The clinical examination, mammography and biopsy showed BC in 24 (20.5%) patients, benign breast disease (BBD) in 44 (37.6%) and healthy breasts (HHS) in 49 (41.9%). Clinicodemographic features of the study participants are reported in Table I. Although the patients in the BC group were older than individuals in the BBD and HHS groups (mean age=52.2 *vs.* 48.5 *vs.* 49.1), the difference was not statistically significant ($p=0.258$). The majority of patients (84/117, 71.8%) were married or living in a stable relationship. Regarding the level of education, 14.5% (n=17) of the sample had 5 years of education, 27.4% (n=32) had 8 years of education, 41% (n=48) had 13 years of education, 17.1% (n=20) were graduates.

Anger assessment by STAXI-2. Anger experience and expression, as measured by STAXI-2, are shown in Table II. Mean scores for each STAXI scale and subscale were within the normal range. Nevertheless, there was a trend in women with BC to have lower scores than those of BBD and HHS groups for almost all subscales of the STAXI-2; the few exceptions in this observed trend concerned the following subscales: TANGT, AX-I, and AC-O, whose mean scores were higher than the two other groups' scores. Statistically significant differences among subgroups emerged only

Table II. *Mean STAXI-2 scores in study participants*.

	BC (n=24)		BBD (n=44)		HHS (n=49)		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	F	*p*-Value
SANG	45.3	1.9	49.2	10.9	50.2	10.6	2.110	0.126
SANGF	46.2	4.0	51.5	13.5	49.7	9.8	1.920	0.151
SANGV	44.6	1.5	48.0	11.3	48.9	8.3	1.961	0.145
SANGP	45.8	0.5	46.7	2.4	50.8	11.3	5.131	0.007
TANG	48.0	10.0	49.6	11.2	50.1	10.1	0.311	0.733
TANGT	50.6	9.5	48.8	11.6	48.7	11.9	0.272	0.762
TANGR	48.6	10.4	51.7	10.7	50.9	10.1	0.689	0.504
AX-O	44.8	5.5	49.3	10.6	46.7	8.5	2.128	0.124
AX-I	51.6	12.3	51.5	12.2	49.5	9.9	0.480	0.620
AC-O	51.5	8.8	51.1	10.2	47.5	11.3	1.858	0.161
AC-I	51.5	8.7	53.4	9.5	52.1	9.3	0.422	0.657
AX	48.5	8.0	48.1	8.0	48.7	9.2	0.049	0.952

BC: Breast cancer; BBD: benign breast disease; HHS: healthy breasts; SANG: state anger; SANGF: state anger/feeling angry; SANGV: state anger/feel like expressing anger verbally; SANGP: state anger/feel like expressing anger physically; TANG: trait anger; TANGT: trait anger/angry temperament; TANGR: trait anger/angry reaction; AX-O: anger expression-out; AX-I: anger expression-in; AC-O: anger control-out; AC-I: anger control-in; AX: anger expression index.

Table III. *Frequencies of individuals with pathological scores on STAXI-2*.

	BC (n=24)		BBD (n=44)		HHS (n=49)		Chi – square test	
	n	%	n	%	n	%	X^2	*p*
SANG	0	0	2	4.5	2	4.1	1.084	0.582
SANGF	0	0	4	9.1	1	2	4.165	0.125
SANGV	0	0	4	9.1	0	0	6.871	0.032
SANGP	0	0	0	0	3	6.1	4.273	0.118
TANG	0	0	0	0	1	2	1.400	0.497
TANGT	0	0	2	4.5	3	6.1	1.489	0.475
TANGR	0	0	0	0	0	0	-	-
AX-O	0	0	4	9.1	1	2	4.165	0.125
AX-I	0	0	0	0	0	0	-	-
AC-O	0	0	0	0	0	0	-	-
AC-I	0	0	0	0	0	0	-	-
AX	0	0	0	0	0	0	-	-

BC: Breast cancer; BBD: benign breast disease; HHS: healthy breasts; SANG: state anger; SANGF: state anger/feeling angry; SANGV: state anger/feel like expressing anger verbally; SANGP: state anger/feel like expressing anger physically; TANG: trait anger; TANGT: trait anger/angry temperament; TANGR: trait anger/angry reaction; AX-O: anger expression-out; AX-I: anger expression-in; AC-O: anger control-out; AC-I: anger control-in; AX: anger expression index.

regarding the variable SANGP, which was higher in the HHS group (Bonferroni post-hoc test: HHS *vs*. BBD: $p=0.027$; HHS *vs*. BC: $p=0.025$).

Regarding the frequencies (expressed in percentages) of those who reported scores in the clinical range in the three groups (Table III), statistically significant differences among subgroups emerged only regarding the variable SANGV ($\chi^2=6.871$; $p=0.032$), with only four individuals (9.1%) from the BBD group showing pathological scores for this subscale.

