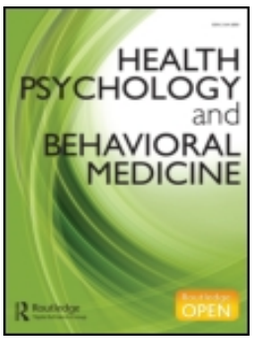

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Stress reactivity, distress and attachment in newly diagnosed breast cancer patients

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Research on psycho-oncology increased across literature during the last decades, pointing to links between biological, psychosocial and behavioural factors in cancer beginning and progression. This study aimed to characterize a sample of recently breast-cancer-diagnosed women, compared to a control group, regarding their stress reactivity at a psychological and autonomic levels, anger regulation and attachment styles. Eighty-seven females (52 breast cancer patients and 33 controls) respectively from Portuguese public hospitals and general population were recruited. They were assessed through psychometric measures (distress, attachment styles and anger regulation) and psychophysiological parameters of reactivity were collected. The breast cancer patients studied seem to be less anxious in their attachment patterns compared to healthy people, but they report significant distress while facing a threatening situation. This clinical group also shows lower psychophysiological reactivity, both at the baseline and confronted with different emotional eliciting stimuli. Self-directed anger was associated with the presence of anxious attachment schemes and strictly linked to the appraised distress. A predictive model suggests the impact of this pattern of anger management and an anxious attachment style in the emotional disturbance reported by these patients. Findings suggest that insecure attachment schemes, dysfunctional anger regulation strategies and a lack of psychophysiological activation may be discussed as relevant factors that modulate emotional distress associated with the diagnosis of breast cancer.

Keywords: distress; attachment; emotional regulation; psychophysiological reactivity; breast cancer

Introduction

A cancer diagnosis can be conceptualized as a major threat, affecting survival expectancy along with social and personal identity. Emotional distress, such as anxiety, depression and other emotional regulation disorders arising from illness experience, has been increasingly associated to disease outcomes, as well as to patients' quality of life. Moreover, psychological aspects

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seem to be essential, not only in the referred sense, but as an undeniable part of the disease, understanding from a pathophysiological level to a personal and to a bioecological level (Linden & Girgis, 2012; Lutgendorf, Costanzo, & Siegel, 2007).

Research on psycho-oncology increased in the last decades, pointing to links between biological, psychosocial and behavioural factors in cancer initiation and progression (Lillberg et al., 2003; Spiegel, 2012; Stommel, Given, & Given, 2002). Supporting data from several theoretical frameworks, including stress and distress investigations, development, emotion regulation and epigenetics (Cole, 2013; McEwen, 2008), are unveiling the possible impact of distress, negative emotions, life events and stress response, on macro and microenvironmental aspects at a cellular and systemic level (McDonald, O'Connell, & Lutgendorf, 2013). In cancer research, Psychoneuroimmunology advances play an important role, contributing to clarify the relations between tumoural cells' development or survival and individual determinants of vulnerability. Such a model highlights the stressful nature of social, interpersonal or intraindividual threats, personal resources and the activation of communication mediators between central nervous system and the immune system (Kiecolt-Glaser, Robles, Heffner, Loving, & Glaser, 2002). Neuroendocrine organs and pathways, including the autonomic nervous system and hypothalamic–pituitary–adrenal axis, are responsible for the production of inflammatory mediators and stress hormones which, acting in the tumour microenvironment, can influence tumour growth and disease progression (Armaiz-Pena, Cole, Lutgendorf, & Sood, 2013).

Stress, loneliness and social support have a strong impact on health and disease, determining morbidity and mortality risks, probably through the complex interplay of mind–body connections across development (Lutgendorf & Sood, 2011).

At an individual level, attachment styles, relatively stable throughout life, seem to influence stress responses in adulthood and how emotion regulation strategies are acquired through development (Cassidy, 1994). The first internal working models, as implicit memories, modulate future attachment styles. Although genetic issues influence these schemes, they are experience-dependent and express complex ways of learning through relations across development, which modulate neural networks with strong connections to orbitofrontal cortex, limbic system and other circuits involved in arousal and emotion processing (Schore, 2000, 2001). Schore and Schore (2008) have described, along an extensive framework, how these networks are regulated by early attachment relations in which feelings of comfort and safeness, or anxiety and fear, become strongly related to internal working models of self and others. The secure attachment schemes, associated with positive emotions, provide a biochemical milieu that supplies a good self-regulation and autonomy. Inversely, insecure attachment schemes related to negative emotional experiences seem to be associated with physical and mental disorders (Cozolino, 2006). The pathways connecting early stressful adversity to the quality of health mechanisms in adulthood include many-sided components, from physiological to behavioural dimensions, and growing evidences suggest that immune dysregulation is one of eventual areas linking early life experiences to physical and mental disorders (Fagundes, Glaser, & Kiecolt-Glaser, 2013; Maunder & Hunter, 2001, 2008).

