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Defensive responses to stressful life events associated with cancer diagnosis

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Abstract

Objectives: Stressful life events (SLEs) are common in patients who developed both physical and psychological syndromes. Research shown the role of psychological defense mechanisms in cancer progression and survival probability. The present study analyzed recent SLEs and defense mechanisms as characteristic of cancer patients and tested their role as potential predisposing factors to cancer development.

Methods: This cross-sectional study enrolled 145 participants: 48 recently diagnosed cancer patients (CP), 43 recently diagnosed benign tumor patients (BT), and 54 healthy subjects (HC). Non-blinded raters assessed participants' defense mechanisms using the Defense Mechanisms Rating Scales Q-sort version (DMRS-Q). Groups were compared on the presence of SLEs and on the maturity of defensive functioning. Significant associations between SLE and defense mechanisms as related to cancer diagnosis were explored.

Results: Higher overall defensive functioning was associated with good physical conditions. Recent SLEs, higher use of neurotic defenses and lower use of obsessional defenses characterized cancer patients. CP showed higher use of suppression, repression, dissociation, rationalization and passive aggression and lower use of affiliation, sublimation, undoing, and devaluation of self-image as compared to controls. Hierarchical regression analysis showed that recent SLEs and defense mechanisms of suppression, repression, dissociation, displacement and omnipotence were associated with cancer diagnosis.

Discussion: Recent SLEs and repressive defensive functioning characterized the CP's defensive response to stress. Despite the relevance of present findings, this study shows several limitations. Prospective and longitudinal studies are needed to confirm these results and to investigate the potential role played by SLEs and defense mechanisms in cancer development.

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1. Introduction

Stressful life events (SLEs) are some of most relevant factors involved in the pathogenesis of both psychological and psychosomatic syndromes (Afari et al., 2014; Dell’Osso et al., 2014; Di Giuseppe, Gemignani, & Conversano, 2020; Martino et al., 2020; McFarlane, 2010) among other factors which contribute both to the onset and to the course such as stress, mood disorders and sleep disturbances (Catalano et al., 2019a, 2019b; Cohen, Janicki-Deverts, & Miller, 2007; Conversano, 2019; Dell’Osso et al., 2012; Martino et al., 2019a; Mula et al., 2008; Palagini et al., 2016; Veltri et al., 2012). Less clear is the relationship between SLEs and the onset of organic diseases, except maybe for acute cardiovascular diseases, cognitive and neuropsychological consequences (Carmassi et al., 2014a, 2017; Coughin, 2011; Gangemi et al., 2018; Lenzo, Sardella, Martino, & Quattropiani 2020; Marazziti et al., 2015; Martino, Langher, Cazzato, & Vicario, 2019; Radziej, Schmid, Dinkel, Zwergal, & Lahmann, 2015). On the other hand, the stressful factor of chronic pathology is widely documented as well as its consequences on individual psychological well-being (Conversano et al., 2015; Marchini et al., 2018; Piccinni et al., 2012; Veltri et al., 2012).

Research on the potential relationships between the occurrence of SLEs and cancer progression has led to controversial or inconclusive findings (Garssen, 2004; Nielsen & Grønbaek, 2006; Rigby, Morris, Lavelle, Stewart, & Gattrell, 2002). SLEs are more common among subjects who subsequently develop not only a psychological but also a somatic disease (Barberis, Quattropiani, & Cuzzocrea, 2019; Carmassi et al., 2014b; Eberhard-Gran, Schei, & Eskid, 2007; Martino, Caputo, Bellone, Quattropiani, & Vicario, 2020; Martino et al., 2019b; 2019c; Settineri, Frisone, Merlo, Geraci, & Martino, 2019; Vicario, Salehinejad, Felmingham, Martino, & Nitsche, 2019), as well as in cancer patients (Chida, Hamer, Wardle, & Steptoe, 2008). However, little is known about the link between cancer development and the specific individual’s response to SLEs (Butow et al., 2000; Neeleman, Biji, & Ormel, 2004). In regard to this relationship, even less it is known in the field of geriatric oncology, where, at least, empirical researches have explored important related themes such as end-of-life care issues or comprehensive assessment tools (Giantin et al., 2013; Iasevoli et al., 2012).

In the present study we investigated the relationship between the use of certain defense mechanisms in response to SLEs and the development of oncology illness, with particular attention to dissociation and its specific pattern of conversion from mental to physical distress (Di Giuseppe, Gennaro, Lingiardi, & Perry, 2019; Perry, 1990).

