Quality of life, alexithymia, and defence mechanisms in patients affected by breast cancer across different stages of illness

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Summary

Objectives
The aim of this study was to evaluate the effect of alexithymia and defence mechanisms on the quality of life of patients affected by breast cancer at different stages of the disease.

Methods
A convenience sample of 110 patients with breast cancer was involved in the study: 41 were receiving adjuvant chemotherapy after surgery, 29 had disease-free survival in follow-up and 40 were receiving chemotherapy for metastatic disease. Quality of life, alexithymia and defence mechanisms were assessed using the following instruments: EORTC QLQ-C30-BR23, Toronto Alexithymia Scale (TAS-20) and Defense Mechanism Inventory (DMI).

Results
Compared to the other groups, patients receiving chemotherapy for metastatic disease reported poorer quality of life in several domains, more severe cancer-related and treatment-related symptoms and higher levels of alexithymia. When the effect of other potential predictors was taken into account, TAS-20 difficulty in identifying feelings was significantly related to all the EORTC functional subscale.

Conclusion
This study underlined the relevance of difficulty in emotional processing and defence mechanisms in modulating psychological adjustment in women affected by breast cancer, suggesting that these might be potential targets of psychological intervention for this population.

Key words
Psycho-oncology • Quality of Life • Alexithymia • Defence mechanisms • Breast Cancer

Introduction

A diagnosis of breast cancer substantially affects patients' quality of life and may produce various psychological consequences, such as changes in self-esteem and personal values and severe disturbances in body image. Consistent evidence has demonstrated that women with breast cancer who underwent to surgical therapy show low self-esteem, greater worries for body image and concerns about the opinions of others [1-3].

In the bio-psycho-social perspective, assessing quality of life in oncology is crucial to monitor the adjustment process of cancer patients to family, social and working life and, when needed, to deliver specific intervention programmes [4]. Chemotherapy has been associated with reduced quality in physical and mental domains, together with body image dissatisfaction and reduced sexual functioning [5][6]. Furthermore, patients experiencing recurrence of disease suffered greater reduction in quality of life, particularly in symptom severity and physical functioning, than patients with metastatic disease or primary, non-metastatic disease [7].

Given its specific characteristics of aggressiveness and uncertainty, a diagnosis of cancer rouses anxieties of destruction, triggering extreme and archaic defence mechanisms. According to the literature, denial is the most frequent defence mechanism used by cancer patients to manage a diagnosis of breast cancer and its consequences [8]. While, on the one hand, denial clearly represents a primitive and global strategy, which often leads to gross distortion of reality, on the other hand, denial might be an adaptive strategy to protect the patient against overwhelming events and emotions [9].

Another well-known feature of cancer patients is the difficulty in identifying feelings and in expressing emotions that is currently defined by the term "alexithymia" [10]. Evidence suggests that alexithymia could represent a possible risk factor for medical and psychiatric disorders. Although high levels of alexithymia have been related to

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immune system dysfunctions, lower quality of life, and anxiety and depression symptoms, the role of alexithymia in the onset and course of breast cancer patients is not fully clear [11] [12]. Indeed, some authors consider alexithymia a dynamic reaction to the illness in recently diagnosed patients, declining during subsequent phases [13] [14]: In this view, cancer patients' inhibited behaviour can be regarded as a time-limited reaction rather than a stable personality trait [15]. Alexithymia can be defined as a reaction to unpleasant emotional states in which individuals restrict their emotional range to mitigate painful experiences. By contrast, others suggested a distinction between primary alexithymia, as a stable personality trait, and secondary alexithymia, as a transitory reaction and a coping mechanism through which individuals avoid unpleasant emotional states by severely restricting emotional range [16] [17]. For instance, an Italian survey of women with breast cancer suggested that these patients may have something in common with so-called psychosomatic patients in terms of constrained imagination and fantasy, and difficulty in verbalising emotions [18].

Our study aims to compare psychological adjustment and cancer- and treatment- related symptoms between patients with breast cancer at different stages of the disease (i.e. receiving chemotherapy for metastatic disease, receiving adjuvant chemotherapy and in disease-free follow-up). Additionally, the study seeks to investigate, whether, besides the effect of the illness stage, quality of life is also affected by alexithymia and defence mechanisms.