These overall aspects have psychophysiological correlates and support the mechanisms by which individuals regulate their emotions in adulthood and deal with stressful events. Thus, whereas secure attachment sponsor a good integration of the physiological and cognitive dimensions of arousal, increasing the quality of the coping mechanisms in response to stress, insecure attachment styles or even disorganized ones seem related to behavioural, emotional and neurophysiological dysregulation that may establish future vulnerabilities for managing stress (Mikulincer & Florian, 1998; Mikulincer, Shaver, & Pereg, 2003).

Despite some inconsistent evidences, current investigation supports that, in breast cancer patients, patterns of stress reactivity (autonomic activation and abnormal cortisol profiles) are

linked to depression, emotional distress and a worse prognosis of the disease (Wu, Yang, Thayer, & Andersen, 2014). Childhood adversity, determining a lack of personal resources and psychophysiological dysfunction, can be a major source of vulnerability in patients (Crosswell, Bower, & Ganz, 2014) as it has been evident in different populations and diseases (Shonkoff, Boyce, & McEwen, 2009; Slopen, Non, Williams, Roberts, & Albert, 2014).

Regarding the above-mentioned links, this research aimed to characterize autonomic reactivity and emotional distress, as well as attachment styles, in recently diagnosed breast-cancer patients compared to a healthy control group. It was hypothesized that distress levels will be higher in patients, compared to controls. The quality of attachment styles and emotion regulation strategies, such as dysfunctional internal working models and anger expression or control modalities, may determine the experience of distress and psychophysiological activation facing diagnosis.

Methods

Participants

The research was carried out in two public hospitals in Lisbon, Portugal, and both Ethics committees from the Centro Hospitalar Lisboa Norte and Centro Hospitalar Lisboa Ocidental approved it. The sample included recently diagnosed patients with breast cancer (BCP) and control subjects from public institutions of health and educational sectors, both recruited in a voluntary modus, after explaining the objectives and procedures.

Patients were evaluated after contacting the surgeon/gynaecologist that informed the patient of the diagnostic of breast cancer and confirmed the inclusion criteria. The participants were invited to take part in the study complying with the following inclusion criteria: (a) diagnosed within the previous 6 months, (b) sufficient language abilities, which was made explicit along with the diagnostic criteria in the short telephone contact, (c) aged between 30 and 55 years, (d) being premenopausal and (e) no mental disorder or other present physical disease. Regarding the previous psychopathology, it was assessed by self-report and participants were asked if they were ever followed by a psychiatrist or clinical psychologist. It was also asked if they had a psychiatric diagnosis and were medicated with psychotropics.

Controls were sampled in a convenience design, reporting the absence of any physical or mental disease and declaring no current medication intake.

All participants gave their written informed consent before being admitted to the study.

Data collection and measures

Patients and controls were assessed through a psychopathology inventory (Brief Symptoms Inventory (BSI)), the Distress Thermometer, the Adult Attachment Scale and the State-Trait Anger Expression Inventory (STAXI).

In patients, the evaluation was planned for the week before treatment beginning. Evaluation included the completion of psychological questionnaires for about 40 minutes and a structured interview for 20 minutes using a Socio-demographic and Medical Questionnaire, while psychophysiological data were recorded.

Brief Symptom Inventory: *BSI* (Derogatis, 1993) is an inventory of psychopathological symptoms with 53 items and is derived from the short form of the Symptom Checklist-90 (SCL-90) from the same author, in which the subject is asked to rate the degree in which every problem mentioned affected him during past week, using a Likert scale which classifies the responses from “never” (0) to “Very often” (4). A Global Symptoms Index (GSI) is provided by this

instrument and it is a well-established score of reported distress. It is extracted as the average of distress ratings assigned to each symptom and assessment of nine subscales – Somatization, Obsessive-compulsive, Interpersonal Sensitivity, Phobic Anxiety, Paranoid Ideation, Psychotic Ideation, Depression, Hostility and Additional Subscales. For this study only, the GSI was considered. In this research, a Portuguese version with adequate psychometric properties was used (Canavarro, 1997, 1999).