Defense mechanisms have been defined as *'unconscious operations that protect the Self from the awareness of feelings and thoughts of internal conflicts and external stressors'* (APA, 1994) and studied in association with several psychological and somatic diseases (Gennaro, Salvatore, & Rocco, 2017; Gennaro, 2011; Hyphantis, Goulia, & Carvalho, 2013; Lingiardi et al., 2010; Boscarino & Figley, 2009; Merlo, 2019a; 2019b; Perry, Presniak, & Olson, 2013; Settineri, Frisone, Alibrandi, & Merlo, 2019; Settineri, Frisone, & Merlo, 2019). According to the theoretical model proposed by Vaillant (1977; 1992), defenses are hierarchically organized at different levels, with specific psychological functions. When at the same level, they may share a general defensive function with different modalities (Perry, Knoll, & Tran, 2019). High-adaptive (or mature) defense mechanisms foster greater adaptation and resilience, while immature defenses protect the self from painful feelings and thoughts, with a consequent important lack of awareness and the occurrence of maladaptive cognitive, affective and relational patterns (Perry & Henry, 2004). Mental inhibition defenses (holding both obsessive and neurotic defense levels) are in the middle of the hierarchy and are present both in clinical and healthy populations (Di Giuseppe, Ciacchini, Piarulli, Nepa, & Conversano, 2019; Di Riso, Gennaro, & Salcuni, 2015; Malone, Choen, Liu, Vaillant, & Waldinger, 2013; Merlo et al., 2020; Perry & Bond, 2012). Obsessive and neurotic defenses are quite adaptive and allow a partial awareness of internal/external stressors, although they may become rigid and may enhance symptoms formation in response to stressful life events (Perry, Metzger, & Sigal, 2015). A robust body of literature shows that traumatic experiences are generally related to the high use of neurotic defenses (Butow et al., 2000; Renzi et al., 2017). In particular, the defense mechanism of dissociation, (defined as a temporary eclipse of awareness, loss of ability to do something, development of psychosomatic symptoms), is typical of traumatized people (Perry et al., 2005). From a psychodynamic perspective, the defense of repression, defined as the inability to remember traumatic experiences or to be cognitively aware of disturbing feelings, wishes and thought, would lead to dysfunctions in endocrine and immune systems, suggesting that the repression of traumatic experiences might influence somatic symptoms formation (Harburg, Julius, Kaciroti, Gleiberman, & Schork, 2003; Schauer & Elbert, 2010). A recent literature review of defensive functioning in cancer patients shows that patients affected by cancer use intensively mental inhibition defenses, especially repression associated to physical and psychological distress (Di Giuseppe et al., 2018).

To our knowledge, a limited number of studies have used instruments built and validated to explore the accepted hierarchical organization of defenses in cancer patients (Di Giuseppe et al., 2019; Perry, Metzger, & Sigal, 2015; Zimmerman, Porcerelli, & Arterbery, 2019). Most

studies used self-report questionnaires, easy to administer on large scale but limited in detecting the unconscious nature of defense mechanisms (Drageset & Lindstrøm, 2003; Hyphantis, Goulia, & Carvalho 2013; Ho & Shiu, 1995; Hyphantis et al., 2016; Hyphantis, Paika, Almyroudi, Kamplatsas, & Pavlidis, 2011; Paika et al., 2010). As an alternative, observer-rated scales and projective test coding systems have been used with the administration of clinical interviews, therapy sessions or responses to projective tests (Porcerelli, Cramer, Porcerelli, & Arterbery, 2017). At present, the instrument considered closest to a gold standard is the *'Defense Mechanisms Rating Scales'* (DMRS), an observer-rated method encompassing thirty different defense mechanisms organized into a hierarchy of seven levels of adaptiveness (Perry 1990; Perry & Henry, 2004). The DMRS provides a complete assessment, but requires a formal training based on the transcription of psychotherapeutic sessions. Recently, a q-sort version of the DMRS (DMRS-Q) has been developed for clinical use (Di Giuseppe, Perry, Petraglia, Janzen, & Lingiardi, 2014). The DMSR-Q is a valid and easy-to-use measure for detecting defense mechanisms in clinical work and applicable without an intensive training for its reliable use.

Research suggests that defense mechanisms, when adequately explored with an inclusive assessment, might influence several physical and psychological aspects in patients with cancer, as well as their attitude to treatment options and survival probability (Beresford, Alfersm, Mangum, Clapp, & Martin, 2006; Porcerelli, Cramer, Porcerelli, & Arterbery 2017). However, it is still unclear the role played by defense mechanisms in cancer prevention and survival rates on the mid-to-long-term period.

1.1 The current study

The aim of this study was to evaluate whether defense mechanisms in response to recent SLEs may characterize the onset of a cancer disease, exploring their role alone or in combination. The present study sought to 1) assess recent SLEs occurrence in cancer patients in comparison with two control groups of patients with benign tumor and healthy individuals, 2) identify differences in cancer patients defensive functioning as compared to controls, and 3) to test SLEs and specific defense mechanisms as characteristics of cancer patients.