Materials and methods

Participants

A convenience sample was recruited among women affected by breast cancer, who were previously treated with surgical therapy, admitted to the outpatient clinic of the Cancer Surgery Department of a private hospital of Palermo. The study was approved by the clinical team. Patients were recruited on voluntary basis, were fully informed about the aims and the risks and benefits of the study and signed an informed consent sheet. Patients were divided into three groups according to disease stage: the first group consisted in patients who were receiving adjuvant chemotherapy after surgery (chemotherapy), the second group in patients in follow-up after treatment of neoplastic disease (disease-free survival/follow-up) and the third group of patients was undergoing chemotherapy treatment for metastatic disease (metastatic).

Instruments

The following instruments were administered to participants by clinical psychologists.

- *The European Organization for Research and Treatment for Cancer Quality of Life* (EORTC QLQ-C30) [19]: a self-report questionnaire used to study the quality of life in cancer patients. It investigates the stage of illness through nine scales: five functional scales (physical, role, cognitive, emotional, social), three symptom scales (fatigue, pain, nausea/vomiting) and a global health status scale. Moreover, it includes six single-item scales assessing symptoms typically associated with cancer and with cancer treatment, such as dyspnoea, insomnia, loss of appetite, constipation, diarrhoea and financial difficulties; there are also some items inquiring sexuality. To better understand the specific conditions of breast cancer patients, the module EORTC BR23 was also administered that covers the effects of therapy, body perception, sphere of sexuality and vision of the future in this specific population.

- *The Toronto Alexithymia Scale* (TAS-20) [20]: a self-report questionnaire consisting in 20 items assessing alexithymia, and specifically difficulty in identifying feelings and distinguishing them from somatic sensations (F1), difficulty in describing feelings (F2) and externally oriented thinking, i.e. the tendency of individuals to focus their attention on external events rather than internal thoughts and emotions (F3).

- *The Defense Mechanisms Inventory* (DMI) [21]: a paper-and-pencil test that evaluates the defence mechanisms, classified according to five defensive styles: Turning Against Object (TAO) that means dealing with internal or external conflicts by attacking an external frustrating object; Projection (PRO) meaning projecting out unacceptable characteristics of the subjects to an external object; Principalisation (PRN) that is isolating, intellectualising and rationalising unacceptable emotions, thoughts, or behaviours; Turning Against Self (TAS), i.e. dealing with frustrating experience by turning aggression against oneself; Reversal (REV), a mechanism by which negative emotions are managed by enacting positive or neutral behaviour in response to frustrating objects, which normally evoke a negative reaction: defences such as negation, denial, reaction formation and repression are subsumed under this category.

In addition to the above, a socio-demographic questionnaire was also administered to collect socio-demographic data.

Statistical analysis

Analyses were carried out using SPSS version 18.0. Comparisons between groups were performed using one-way ANOVA and post-hoc Bonferroni and Dunnet's C tests. When appropriate, analyses were controlled for possible confounders (i.e. any variable that was associated both with

the disease stage and with any of the psychological variables) using ANCOVA. The correlation between variables was tested using bivariate Pearson's correlation. Finally, the combined effect of groups, alexithymia and defence mechanism on quality of life domains was assessed using linear regression models.

Results

Our sample consisted of 110 subjects. 41 patients were receiving adjuvant chemotherapy (Chemotherapy), 40 patients chemotherapy for metastatic disease (Metastatic) and 29 were disease-free patients in follow-up (Follow-up). The description of sample is reported in Table I. The three groups were different only in terms of education with the follow-up group that achieved higher education level (meaning more than 9 years spent at school) than the other two groups.

Mean score of the quality of life (EORTC QLQ-C30, Global Health Status QOL) scale and mean scores at the physical, role, emotional and social functional scales were significantly lower in metastatic patients than in disease-free patients. Furthermore, the former showed more severe symptoms of fatigue, nausea, pain and appetite loss than patients in follow-up. In addition, financial difficulties were less pronounced in the follow-up patients compared to the other groups (Table IIa).