The *Distress Thermometer*, *DT* (Roth et al., 1998), is a visual analogue scale – ranging from 0 (no distress) to 10 (extreme distress) – created to provide self-report of emotional distress in cancer patients. A Portuguese translation of the scale was carried out in the present study, duly allowed by the National Comprehensive Cancer Network. The participants were invited to select the number which described better the overall level of distress they experienced in the past week.

For assessing attachment schemes, the Portuguese version of the *Revised Adult Attachment Scale* was used (Canavarro, 1999). This scale is composed of 18 items and 3 subscales (close, dependent and anxiety). The 'close' scale measures the extent to which a person is comfortable with closeness and intimacy. The 'dependent' scale measures the extent to which a person feels that he/she can depend on others to be available when needed. The 'anxiety' subscale measures the extent to which a person is worried about being abandoned or unloved, reflecting the internal working model of *self.* Following Collins recommendations (Brennan, Clark, & Shaver, 1998; Collins, 2008), we used an alternative score system, measuring two attachment dimensions – attachment anxiety (model of self) and attachment avoidance (model of other).

The *STAXI* (Spielberger, 1999) is a self-assessment scale, coded on a 4-point scale (0–3). The *STAXI* is a self-assessment scale, coded on a 4-point scale (0–3) to assess anger experience and expression. The Portuguese-adapted version used (Silva, Campos, & Prazeres, 1999) included 44 items, divided in six scales measuring different construct dimensions and an Anger Expression Index. The scale *State Anger* dimension reflects the intensity of angry feelings in the last week. *Trait Anger* measures a disposition to experience anger and it is divided into two subscales – *Anger Reaction and Anger Temperament*. Those subscales measure the propensity to react under situations which involve frustration or feelings of unfairness, or without such circumstances, respectively. *Anger Expression-Out* is related to the expression of angry feelings towards others or objects and *Anger Expression-In* to the suppression and self-directedness of those feelings. *Anger Control* reflects the extension of control or suppression of anger expression, and the *Anger Expression Index* is an overall index of the frequency of anger expression, regardless of its direction.

The *Socio-demographic and Medical Questionnaire* included questions intended to provoke different levels of arousal, during which skin conductance and heart rate (HR) were measured. In *Moment 1*, socio-demographic questions were asked, and, assuming their neutrality, basal activity was assessed. *Moment 2* corresponded to an Arithmetic question for eliciting arousal with a neutral emotional valence. *Moment 3* addressed the medical history and BC diagnosis, which presumably elicit negative emotional arousal, as for Moment 4, when asked for negative life events (NLEs) in the past year. Autonomic measures were recorded using *biosignalsPlux wireless* (Plux Wireless Biosignals S.A., Portugal). Participants were connected to an IT physiological data system and electrodermal and cardiovascular activity were continuously collected between the baseline and moment 4. Two Ag/AgCl-electrodes from edaPLUX sensor were placed on the thenar and hypothenar eminence of the non-dominant hand for measuring the electrodermal activity. Blood volume pressure (BVP) was measured based on photoplethismography technique, applied on the middle finger of the dominant hand. Initially, the experimenter demonstrated at the computer screen how participants' movements produce artefacts and then gave instructions to sit still during the interview. The four interview moments were marked with a switch button (sync-PLUX sensor) ensuring temporal synchrony, with millisecond accuracy, between the recording of psychophysiological parameters and the questions asked.

Data analysis

Skin conductance tonic level and HR were extracted from the psychophysiological collecting data system. For feature selection, the raw data were processed using the Python programming language, and the SciPy scientific computing library. The raw data were first filtered to eliminate artefacts such as powerline interference; the BVP signal is bandpass filtered with a [1–8] Hz passing band, using a 4th order filter and the raw EDA signal is lowpass filtered with a 0.25 Hz cut-off frequency, using a 2nd order filter. For both signals, a Butterworth filter design was used since it is acknowledged to provide the best impulse response in the cut-off frequency boundaries, and a zero-phase forward and reverse digital filtering process was adopted (Silva, Fred, Eusebio, Torrado, & Ouakinin, 2012).