2. Method

2.1 Participants

This cross-sectional study enrolled 145 participants divided into three groups: 48 patients in a waiting list condition for oncology treatments after surgery (CP), 43 patients who recently received a diagnosis of benign tumor (BT), and 54 individuals without a diagnosed of physical illness (HC). The mean age of the total sample was 52.9 ($SD= 9.98$), without significant

difference between groups (CP: mean=53.3, $SD= 10.74$; BT: mean=53.3, $SD= 11.23$; HC: mean=52.4, $SD= 8.23$). Female gender was prevalent in the total sample ($N=84$; 57.9%), with CP, BT, and HC groups contributing for 14.5% ($N=21$), 11.0% ($N=16$), and 16.6% ($N=24$) respectively. All participants were recruited in Central Italy. Healthy controls were enrolled among health professionals. Exclusion criteria encompassed the following diagnoses according to DSM-5 criteria: Bipolar Disorders, Schizophrenia, Schizoaffective Disorder, Acute Psychosis, and Dementia. Participants were asked to sign an informed consent to be interviewed. Study procedures were conducted according to the Code of Ethics of the World Medical Association (Declaration of Helsinki).

2.2 Measures

Traumatic experiences and defense mechanisms were assessed from clinical interviews and using only observer-rated measures. A clinician-reported 4-point Likert was developed and used for the assessment of presence and severity of SLEs.

Sociodemographic and clinical information. The clinical data form encompasses information on socio-demographic characteristics, family composition, history of chronic illnesses in relatives, presence/absence of psychological symptoms, history of psychiatric illness, presence and description of recent SLEs, and a brief summary of the patient's overall psychological functioning. For the purposes of this study, we extracted only demographic characteristics as age and gender.

Defense mechanisms. The Defense Mechanisms Rating Scales – Q-sort version (DMRS-Q; Di Giuseppe, Perry, Petraglia, Janzen, & Lingiard, 2014) is a computerized observer-rated method for the assessment of defense mechanisms. The DMRS-Q provides quantitative scores of 30 defense mechanisms, seven defense levels, and one index of overall defensive functioning (ODF). In addition, the DMRS-Q provides a qualitative description of the patient's defensive profile based on the most representative defensive patterns. The hierarchical organization of defense mechanisms is the same as in all versions of the scale (DMRS, DMRS-Q, and DMRS-SR-30) and it is described in Table 1.

Table 1. Hierarchy of defense mechanisms in the DMRS and DMRS-Q

Level 7: High-Adaptive Defenses

- Affiliation
- Altruism
- Anticipation
- Humor

Self-Assertion
 Self-Observation
 Sublimation
 Suppression

Level 6: Obsessional Defenses

Undoing
 Intellectualization
 Isolation of Affect

Level 5: Neurotic Defenses

Repression
 Dissociation
 Reaction Formation
 Displacement

Level 4: Minor Image-Distortion Defenses

Idealization of Self Image
 Idealization of Other's Image
 Devaluation of Self Image
 Devaluation of Other's Image
 Omnipotence

Level 3: Disavowal Defenses

Denial
 Rationalization
 Projection
 Autistic Fantasy

Level 2: Major Image-Distortion Defenses

Splitting of Self Image
 Splitting of Other's Image
 Projective Identification

Level 1: Action Defenses

Acting Out
 Passive Aggression (Turning against the Self)
 Help Rejecting Complaining (Hypochondriasis)

The DMRS-Q assessment requires to rank-order 150 items into a 7-rank forced distribution and it takes approximately 30 minutes to be completed by trained raters. Rating procedure is available at www.dmrs-q.com. Preliminary validation studies have found good convergent validity and reliability of quantitative scores. Correlations between DMRS and DMRS-Q ranged from acceptable to excellent (0.72 to 0.92) for both the ODF and the three super categories of defenses (Di Giuseppe et al., 2014). Inter-rater reliability was good for the ODF and defense levels (intraclass R values > 0.80), decreasing to acceptable for individual defenses (median ICC= 0.62).

Stressful Life Events. The presence and the severity of recent SLEs were evaluated using a non-standardized 4-point Likert scale developed by authors for the purpose of the present study. The absence of SLEs was scored as 0, the presence of financial and/or relational problems was scored as 1, the presence of severe illness and/or injuries (with the exclusion of the current cancer or benign tumor diagnosis) was scored as 2, and finally the presence of death of close relatives was scored as 3. Other stressful experiences were rated according to the severity described by participants. SLEs included in the assessment occurred within two years from the interview and were evaluated by the clinician after each session.

2.3 Procedure

The clinician filled a clinical data form with the participant's relevant information during the interview. After each interview, the clinician assessed the presence and severity of SLEs using a clinician-reported non standardized scale, while two trained non-blinded raters independently assessed defense mechanisms using the DMRS-Q. Later, the two raters discussed their ratings and agreed upon a consensus rating which was used for data analysis. Both the interviewer and the DMRS-Q raters were blinded to each other's assessment.