Regarding the specific features of QoL in breast cancer patients, persons with metastatic cancer showed lower body image satisfaction compared to persons in the follow-up stage. This group was, obviously, less upset by side effects and hair loss than the other two groups. In addition, patients undergoing adjuvant chemotherapy experienced worse sexual functioning than the metastatic (Table IIb). For these QOL domains (i.e. social functioning) or symptoms (i.e. pain, and side effects) that were also associated with education level, analyses were repeated using ANCOVA: the effect of group remained significant and, additionally, higher education was also associated with poorer social functioning (B = -14.582, 95% CI -23.082 to -6.082, t = -3.402, p = 0.001).

Alexithymia total score and, specifically, difficulty in identifying feelings (TAS-20 F1) and externally oriented thinking (TAS-20 F3) were higher in patients with progressive disease compared to the other groups, which showed similar mean scores. Furthermore, difficulty in expressing feelings (TAS-20 F2) was higher in the metastatic group only compared to the adjuvant chemotherapy group (see Table III). Since in this sample alexithymia was associated with lower education, analyses were covariated for education levels: the effect of group remained significant, but, in addition, higher education achievement was associated with lower alexithymia total score (B = -5.988, 95% CI -10.515 to -1.460, t = -2.622, p = 0.010), reduced F2 difficulty in expressing feelings (B = -8.894, 95% CI -16.887 to -0.902, t = -2.206, p = 0.030) and lower F3 externally oriented thinking (B = 7.433, 95% CI -12.323 to -2.543, t = -3.014, p = 0.003).

We found that the TAS-20 difficulty in identifying feeling negatively correlated with all the functional scales of EORTC (physical functioning Pearson's r = -0.419 p < 0.001; role functioning r = -0.312, p = 0.001; emotional functioning r = -0.422 p < 0.001; cognitive functioning r = -0.318, p = 0.001; social functioning r = -0.412, p < 0.001). However, TAS-20 F2 difficulty in expressing feelings was only related to physical functioning (r = -0.276, p = 0.004) and

	Follow-up n = 29	Chemotherapy n = 41	Metastatic n = 40	Anova's F test/ chi square	p
TABLE I. Demographic features of the sample.					
Age mean (sd)	54.1 (10.2)	54.2 (9.2)	57.9 (9.9)	1.589	0.209
Education					
Lower education (< 8 ys) n (%)	11 (27.5%)	24 (58.5%)	17 (58.6%)	9.859	0.007
Higher education (> 9 ys) n (%)	29 (72.5%)	17 (41.5%)	12 (41.4%)		
Occupation					
Unoccupied n (%)	23 (57.5%)	25 (61.0%)	18 (62.1%)	0.172	0.918
Occupied n (%)	17 (42.5%)	16 (39.0%)	11 (37.9%)		
Marital status					
Married n (%)	35 (87.5%)	33 (80.5%)	22 (75.9%)	1.608	0.447
Unmarried n (%)	5 (12.5%)	8 (19.5%)	7 (24.1%)		
sd: Standard deviation; ys: Years of instruction.					

TABLE IIA.
EORTC QLQ-C30 scores across groups.