Statistical analyses were generally conducted using the Statistical Package for Social Sciences (SPSS), version 19 for Macintosh. All statistical tests were two-tailed, with significance levels of 5%. Comparisons between independent samples regarding ordinal and continuous variables and associations between continuous variables were performed through Mann–Whitney non-parametric tests and Spearman correlations and associated significance tests, respectively, since assumptions of normality of variables were not met. Independency between ordinal and/or categorical variables was assessed through Fisher Exact tests either since 20% or more of the tables' cells presented expected counts below 5 or 2×2 tables were analysed. Multiple regression linear models were carried out for characterizing eventual predictive effects of independent variables such as self-directed anger and anxious attachment style on emotional disturbance in the studied patients. Potentially confounding variables were systematically included in the model to control for such effects, namely Age, Education (5 points ordinal variable) and Employment Situation (dichotomized by Active-Working versus Other – Sick leave, Unemployed, Domestic). These results are presented in the next section. An alternative model using Education (dichotomized by Professional or Higher Education versus Secondary School or lower) was also built, as well as a model with GSI as dependent variables and only using the three potential confounders as independent variables as validation. Since these results were coherent with the ones of previous models, they were not included here.

Results

The studied sample included 85 females, 52 BCP and 33 controls, with a mean age of 41.87 and 37.42 years, respectively. Most of the BCP participants were married (46.2%), followed by the divorced (21.2%) and the civil union categories (15.4%). Forty-six percent of these participants have the high-school level of education and 67.3% were employed. Regarding their health status, most of them reported regular check-ups and blood tests (61.5%), breast palpation (67.3%) and did not show gynaecologic diseases history (73.1%). The majority of participants did not state familial breast cancer history (67.3%) or antecedent breast pathology (55.8%). A relevant part of the participants reported no physical diseases history (33%) nor previous psychopathology (65.4%) and 50% stated no current use of medication. The BCP participants initiated a treatment modality for cancer for overall 1 month at the date of the interview.

Comparison of groups

Excluding age ($U = 501.00$, $p = .001$), education level ($p = .028$, Fisher's exact test), working status ($p = .001$, Fisher's exact test) and regularity of check-ups reported ($p = .048$, Fisher's exact test), the studied groups were homogenous in many socio-demographic variables such as

Table 1. Socio-demographic and clinical characterization of BCP and control group.

	BCP ($n = 52$)	Controls ($n = 33$)		
	Mean value (SD)		U	p
Age	41.87 (6.90)	37.42 (4.22)	501.000	.001**
Menarche age	12 (1.49)	13 (1.42)	807.000	.638
	N		p-value (Fisher Exact test)	
Education level				
Basic school	5	0	.028*	
Junior high school	12	3		
Secondary school	24	14		
Professional school	1	1		
Graduation	10	14		
Working status				
Employed	46	33	.001**	
Unemployed	6	0		
Marital status				
Single	6	10	.129	
Married	24	12		
Divorced	11	4		
Civil union	8	7		
Civil separated	3	0		
Household				
Husband/partner	4	5	.103	
Partner and son/daughter	31	16		
Son/daughter	11	2		
Parents	2	4		
Others	2	2		
Alone	2	4		
Gynaecologic diseases history				
Yes	14	9	.582	
No	38	24		
Familial breast cancer history				
Yes	17	6	.111	
No	35	27		
Antecedent breast pathology				
Yes	23	14	.525	
No	29	19		
Breast palpation habits				
Yes	35	21	.453	
No	17	12		
Regular check-up and blood tests				
Yes	32	23	.048*	
No	20	5		
Previous psychopathology				
None	34	20	.496	
Depression	14	12		
Anxiety	4	1		

Note: *$p < .05$.
**$p < .01$.

marital status or family composition (Table 1) and in other variables considered (gynaecologic diseases history, familial breast cancer history, antecedent breast pathology, previous psychopathology, and breast palpation habits). In what concerns the occurrence of NLEs in the previous

year (Table 2), such as deaths of close people or close relatives' diseases, marital and relational problems or financial problems, groups did not differ in a significant way.

Concerning the attachment styles, BCP described themselves as significantly less anxious than controls ($p < .05$), and similar to controls in what regards to avoidant patterns of attachment.