Other psychiatric measures. No clinically significant differences between groups were recorded regarding mood assessment (BC group *vs*. BBD group *vs*. HHS group: 12±8.1

vs. 9.2±5.1 *vs*. 9±5.2; ANOVA: F=2.35, df=2, *p*=0.099), and life events (BC group *vs*. BBD group *vs*. HHS group: 12.7±13.1 *vs*. 18.1±19.1 *vs*. 16.3±23.7; ANOVA: F=0.552, df=2, *p*=0.577).

Discussion

The present study was designed to assess anger in a sample of patients who had breast symptoms but had not yet been given a definitive diagnosis; after diagnostic procedures, the study sample was divided into three groups: BC, BBD, and HHS. We found that levels of anger, measured by STAXI-2 scales and subscales, were within normal range in all three groups. There was only one significant difference in anger scores: HHS women experienced more state anger (expressed by behaviors consisting in physical expressions like hitting someone or breaking objects) due to unpleasant or frustrating events, than did BC and BBD groups.

Although not statistically significant, women with BC had lower levels of anger experience and expression than BBD and HHS groups for almost all STAXI-2 scales, except for three scales measuring angry temperament, inwardly expressed anger, and outward control of anger, whose mean scores were higher than the two other groups' scores.

In general, this findings support the hypothesis that there is no association between different dimensions of anger and development of BC.

Although the line of research aimed to evaluate possible relationships between socio-psychological factors and the risk of breast cancer has involved depression, anxiety and anger (14-18), discordant results have emerged on the role of negative emotions and stressful life events (19-22).

The findings of the current study are consistent with those of White *et al*., who showed that there was no significant association between the dimension of anger control or negative emotions and the risk of BC and other types of tumoral diseases (23).

Our results further support the study by Bleiker *et al*. that assessed several negative emotions such as anxiety, anger, depression, as well as the way of dealing with them: "expression – in" (when negative emotions are held in or suppressed), "expression – out" (when negative emotions are directed toward other people or objects), and "control" in patients with BC compared to healthy individuals (24). In their study, the authors demonstrated that none of the examined emotional features was significantly associated with an increased risk of BC.

In a previous study examining the theoretical model of 'cancer prone personality' (25), characterized by unassertiveness, difficulty in expressing emotions, and an attitude toward helplessness or hopelessness, Price *et al*. did not detect differences between those with BC and controls for different psychological measures, including emotional "expression – in" and emotional "expression – out" (26). More recently, it was shown that patients with BC tended to have an increased risk for bearing the 'high commitment' characteristic and this pattern could contribute to cancer risk through immune and hormonal pathways (27).

On the other hand, previous findings showed evidence of anger suppression and repression to be associated with BC development and progression (28, 29). A review investigating the interaction between psychosocial factors and BC highlighted that social support, anxious-depressive symptoms and personality factors were not related to cancer development, with the only exception being anger repression (30). Nevertheless, most of the reviewed studies suffered from selection biases regarding factors such as participants' age and possible knowledge of diagnosis at the time of recruitment.

In our sample, women with BC were older than those of BBD and HHS groups, but there was no significant age difference between these subgroups. Moreover, the assessment of anger was conducted in a screened population showing BC symptoms or breast abnormalities before definitive diagnosis.

There are a number of limitations to this study that should be considered. The sample size is relatively small, and recruited individuals were from a geographically restricted area, so this may limit the generalizability and validity of these findings. Therefore, the results obtained should be replicated in a larger sample more representative of the general population. Furthermore, the results obtained in our study are based on the use of a self-report psychometric measure, which may have been influenced by extraneous events such as the use of a defensive response style, filtered and subjective rater perceptions, social desirability, self-serving biases regarding positive personal traits and "halo effect" (no discrimination among behaviors), all individual factors which may interfere with the validity of self-evaluation instruments, preventing the evaluation of the true anger level.

In conclusion, our study has confirmed the findings of the literature showing that measures of anger have a relatively poor association with risk of BC. Therefore anger as an emotion, when taken as an isolated factor, cannot be considered as a predisposing factor for this disease. Nevertheless, it is possible that anger dimensions, or other negative emotions, although having no direct impact on the development of breast carcinoma, may represent vulnerability factors that compromise the adjustment to the diagnosis of a serious illness. For this reason, further studies should investigate this controversial area of research, also evaluating the association with other important medical and behavioral risk factors for cancer, such as physical inactivity, smoking, obesity, alcohol abuse.

Finally, according to our results, the hypothesis that STAXI-2 may be a useful psychometric tool for assessing anger as a predictive feature in the development of BC was not supported.

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