	Follow-up	Chemotherapy	Metastatic	Crude Anova's F test (p value)	Adjusted Anova's F test (p value)	Comparison between groups
Global Health Status QoL M (sd)	76.7 (17.4)	71.4 (19.8)	63.4 (18.8)	4.253 (0.017)		M < C*
Functional scales						
Physical functioning (PF2) M (sd)	86.4 (15.2)	80.5 (15.3)	62.5 (26.9)	9.224 (< 0.001)		M < C; M < FU**
Role functioning (RF2) M (sd)	89.4 (17.9)	82.8 (20.6)	60.9 (38.8)	7.772 (0.001)		M < C; M < FU**
Emotional functioning (EF) M (sd)	79.8 (19.5)	75.1 (20.5)	60.6 (27.5)	6.530 (0.002)		M < C; M < FU*
Cognitive functioning (CF) M (sd)	83.7 (18.2)	82.7 (19.1)	82.2 (27.4)	0.044 (0.957)		
Social functioning (SF) M (sd)	91.7 (13.4)	83.1 (22.0)	74.6 (31.0)	5.037 (0.010)	8.110 (0.001)	M < FU**
Symptom scales						
Fatigue (FA) M (sd)	19.7 (24.4)	27.0 (22.8)	43.0 (28.7)	7.308 (0.001)		M > C; M > FU*
Nausea and vomiting (NV) M (sd)	3.4 (12.6)	8.3 (14.8)	19.3 (29.1)	4.251 (0.019)		M > FU**
Pain (PA) M (sd)	13.4 (16.4)	18.8 (19.4)	30.5 (30.2)	3.952 (0.024)	3.970 (0.022)	M > FU**
Dyspnoea (DY) M (sd)	10.1 (17.1)	9.6 (18.4)	26.3 (34.9)	2.900 (0.063)		
Insomnia (SL) M (sd)	15.2 (21.2)	26.6 (29.8)	31.9 (33.8)	3.204 (0.045)		
Appetite loss (AP) M (sd)	4.2 (11.1)	3.2 (9.9)	22.8 (30.9)	5.401 (0.007)		M > C; M > FU**
Constipation (CO) M (sd)	9.3 (22.7)	16.1 (24.6)	23.9 (33.0)	2.255 (0.113)		
Diarrhoea (DI) M (sd)	4.2 (13.5)	4.8 (13.9)	10.3 (21.9)	0.881 (0.419)		
Financial difficulties (FI) M (sd)	5.8 (14.8)	19.3 (24.4)	26.3 (35.9)	7.289 (0.002)		FU < C; FU < M**

* Bonferroni's test significant at 0.05 level; ** Dunnett C's test significant at 0.05 level; M: Metastatic group; C: Chemotherapy group; FU: Follow-up group; m: Mean; sd: Standard deviation.

role functioning (r = -0.224, p = 0.019), and TAS-20 externally oriented thinking only correlated with physical functioning (r = -0.215, p = 0.025).

All the groups scored higher in the principalisation (PRN) defensive style than in the other defensive styles, with no differences between groups (see Table IV). Furthermore, turning against the object (TAO) was positively related to EORTC physical functioning (Pearson's r = 0.273 p = 0.004) and role functioning (Pearson's r = 0.234 p = 0.014), while principalisation (PRN) negatively correlated with EORTC emotional functioning (Pearson's r = -0.217 p = 0.023).

Finally, considering the results of the univariate analyses, we assessed the combined effect of the groups, TAS-20 alexithymia scales, and DMI defence styles on the EORTC functional scales. Independent variables were entered in three blocks: in the first block we included stage of the illness and education level; in the second block the TAS-20 subscales that correlated with EORTC scales; in the third block the DMI defence styles that correlated with EORTC scales. As described in Table V, controlling for effect of the other psychological variables, the stage of the illness significantly predicted only the social functioning score.

In contrast, TAS-20 F1, difficulty in identifying feelings predicted lower quality of life in all EORTC domain and DMI TAO better physical functioning and role functioning. Overall, the final models explained between 8% and 26% of the variance in quality of life.

Discussion and conclusion

Although EORTC global health status (range 63.4 - 76.7) and functional domains score (range 60.6 - 91.7) show that – on average – our sample describe their quality of life as medium-high [19], the different stages of breast cancer were related to specific issues in psychological adjustment and physical symptoms.

Compared to the other groups, patients receiving chemotherapy for metastatic disease showed higher global impairment, poorer quality of life in several domains and experienced more severe cancer-related and treatment-related symptoms. Specifically, after controlling for the effect of multiple testing, metastatic patients showed greater physical impairment and greater diffi-

TABLE IIB.
EORTC BR23 scores across the three groups.