In terms of reactivity, BPC showed significantly higher rated distress compared to controls, but a lower electrodermal reactivity both at the baseline ($U = 422.00$, $p < .001$) and confronted with different emotional eliciting stimuli: arithmetic question ($U = 453.00$, $p = .001$), recalling the medical history and BC diagnosis ($U = 428.00$, $p < .001$), as well as when they were asked for NLEs in the past year and ($U = 346.00$, $p < .001$). BCP also showed less cardiovascular reactivity at the four moments of assessment, even though not significantly different than controls. Statistical analysis between groups did not show any significant differences regarding reported psychopathological symptoms, anger states and traits, and anger regulation strategies (Table 3).

Correlations between several variables studied in BCP group point relevant associations between an anxious pattern of attachment, anger regulation strategies ($r = .445$; $p < .01$), specially self-directedness ones (STAXI – anger expression in) and reported distress from GSI scores ($r = .580$; $p < .01$). Results showed a negative correlation between the expression of angry feelings towards others or objects ($r = -.320$; $p < .05$) and anger control and positive associations between distress measured by BSI and anger expression-in ($r = .393$; $p < .01$) and also with perceived distress rated by the distress thermometer ($r = .415$; $p < .01$). Anger expression-in was especially associated with the presence of an anxious attachment and, simultaneously, strictly linked to the reported level of psychopathological symptoms.

No significant associations between psychophysiological parameters and psychological measures of attachment styles were verified in both groups (Table 4).

Although the clinical sample is composed of a relatively small number of subjects, which provides a modest support to the development of robust statistics models of prediction, a multiple regression model was carried out using the General Symptoms Index as dependent variable and AAS-Anxiety (Anxiety factor extracted from the Adult Attachment Scale) and Anger Expression In (extracted from the STAXI) as independent variables (Model 1 in Table 5). These results pointed to a pattern of self-directed anger expression and particularly an anxious

Table 2. NLEs in the previous year.

	N		
	BCP ($n = 52$)	Controls ($n = 33$)	p-value (Fisher Exact test)
Deaths of close people in the last year			
Yes	9	4	0.549
No	43	29	
Close relatives diseases			
Yes	12	8	1.000
No	40	25	
Marital problems			
Yes	13	4	0.286
No	39	29	
Relational problems			
Yes	3	3	0.681
No	49	30	
Financial problems			
Yes	5	3	1.000
No	47	30	

Table 3. Differences between BCP and healthy participants on psychological measures and psychophysiological parameters.

Mean values for BCP and controls and Mann–Whitney test				
	BCP ($n = 52$)	Controls ($n = 33$)	Mann–Whitney U	p
AAS-Anxiety	2.05	2.34	605.500*	.020
AAS-Avoidance	2.60	2.66	794.000	.663
BSI-Gen Sympt Ind	0.67	.70	792.000	.650
Distress Thermometer	6.16	4.51	546.000*	.011
STAXI – state anger	11.23	11.67	841.000	.996
STAXI – trait anger	15.47	16.39	738.500	.342
STAXI – angry temperament	5.67	5.67	830.000	.914
STAXI – angry reaction	7.18	7.85	734.500	.321
STAXI – anger expression in	14.73	14.88	828.500	.905
STAXI – anger expression out	12.47	13.12	753.000	.413
STAXI – anger control	23.08	22.40	772.000	.523
STAXI – anger expression	20.10	21.60	783.000	.591
EDA Baseline	8.41	13.45	422.000**	.000
EDA Moment 1	10.04	14.74	453.000**	.001
EDA Moment 2	9.39	14.17	428.000**	.000
EDA Moment 3	7.52	13.45	346.000**	.000
HR Baseline	80.16	80.85	726.000	.435
HR Moment 1	75.50	82.03	654.000	.144
HR Moment 2	73.92	80.20	679.000	.221
HR Moment 3	74.10	79.60	721.000	.408

Notes:
AAS-Anxiety –anxiety factor extracted from the Adult Attachment Scale;
AAS-Avoidance – avoidance factor extracted from the Adult Attachment Scale;
BSI-Gen Sympt Ind – General Symptoms Index extracted from the Brief Symptoms Inventory;
EDA Baseline – skin conductance tonic level at the baseline measured by the bioPLUX research device;
EDA Moment 1 – skin conductance tonic level at the moment 1 measured by the bioPLUX research device;
EDA Moment 2 – skin conductance tonic level at the moment 2 measured by the bioPLUX research device;
EDA Moment 3 – skin conductance tonic level at the moment 3 measured by the bioPLUX research device;
HR Baseline – heart rate in beats per minute at the baseline measured by the bioPLUX research device;
HR Moment 1 – heart rate in beats per minute at the moment 1 measured by the bioPLUX research device;
HR Moment 2 – heart rate in beats per minute at the moment 2 measured by the bioPLUX research device;
HR Moment 3 – heart rate in beats per minute at the moment 3 measured by the bioPLUX research device.
*$p < .05$.
**$p < .01$.