2.4 Statistical analyses

A preliminary analysis of descriptive statistics was conducted among the three subgroups on age, gender, SLEs and defense mechanisms. Kolmogorov-Smirnov test was used to verify normality of distribution. Sample power of the significant variables was 0.8 assuring an appropriate sample size. Significant differences between groups were detected using analysis of variance (ANOVA). LSD post hoc was used for detecting differences between groups. Finally, two hierarchical multiple regressions were performed to evaluate SLEs and defense mechanisms as potential moderators of cancer diagnosis. We started including only age as independent variables (Model 1), and then we added SLEs (Model 2), ODF (Model 3), defense levels (Model 4), and finally single defense mechanisms (Model 5). Significance level was set at $\alpha = 0.05$. Analyses were carried out using IBM SPSS Statistics 25.

3. Results

3.1 Sample characteristics

Among 156 individuals initially screened, 48 CP, 43 BT, and 54 HC agreed to participate in the study resulting in a final sample of 145 participants. Participants demographic and clinical characteristics are summarized in Table 2.

Table 2. Demographic, clinical and professional descriptive statistics

	N	Percentage	Mean	SD	Skewness	Kurtosis
Age			52.94	9.98	.055	-.169
CP			53.27	10.74	.057	-.867
BT			53.28	11.23	.189	.315
HC			52.39	8.23	-.375	-.542
Gender						
Male	61	42.1				
CP	21	14.5				
BT	16	11.0				
HC	24	16.6				
Female	84	57.9				
CP	27	18.6				
BT	27	18.6				
HC	30	20.7				
Subgroups characteristics						
CP	48	33.1				
Breast	22	15.2				
Colon	15	10.3				
Skin	7	4.8				
Throat	4	2.8				
BT	43	29.6				
Breast	18	12.4				
Colon	9	6.2				
Skin	12	8.3				
Throat	4	2.8				
HC	54	37.2				
Physicians	16	11.0				
Psychologist	4	2.8				
Nurses	29	20.0				
Social Workers	5	3.4				

Note: Cancer patients abbreviated as CP; benign tumor patients abbreviated as BT; healthy controls abbreviated as HC

Females were 84 (57.9%), equally distributed among groups ($N_{CP}=27$; 18.6%; $N_{BT}= 27$; 18.6%; $N_{HC}= 30$; 20.7%). The mean age of the overall sample was 52.9 years ($SD= 9.98$), with no significant difference between groups. Values of skewness and kurtosis indicated that the whole sample and the three subgroups were normally distributed according to age. Patients with a cancer diagnosis were prevalently affected by breast cancer ($N= 22$; 15.2%) and colon-rectal cancer ($N= 15$; 10.3%), while 7.6% reported a recent diagnosis of skin cancer ($N= 7$; 4.8%) and throat cancer ($N=4$; 2.8%). Patients with benign tumors in similar sites were selected for comparison. Among the BT group, patients reported breast nodules ($N= 18$; 12.4%), colon polyps ($N= 9$; 6.2%), benign skin tumors ($N= 12$; 8.3%), and throat nodules ($N= 4$; 2.8%). Among healthy individuals screened as a second comparison group, nurses were the majority ($N= 29$; 20.0%), followed by physicians ($N= 16$; 11.0%), social workers ($N= 5$; 3.4%) and psychologists ($N= 4$; 2.8%).

3.2 Associations between SLEs, defense mechanisms and cancer diagnosis

Table 3 summarizes mean differences in SLEs and defensive functioning among the three groups.

Table 3. Differences between cancer patients and controls according to SLEs and defense mechanisms