	Follow-up	Chemotherapy	Metastatic	Crude Anova's F (p value)	Adjusted Anova's F test (p value)	Comparison between groups
Functional scales						
Body image (BRBI) M (sd)	86.5 (22.9)	74.2 (24.1)	72.1 (24.1)	4.013 (0.023)		M < FU**
Sexual functioning (BRSEF) M (sd)	25.9 (26.3)	15.6 (19.1)	36.7 (40.4)	4.649 (0.012)		C < M*
Sexual enjoyment (BRSEE) M (sd)	23.8 (27.4)	12.9 (21.9)	20.6 (34.9)	1.633 (0.200)		
Future perspective (BRFU) M (sd)	66.6 (30.8)	59.6 (31.0)	48.3 (28.9)	3.139 (0.053)		
Symptom scales						
Systemic therapy side effects (BRST) M (sd)	8.1 (9.3)	21.9 (14.5)	29.7 (20.3)	19.017 (< 0.001)	15.802 (< 0.001)	C > F; M > F*
Breast symptoms (BRBS) M (sd)	8.2 (14.0)	13.3 (12.8)	9.6 (12.7)	1.549 (0.220)		
Arms symptoms (BRAS) M (sd)	16.0 (20.5)	21.6 (20.9)	20.4 (20.5)	0.798 (0.454)		
Upset by hair loss (BRHL) M (sd)	0.6 (3.5)	31.5 (38.5)	25.1 (36.2)	11.399 (< 0.001)		C > F; M > F*

* Bonferroni's test significant at 0.05 level; ** Dunnett C's test significant at 0.05 level; M: Metastatic group; C: Chemotherapy group; FU: Follow-up group; m: Mean; sd: Standard deviation.

TABLE III.
Toronto Alexithymia Scale-20 scores across the three groups.

	Follow-up	Chemotherapy	Metastatic	Crude Anova's F test (p value)	Adjusted Anova's F test (p value)	Comparison between groups*
TAS-20 M (sd)	42.5 (10.9)	44.2 (11.0)	57.6 (13.3)	15.917 (< 0.001)	14.208 (< 0.001)	M > C M > FU
F1 M (sd)	39.8 (17.2)	41.5 (15.9)	55.3 (22.8)	6.772 (0.002)	6.209 (0.003)	M > C M > FU
F2 M (sd)	47.9 (19.9)	46.2 (19.8)	58.9 (22.1)	3.624 (0.030)	3.367 (0.038)	M > C
F3 M (sd)	43.2 (13.4)	46.9 (13.4)	58.5 (10.5)	12.692 (< 0.001)	10.479 (< 0.001)	M > C M > FU

* Bonferroni's test significant at 0.05 level; TAS-20: Alexithymia total score; F1: Difficulty in identifying feelings; F2: Difficulty in expressing emotions; F3: Externally oriented thinking; m: Mean; sd: Standard deviation; M: Metastatic group; C: Chemotherapy group; FU: Follow-up group.

culty in daily life activities and employment. Moreover, they reported more often than the other groups to feel anxious, worried, or depressed and to be less satisfied of their body image than patients in follow-up. All the above are obviously related to the greater impact of cancer on family and social life. When the other personality features were taken in account, illness stage significantly predicted EORTC social functioning. This confirms the

TABLE IV.
DMI scores across the three groups.

	Follow-up	Chemotherapy	Metastatic	Crude Anova's F (p value)
TAO M (sd)	32.7 (8.1)	33.5 (9.0)	33.9 (10.5)	0.959 (0.386)
PRO M (sd)	38.4 (6.3)	38.7 (6.3)	33.1 (4.6)	0.707 (0.495)
PRN M (sd)	51.0 (6.3)	49.9 (7.5)	50.5 (6.8)	0.279 (0.757)
TAS M (sd)	37.0 (7.7)	35.0 (6.7)	36.6 (7.0)	0.883 (0.416)
REV M (sd)	41.1 (7.5)	40.2 (9.0)	41.7 (7.7)	0.294 (0.746)

TAO: Turning Against Object; PRO: Projection; PRN: Principalisation; TAS: Turning Against Self; REV: Reversal; m: Mean; sd: Standard deviation..

TABLE V.
Effect of stage of the illness, education level, alexithymia, defence style and the functional scale of EORTC.