attachment style as variables with impact on the general psychopathological symptoms report ($R^2 = .294$; regression: ANOVA, $F = 9.974$, $p = .000$). The confidence intervals support the tests regarding the regression coefficients as showed in Table 5. Multiple regression models were additionally used with potential confounders' age, education and employment status, but did not indicate any biases in findings (Models 2–4 in Table 5).

Discussion

Results found in this study are in line with literature that points to the relevance of distress screening and the need of being aware of patients' emotional suffering when they are faced with a severe disease diagnosis, even when they do not report it spontaneously (Carlson, Waller, & Mitchell, 2012; Linden & Girgis, 2012). Despite rating a level of distress that can be considered significant (DT > 4), BCP seem to cope with negative emotions by controlling its expression or turning it

Table 4. Spearman correlations between attachment styles, anger expression and control, general psychopathological symptoms and distress.

		Gen Sympt Ind	AAS-ANX	AAS-AVOID	Anger Control	Anger Expression In	Anger Expression Out	Distress Thermometer
Gen Sympt Ind	Correlation coefficient	1.000						
	Sig. (two-tailed)	–						
AAS-Anxiety	Correlation coefficient	0.580**	1.000					
	Sig. (two-tailed)	0.000	–					
AAS-Avoid	Correlation coefficient	0.152	0.254	1.000				
	Sig. (two-tailed)	0.287	0.072	–				
Anger Control	Correlation coefficient	−0.237	−0.271	−0.205	1.000			
	Sig. (two-tailed)	0.095	0.116	0.155	–			
Anger Expression In	Correlation coefficient	0.393**	0.445**	0.172	−0.131	1.000		
	Sig. (two-tailed)	0.004	0.001	0.228	0.359	–		
Anger Expression Out	Correlation coefficient	0.077	0.218	−0.007	−0.320*	0.137	1.000	
	Sig. (two-tailed)	0.590	0.124	0.959	0.022	0.336	–	
Distress Thermometer	Correlation coefficient	0.415**	0.251	0.173	0.177	0.266	0.131	1.000
	Sig. (two-tailed)	0.002	0.076	0.226	0.317	0.059	0.360	–

Notes:
AAS-Anxiety – anxiety factor extracted from the Adult Attachment Scale;
AAS-Avoidance – avoidance factor extracted from the Adult Attachment Scale;
Gen Sympt Ind – General Symptoms Index extracted from the BSI);
Anger Control – extracted from the STAXI);
Anger Expression In – extracted from the STAXI;
Anger Expression Out – extracted from the STAXI;
Distress Thermometer – extracted from the Distress Thermometer, DT.
*$p < .05$.
**$p < .01$.

Table 5. Multiple regression linear models with General Symptoms Index (extracted from the BSI) as dependent variable.

Independent variables	*B*	SE	*β*	*t*	Sig.	95% CI for *B*
Model: 1 $R^2 = 0.294$ $F = 9.974$, $p = .000$						
AAS-Anxiety	.310	.089	.486	3.503	.001	[.132, .488]
Anger Expression In	.013	.018	.100	0.718	.476	[−.024, .050]
Model 2: $R^2 = 0.316$ $F = 7.227$, $p = .000$						
AAS-Anxiety	.320	.088	.501	3.616	.001	[.142, .497]
Anger Expression In	.012	.018	.091	0.658	.514	[−.025, .049]
Age	.009	.008	.149	1.232	.224	[−.006, .025]
Model 3: $R^2 = 0.301$ $F = 6.738$, $p = .001$						
AAS-Anxiety	.307	.089	.481	3.442	.001	[.127, .486]
Anger Expression In	.012	.018	.093	0.663	.511	[−.025, .049]
Education	.031	.045	.085	0.694	.491	[−.060, .122]
Model 4: $R^2 = 0.316$ $F = 7.230$, $p = .000$						
AAS-Anxiety	.311	.088	.488	3.534	.001	[.134, .488]
Anger Expression In	.012	.018	.092	0.665	.510	[−.025, .049]
Employment situation	.137	.111	.149	1.235	.223	[−.086, .361]

Notes:
AAS-Anxiety – anxiety factor extracted from the Adult Attachment Scale;
Anger Expression In – extracted from the STAXI;
B – unstandardized coefficients;
SE – standard error for unstandardized coefficients;
β – standardized coefficients;
95% CI for *B* – 95% confidence interval for *B*.

against themselves. Nevertheless, this effort did not prevent their emotional disturbance facing disease, as the distress measures pointed out.