	Mean CP	SD	Mean BT	SD	Mean HC	SD	LSD post hoc (p-value)		
							CP- BT	CP- HC	BT- HC
Age	53.27	10.74	53.28	11.23	52.39	8.23	.997	.659	.665
SLEs	1.44	1.09	0.65	0.97	0.44	0.79	.000	.000	.290
ODF	4.51	0.67	4.70	0.56	5.15	0.49	.121	.000	.000
7. High Adaptive	26.85	9.54	27.90	7.51	33.16	11.52	.610	.001	.010
Affiliation	2.70	1.74	3.74	1.44	4.15	2.00	.005	.000	.263
Altruism	2.93	1.83	2.61	1.61	3.07	2.26	.427	.721	.245
Anticipation	2.09	1.80	2.80	1.86	3.37	2.39	.104	.002	.175
Humor	3.78	2.53	3.19	1.79	3.91	2.88	.259	.790	.157
Self-assertion	3.92	2.38	4.79	1.84	5.49	2.13	.055	.000	.108
Self-observation	4.34	2.30	5.12	2.19	5.99	2.51	.115	.001	.074
Sublimation	1.86	1.65	2.81	1.48	2.80	1.92	.009	.006	.981
Suppression	5.19	2.61	2.75	1.72	3.88	2.52	.000	.006	.012
6. Obsessive	9.60	5.54	11.90	4.80	16.15	5.97	.048	.000	.000
Isolation of Affects	3.73	3.72	3.24	2.62	4.59	3.12	.467	.177	.041
Intellectualization	2.66	2.33	3.32	1.78	5.80	3.08	.208	.000	.000
Undoing	3.20	1.96	5.06	1.83	5.46	2.90	.000	.000	.398
5. Neurotic	18.99	5.18	15.82	3.15	14.65	4.37	.001	.000	.190
Repression	6.77	2.81	4.59	1.95	4.96	2.59	.000	.000	.469
Dissociation	3.84	2.67	1.40	1.23	1.37	1.49	.000	.000	.940
Reaction Formation	4.11	2.63	4.06	1.93	4.02	2.27	.932	.924	.851
Displacement	4.28	1.75	4.95	1.53	4.61	2.00	.078	.350	.361
4. Minor Image-distortion	16.13	4.59	17.34	4.15	15.25	4.24	.185	.309	.020
Devaluation S-I	2.02	1.48	3.13	1.86	3.18	2.00	.004	.002	.887
Devaluation O-I	4.30	2.26	4.21	2.12	3.88	2.22	.845	.345	.474
Idealization S-I	2.57	2.13	3.32	1.43	3.07	1.55	.043	.150	.491
Idealization O-I	3.04	1.78	3.77	2.06	2.89	1.84	.069	.688	.024
Omnipotence	4.14	2.89	3.23	2.28	2.32	1.98	.073	.000	.067
3. Disavowal	15.94	3.64	15.29	4.16	11.44	4.05	.431	.000	.000
Denial	3.90	1.92	3.89	1.68	2.56	1.66	.860	.000	.000
Rationalization	7.03	1.92	5.07	2.03	4.42	1.85	.000	.000	.102
Projection	2.77	1.64	3.22	1.50	1.97	1.31	.154	.007	.000
Autistic Fantasy	2.17	1.60	2.91	1.61	2.40	1.63	.031	.472	.125
2. Major Image-distortion	3.48	3.25	3.80	2.85	3.63	2.94	.617	.807	.781
Projective Identification	1.09	1.21	1.25	1.25	1.31	1.35	.559	.389	.813
Splitting S-I	0.78	0.65	1.00	1.02	1.12	1.39	.338	.115	.581
Splitting O-I	1.60	1.99	1.54	1.53	1.13	1.18	.862	.142	.212
1. Action	8.98	4.40	7.73	3.71	5.95	2.69	.105	.000	.018
Passive Aggression	3.99	2.15	2.41	1.40	2.51	1.83	.000	.000	.780
HRC	3.27	2.32	2.88	1.97	2.06	1.30	.325	.001	.035
Acting Out	1.77	1.82	2.26	2.04	1.38	1.49	.183	.271	.016

Note: Image-distortion abbreviated as I-D; Self-image abbreviated as S-I; Object's image abbreviated as O-I.

The presence of recent SLEs was significantly higher in CP (mean= 1.44; SD= 1.09) than in both BT (mean= 0.65; SD= 0.97) and HC (mean= 0.44; SD= 0.79). Significant differences between CP and controls were also found for ODF, defense levels, and individual defenses.

ANOVA test and LSD post hoc showed that CP and BT had significantly lower ODF as compared to HC ($p = .000$), indicating that individuals holding clinical conditions showed a generally lower level of defensive adaptiveness as compared to healthy individuals. Differences in defense levels scores showed that CP groups differ from control groups for higher use of neurotic defenses and lower use of obsessional defenses.

Moreover, higher use of action defenses and disavowal defenses and lower use of high-adaptive defenses characterized CP as compared to HC, indicating a general increase of immature defenses in response to illness-related stress.

A deeper understanding of CP defensive functioning is provided by the mean scores of individual defense mechanisms. Higher use of suppression, repression, dissociation, rationalization and passive aggression (all p -values below .006) and lower use of affiliation, sublimation, undoing, and devaluation of self-image (all p -values below .009) differentiated CP from controls. Post hoc analyses showed differences between CP and BT in the use of idealization of self-image ($p = .043$) and autistic fantasy ($p = .031$).

Furthermore, higher use of denial, projection, and help-rejecting complaint (HRC) and less use of anticipation, self-assertion, self-observation, and intellectualization differentiated CP from HC (all p -values below .007). These results indicated that CP tended to either withdraw stressful feelings, ideas and thoughts or express them by annoying significant others, showing an overall repressive and self-sacrificing defensive functioning.