Regarding attachment dimensions, BCP seem to describe themselves as no particularly avoidant, compared to controls, and less anxiously attached than the healthy group, a result that somehow we did not expect considering that in the presence of threatening experience insecure attachment schemes would be (theoretically) more activated. Since the period during which these women were screened and some literature emphasizing the preferable use of defensive and control strategies for coping with early phases of breast cancer diagnosis (Giese-Davis, Conrad, Nouriani, & Spiegel, 2008), we hypothesize that this clinical group outcomes may reflect a pattern of emotional control for dealing with negative feelings evoked by the aversive situation they are living, such as sadness and fear, in a way that minimizes their perceived disturbance about their health status. Considering that these BCP also showed a significant lower sympathetic reactivity at the baseline and faced with different stimuli, some of them with a negative valence, it is plausible to consider that these efforts to not contact with these negative emotions may be not conscious and reflect a previous broader pattern of emotion regulation. Perhaps these patterns may be sustained through development and related to a repressive coping style that may also interfere with the self-reported information collected through rating scales. Previous studies have found a probable relation between underreported clinical symptoms and emotional distress and repressive traits which may happen because repressors are less aware of bodily signs and symptoms (Cooke, Myers, & Derakshan, 2003; Tamagawa et al., 2013).

Additionally, no significant correlation was found between EDA parameters and perceived and self-reported distress in these patients, which is compatible with a pattern of dissociation between cognitive and physiological aspects of emotion observed in other groups (Diamond, Hicks, & Otter-Henderson, 2006; Torrado, Silva, Eusébio, Fred, & Ouakinin, 2015). This

dissociation is commonly considered an indicator of emotional dysregulation (Diamond et al., 2006), although different from the pattern typically observed in repressive patients, that according to some studies appear to have heightened physiologic reactivity (Tamagawa et al., 2013).

Even though BCP seem to have less anxious attachment internal working models, eventually resulting from reassuring attempts to find support and to appease themselves, insecure attachment profiles can be considered (in light of the hypothesis mentioned) a vulnerability factor for dealing with major stressors. This mechanism may influences coping resources and, particularly, disease adaptation (Cicero, Lo Coco, Gullo, & Lo Verso, 2009; Mikulincer & Florian, 1998). In fact, the level of anxious attachment is strictly associated with self-rated distress, supporting that their cognitive–emotional schemes and thoughts on their self-worth and minor availability of others are in some way related with the emotional disturbance reported. Thus, a defensive strategy to control their alertness and helplessness may be carried out by these women in order to minimize their distress and potential emotional disruption facing the uncertainty of this disease. The results may thus also support the evidence of the use of suppression strategies as deliberate efforts to inhibit expressive behaviour or to push it out of consciousness (Watson & Greer, 1983) as a strategy to modulate negative emotions, but, as other studies pointed out, it seems not efficacious enough for relieving distress (Classen, Koopman, Angell, & Spiegel, 1996; Cordova et al., 2003). Probably, the increased accessibility to unwanted thoughts and emotions results in prolonged exposure of negative affect and consequently heightened distress (Tamagawa et al., 2013).

From other's point of view, these results also bring to mind the considerations of some researchers that emphasize the presence of alexithymia in these populations (which constitutes a particular cognitive-affective style of functioning characterized by difficulties in identifying and describing feelings) that seems to be related to a poor regulation of emotional states and is suggested to interfere with the progression of diseases (De Vries, Forni, Voellinger, & Stiefel, 2012). The study of alexithymia in these groups could be a relevant contribution for analysing this marked absence of reactivity specially facing the diagnosis in BCP and may be taken into account in future research.

The regression model carried out seems also support this assumption. Although modestly explaining about 30% of the variance, it suggests that anxious attachment schemes and self-directed anger expression contribute to predict the global emotional disturbance reported, which might constitute a core issue to keep in mind regarding therapeutic interventions towards the improvement of these patients' well-being.