3.3 SLEs and defense mechanisms moderators of cancer diagnosis

Table 4 summarizes the results of a 5-step hierarchical multiple regression analysis.

Table 4. Hierarchical regression analysis of predictors of cancer diagnosis.

	b	SE _b	b'	t	p	F	p	R ²	Adjusted R ²
Model 1						.076	.783	.001	-.006
Age	.002	.008	.023	.276	.783				
Model 2						14.263	.000	.167	.156**
Age	-.001	.007	-.008	-.098	.922				
SLEs	.372**	.070	.409	5.332	.000				
Model 3						11.497	.025	.197	.179*
Age	-.001	.007	-.015	-.194	.846				
SLEs	.302**	.075	.332	4.004	.000				
ODF	-.279*	.123	-.188	-2.266	.025				
Model 4						8.832	.000	.397	.352**
Age	.000	.006	.003	.050	.961				
SLEs	.216*	.071	.238	3.026	.003				

ODF	-.321	.250	-.217	-1.284	.201				
High adaptive	-.005	.042	-.058	-.129	.898				
Obsessive	-.051	.042	-.330	-1.210	.228				
Neurotic	.033	.042	.166	.787	.433				
Minor I-D	-.027	.045	-.124	-.587	.558				
Disavowal	.018	.046	.086	.403	.687				
Major I-D	-.090	.049	-.287	-1.829	.070				
Action	.000	.050	.002	.009	.993				
Model 5						13.772	.000	.841	.780**
Age	-.002	.004	-.016	-.356	.723				
SLEs	.139*	.050	.153	2.773	.007				
ODF	-.196	.179	.132	-1.098	.275				
High adaptive	-.023	.028	-.247	-.810	.420				
Obsessive	.052	.060	.337	.861	.391				
Neurotic	-.007	.056	-.037	-.133	.895				
Minor I-D	-.010	.062	-.045	-.155	.877				
Disavowal	.046	.089	.217	.517	.606				
Major I-D	-.047	.103	-.151	-.461	.646				
Action	.084	.105	.339	.797	.427				
Suppression	.198**	.049	.533	4.008	.000				
Sublimation	.028	.052	.052	.539	.591				
Self-observation	-.006	.049	-.016	-.131	.896				
Self-assertion	.043	.053	.102	.814	.418				
Humor	.103	.065	.278	1.527	.121				
Anticipation	-.048	.048	-.107	-.992	.323				
Altruism	.062	.050	.127	1.232	.221				
Affiliation	.005	.041	.010	.131	.896				
Isolation	-.002	.043	-.006	-.042	.967				
Intellectualization	-.057	.045	-.171	-1.268	.208				
Undoing	-.060	.039	-.158	-1.543	.126				
Repression	.077*	.035	.216	2.202	.030				
Dissociation	.142**	.041	.333	3.466	.001				
Reaction formation	.047	.041	.115	1.150	.253				
Displacement	.086	.045	.163	1.885	.062				
Devaluation S-I	.048	.066	.096	.731	.466				
Devaluation O-I	.042	.067	.097	.622	.535				
Idealization S-I	.082	.064	.151	1.280	.204				
Idealization O-I	.031	.064	.063	.483	.630				
Omnipotence	.122	.063	.323	1.930	.056				
Denial	-.017	.080	-.033	-.210	.834				
Rationalization	.055	.083	.131	.666	.507				
Projection	-.038	.084	-.062	-.447	.656				
Autistic fantasy	-.092	.079	-.159	-1.158	.250				
Projective	.028	.102	.037	.271	.787				
Identification									
Splitting S-I	.142	.124	.163	1.139	.257				
Splitting O-I	.014	.107	.023	.128	.898				
Passive Aggression	.088	.091	.183	.969	.335				
HRC	-.069	.094	-.143	-.733	.465				
Acting out	-.087	.096	-.165	-.902	.369				

Notes: Hierarchical multiple regression analysis with dependent variable the cancer diagnosis. In this analysis age was entered in model 1, traumatic experience was added in model 2, ODF was added in model 3, while defense levels and individual defenses were added in model 4 and model 5 respectively. Image-distortion abbreviated as I-D; Self-image abbreviated as S-I; Others image abbreviated as O-I

* $p < .05$; ** $p < .001$

Age was entered as independent variable in the first model (Model 1), resulting not significantly related to cancer diagnosis ($F = .076$; $p = .783$). SLEs were added in the second model (Model

2), explaining 15.6% of the variance ($F= 14.263$; $p= .000$), that slightly increased up to 17.9% while adding the ODF ($F= 11.497$; $p= .025$) in the third model (Model 3). As a further step, we entered the seven defense levels (Model 4), which increased the explained variance to 35.2% ($F= 8.832$; $p= .000$). However, none of the defense levels resulted significantly related for cancer diagnosis and ODF was no longer significant. Only SLEs remained significant in the fourth model. The greatest increase in the explained variances was reached in the fifth model (Model 5) with the addition of individual defenses ($F= 13.772$; $p= .000$). Looking at the regression coefficients, we found that SLEs ($b= .139$; $p= .007$), suppression ($b= .198$; $p= .000$), repression ($b= .077$; $p= .030$), and dissociation ($b= .142$; $p= .001$) were significantly associated with the cancer diagnosis, while quasi significant results were found for displacement ($b= .086$; $p= .062$) and omnipotence ($b= .122$; $p= .056$). In the final model, SLEs and defense mechanisms of suppression, repression, dissociation, displacement and omnipotence moderated cancer diagnosis and explained 78.0% of the variance.

4. Discussion

This cross-sectional study showed that SLEs were more frequent in CP than in controls and that a lower defensive maturity differentiated individuals holding clinical conditions from healthy controls. Interestingly, higher use of neurotic defenses and lower use of obsessional defenses characterized cancer patients, indicating a specific defensive profile of cancer patients. Defense mechanisms of suppression, repression, dissociation, displacement and omnipotence moderated cancer diagnosis, suggesting that a repressive and apparently self-confident defensive functioning is characteristic of people who developed malignant tumors. These results confirmed the psychosomatic hypothesis of dysfunctional physical functioning activated by neurotic defensive responses to SLEs (Afari et al., 2014; Chida, Hamer, Wardle, & Steptoe 2008; Radziej, Schmid, Dinkel, Zwergal, & Lahmann, 2015) and highlighted the potential role of maladaptive defense mechanisms in enhancing cancer development.

There is a wide body of literature devoted to the elucidation of the relationships between SLEs and clinical features in patients with cancer (Cabaniols et al., 2011; Rigby Morris, Lavelle, Stewart, & Gatrell, 2002). Previous research has already shown that defense mechanisms belonging to the highest level of adaptiveness might be associated with a better physical/psychological functioning and a better outcome in oncology patients (Befesford, Alfesm, Mangum, Clapp, & Martin, 2006; Di Giuseppe et al., 2018). Conversely, immature defenses predicted higher levels of psychological distress, sleep difficulties and lower survival rates after cancer diagnosis (Hyphantis et al., 2016; Paika et al., 2010; Porcerelli Cramer,

Porcerelli, & Arterbery, 2017). We evaluated SLEs and defense mechanisms as potentially linked to cancer disease.

Our first hypothesis that severe SLEs were more frequently reported by CP as compared to controls was fully confirmed. SLEs occurrence among CP was greater in both frequency and severity, suggesting that SLEs could be a concomitant factor in patients who subsequently developed cancer (Butow et al., 2000; Kohn, Levav, Liphshitz, Barchana, & Keinan-Boker, 2014). However, SLEs might have different effects on psychological functioning depending on the maturity of defense mechanisms activated in response to distress (Di Giuseppe, Chiacchini, Piarulli, Nepa, & Conversano, 2019).

Whit regard to the second hypothesis that CP differed from controls in their defensive functioning, findings revealed that CP did not differ significantly from BT in the overall defensive maturity, while they both showed lower ODF as compared to HC. According to recent studies (Perry et al., 2015; Zimmerman, Porcerelli, & Arterbery, 2019), receiving a diagnosis of physical illness might represent a SLE itself and lead to a decrease of baseline ODF, independently from the severity of the diagnosis. More in detail, CP differed from BT and HC in the higher use of neurotic defenses and the lower use of obsessional defenses, indicating that CP's need to keep stressful thoughts out of awareness while still experiencing charged feelings (APA, 1994). This finding is noticeable and reflects the psychosomatic hypothesis of psychological effects in cancer development (Hyphantis et al., 2013; Neeleman, Biji, & Ormel, 2004; Price et al., 2001). Individual defenses were also differently used by CP and controls. We found that CP used more suppression, repression, dissociation, rationalization and passive aggression as compared to both BT and HC. According to definitions and functions of defense mechanism (Perry, 1990; Perry & Henry, 2004), CP tended to develop somatic symptoms instead of consciously dealing with stressful feelings. Moreover, they kept distance from cognitive awareness of their needs, giving plausible excuses for actions and reactions of themselves or of significant others, in order to minimize or avoid feelings of hopelessness and powerlessness, thus playing the 'martyr' role in an apparent detachment from their problems. In addition, the scarce use of affiliation, sublimation, undoing, and devaluation of self-image highlighted difficulties in accepting benefic factors, including the treatments, enhancing the subjective level of psychological distress of CP.