Analysing EDA in different provocative moments, patients are less activated than controls, which showed a higher level of activation in the baseline and all provocative moments. Concerning the lack of electrodermal activation in BCP, they were slightly more activated in the arithmetic question than in the recall of the diagnosis, which may highlight a particular automated (physiological) way to deal with threatful situations or events. This pattern resembles Pettingale, Watson, and Greer's (1984) findings about the tendency to repress emotional reactions in spite of more anxious results in neutral tasks, in line with theories on cancer prone personality traits. However, literature is not consensual and it may be possible that in result of the adjusting efforts of these studied BCP, some emotional control is required to better respond to upcoming challenges (Ginzburg, Wrensch, Rice, Farren, & Spiegel, 2008).

The effects of non-expressed negative affect in health are supported by several evidences (Spiegel, 2012) but of course only larger studies with longitudinal designs can clarify the hypothesis of considering emotional restriction (i.e. suppression, repression or deliberate control), such as anger control, insecure attachment styles and a lack of psychophysiological activation facing different stimuli as important determinants of disease evolution.

The results may also clarify the relationship between distress and emotional regulation development. We must keep in mind that the concept of emotion dysregulation include the failure to

control, evaluate or modify an emotional response to a provocative event, with a particular impact on behavioural expression. In this investigation, we tried to relate the externalized behaviour and the associated subjective experience with attachment patterns that are known to be relevant for determining affective reactivity in adulthood. In fact, literature supports the relation between those patterns, early life stress and neurobiological development of structural and functional dimensions of emotion regulation. As it was mentioned previously, a secure attachment style supports a better integration of the physiological and cognitive dimensions of emotion, improving the ability to cope with stressors. However, insecure or even disorganized attachment styles seem related to behavioural, emotional and neurophysiological dysregulation that may establish future vulnerabilities for managing stress. In our investigation, we can consider that the more dysfunctional emotion regulation strategies we observed can point towards a defensive approach, but on the other hand they may also amplify the impact of a threatening situation. An anxious attachment style is usually associated to a higher need of support, which can strengthen the suppression of negative emotions as a way to prevent the loss of significant ones, troubled by patients' emotional expression and suffering. To preserve that support, this strategy would in turn amplify the threat and levels of distress, despite an appearance of calm and acceptance as psychophysiological measure seem to suggest in this group of breast-cancer patients. This perspective may contribute to an integration of apparently contrasting genetic, neurochemical and psychological levels of explanation.

As Harrison and Critchley (2007) pointed, affective neuroscience provides a robust investigation support to search for the fundamentals of adaptive emotional behavioural and psychiatric morbidity. In our view, exploring adaptive emotional behaviour in diseases such as cancer can also provide a comprehensive setting for the understanding of mind–body relations and the evolution of the disease.

Limitations

Although this study contributed to a broader understanding of the relation between distress and emotional regulation development, in face of a challenging diagnosis, we identify some undeniable limitations. First, the small size of both samples prevents any generalization of the results. Second, the study could benefit from a case–control approach which was not possible, since the estimated selection bias could compromise the achievement of a proper randomization especially because of the refusal to participate by the selected individuals. Third, with larger samples and controlling for multicolinearity problems, more robust multiple regression linear models could be obtained, also allowing for the application of regression models with moderation effects that could complement the present findings. Finally, since this research focused on distress reactions, it would have been important to control disease staging as it expectably influences different emotional outcomes.

Conclusions

Despite the above-mentioned limitations, results seem to demonstrate that reported distress was not associated to a psychophysiological arousal in this sample of breast cancer patients as previously hypothesized, although strongly related to anxious pattern of attachment and a form of acting-in expression of anger. Insecure attachment dimensions may be conceptualized as vulnerability factors, facing a threat such as the diagnosis of breast cancer. Apparently dealing with negative emotions, the absence of an externalized expression of them in the studied clinical group at a psychological or physiological level, as well as the efforts to control it can remind us several defensive patterns such as repression, emotional control, suppression or even

alexithymia, the diversity of which would be relevant to further investigate in other studies, through specific measures and, if possible, not only with self-report but also performance measures in order to better mitigate the influence of confoundable variables. Future research should help us to clarify the subtle differences between these constructs in these clinical samples, for improving the ability of clinicians in helping these patients to adjust their sometimes overwhelming feelings of fear.

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