Our third hypothesis that SLEs and defense mechanisms characterized CP was fully confirmed. SLEs and defense mechanisms of suppression, repression, dissociation, displacement and omnipotence were strongly associated with cancer diagnosis, explaining the 78.0% of the variance. According to the consent definitions of defense mechanisms (APA, 1994; Perry, 1990),

these defenses described the repressive and self-sacrificing defensive profile of CP. The well-known association between cancer and repressive defensive functioning, including the high-adaptive defense of suppression and the neurotic defense of repression (see Table 1), was confirmed in a number of studies. Taken together these findings suggest that the attitude to repress stressful experiences may be accompanied by conversion symptoms, which lead to higher physical impairment (Di Giuseppe et al., 2018; Giese-Davis, 2008; Kreitler Chaitchik & Kreitlers, 1993). Repression was found negatively associated to physical well-being (Paika et al., 2010) and positively related to passive role in treatment decision-making (Hyphantis Goulia, & Carvalho, 2013). Other studies found that repression predicted deterioration of physical health after one year from the cancer diagnosis (Hyphantis Paika, Almyroudi, Kampletsas, & Pavlidis, 2011), while displacement and omnipotence characterized women with breast cancer (Di Giuseppe et al., 2019; Perry, Metzger, & Sigal, 2015).

Our findings demonstrated that CP had a distinctive repressive defensive functioning that could moderate cancer development and progression. Particular attention must be given to the defense of dissociation, defined as temporary alteration in the integrative functions of consciousness or identity' because of an 'affect or impulse which the subject is not aware of that operates in the subject's life out of normal awareness' (APA, 1994; Perry & Henry, 2004). The unnoticed idea and associated affect might be expressed by the development of somatic symptoms or dysfunctions. In agreement with previous studies (Krause-Ulz & Elzinga, 2018; Nicholson et al., 2017), this finding suggested that the dissociative response to traumatic experiences might lead to organic symptoms formation, thus being a potential player in cancer development.

4.1 Strength and limitations

The main strength of the present study is the detection of characteristic defensive profile in response to SLEs in patients with cancer. Assessing the whole hierarchy of defense mechanisms with appropriate measures allowed for a deep understanding of the unconscious function of defenses used by CP. This original contribution put lights on potential role of psychological aspects as predisposing factors for cancer development. To the best of our knowledge, this is the first study analyzing the whole hierarchy of defense mechanisms in relation to recent SLE and cancer diagnoses using the DMRS-Q, a new computerized measure based on the standard criteria for defense mechanisms assessment. Recent studies focused on the role of defense mechanisms as adaptive responses to cancer-related stress (Zimmerman et al., 2019) and investigated the influence of clinicians' defensive functioning in patients' satisfaction (de Vries et al., 2017, 2018), while less attention has been devoted to defenses as factors potentially influencing cancer initiation (Boscarino & Figley, 2009; Harburg Julius, Kaciroti, Gleiberman,

& Schork, 2003). The present study provided preliminary results of associations between SLEs, defense mechanisms and cancer development, suggesting a possible link between psychological and somatic maladaptive functioning that needs further investigation.

Our results should be interpreted in the light of several limitations. The cross-sectional design does not allow for a causal interpretation of results; the finding of SLEs and repressive defensive functioning as moderating cancer development should be interpreted cautiously. Although results indicated a strong association between cancer and both SLEs and defense mechanisms, further prospective and longitudinal studies are needed to investigate their role as predisposing factors for the subsequent cancer development. Moreover, information on SLEs was gathered retrospectively, only by asking participants about any psychologically or physically stressful event occurring in the recent past. Thus, we cannot exclude in a systematic manner the possible positive or negative biases in reporting such a wide range of events. Moreover, SLEs scores were obtained using a clinician-reported scale developed by authors for the purpose of the study instead of with a valid standardized measure. In addition, the trained observers who rated the participants' defensive functioning were not blinded to the cohort membership of the participants, introducing potential subconscious biases in the scales scores. Further longitudinal studies should address these issues by confronting blinded groups using only validated measures. Furthermore, statistical analyses did not consider the stratification of clinical sample according to the cancer primary site, which could have introduced biases in results. Further investigations should consider the potential relationships between defensive response to SLEs and a subsequent diagnosis of different types of cancer.

4.2 Conclusions

Despite the above described limitations, the present report provides additional detailed information about defense mechanisms characteristically associated with cancer. The coexistence of recent SLEs, a repressive defensive functioning, and high use of dissociation were strongly related to the condition of having a cancer. According with Kohn and colleagues (2014), we believe that the tendency of leaving SLE-related unpleasant emotions, feelings or impulses unexpressed may lead to somatization and consequently may influence the individual's physical and psychological functioning overall. However, further research is needed to deeply understand the specific burden of SLEs and defense mechanisms as potential predisposing factors for cancer development.

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