	Predictors	B (95% CI)	Anova's F (p value)	R2	Adj. R2
Physical functioning	TAS-20 F1 DMI TAO	-0.358 (-0.586 – -0.194) 0.298 (0.293 – 1.086)	6.920 (< 0.001)	0.289	0.247
Role functioning	TAS-20 F1 DMI TAO	-2.720 (-0.631 – - 0.099) 2.904 (0.250 – 1.329)	4.795 (0.001)	0.189	0.149
Emotional functioning	TAS-20 F1	-0.460 (-0.780 – -0.328)	6.502 (< 0.001)	0.200	0.169
Cognitive functioning	TAS-20 F1	-0.318 (-0.547 – -0.l45)	3.941 (0.010)	0.101	0.076
Social functioning	Group education level TAS-20 F1	0.215 (1.193 – 10.411) 0.315 (6.484 – 22.684) -0.456 (-0.758 – -0.332)	10.460 (< 0.001)	0.287	0.259

crucial impact of cancer on the interpersonal and social relationship [22] as well as on sexual functioning [23][24]. In fact, sexual functioning scores were very low across groups and, particularly, in the group receiving adjuvant chemotherapy. In addition, as expected, both patients undertaking chemotherapy for primary or metastatic disease were more upset by cancer-related (i.e. fatigue, nausea, pain, and appetite loss) and treatment-related symptoms (i.e. systemic therapy side effects and hair loss) than disease-free patients.

Self-reported alexithymia was significantly higher in the metastatic patients group than in the other two, being in the range 52-60 that is classified as "possible alexithymia" [20]. Although several longitudinal studies have indicated alexithymia as a stable personality trait [25][26], some research pointed out secondary, or reactive, alexithymia in breast cancer patients [27] as a defensive reaction to stressful events. Furthermore, several studies on different

clinical populations, including oncologic cohorts, support the view that alexithymia is mainly a relatively stable personality trait, but to a small extent, it is susceptible to be increased under psychological distress [28-30]. In this perspective, and with the limitation of a cross-sectional study (i.e. lack of information about alexithymia before the onset of cancer disease), the higher score in the metastatic group might be interpreted as a reaction to the stress conveyed by the progression of the disease.

In addition to the course of the disease, TAS-20 factor 1, difficulty in identifying feelings, was significantly related to all the EORTC functional subscales, even when the effect of other potential predictors was taken into account, contributing to considerably lowering the quality of life of patients affected by breast cancer, independently of their illness stage. The finding is consistent with a previous study on cancer patients showing that, together with abnormal illness behaviour, difficulty in identifying

and describing feelings predicted cancer pain, which in turn was related to cancer status and adjustment to the disease [31]. Furthermore, another study on HIV-infected men attending a cancer screening program found that, after controlling for baseline mental health, TAS-20 F1 predicted lower physical and mental quality of life and higher levels of anxiety and depression [32]. It was suggested that difficulty in identifying and processing feelings tend to increase sensitivity to pain and use of maladaptive coping strategies to manage negative emotions, with important consequences on the quality of life [31 32]. Besides difficulty in processing emotions, patients affected by breast cancer share a similar defence profile characterised by the use of defensive strategies linked to the denial cluster, such as DMI principalisation (i.e. managing unacceptable emotions and stressful experiences by isolating their intellectual meaning, including isolation and rationalisation) and, to lesser extent, reversal (i.e. dealing with unacceptable emotions and stressful experiences by giving them a neutral or positive connotation (including denial, reaction formation, and repression). Moreover, more intensive use of principalisation was related to poorer EORTC emotional functioning, namely greater depression, anxiety and worries. This is consistent with studies claiming that women affected by breast cancer have a strong propensity to inhibit their own affection and to be emotionally over-controlled, even when this implies to give up to their personal needs [33 34]. Furthermore, additional evidence suggests that among oncologic patients the so-called "type D (distressed) personality", characterised by negative effects and social inhibition, might be associated with impaired quality of life, higher psychological distress and increased risk for mental health problems, including somatic symptoms [35 36]. However, caution is needed in interpreting the association between principalisation and quality of life, since in linear regression model, the effect of this mechanism became non significant once that the effect of the other variables was taken into account. On the other hand, we found a positive correlation and a positive effect of DMI turning against the object (i.e. dealing internal or external conflicts by attacking an external frustrating object, including displacement) on EORTC physical and role functioning. This seems counterintuitive, since turning against the object is considered as a primitive, immature defence that was associated with more severe psychopathology in the general population [37] and poor social support in women with a possible diagnosis of breast cancer [38]. However, it could be speculated that, for some patients and in particular time of the disease course, the outward expression of anger might be less impairing than its repression (i.e. reversal) or its inward expression (i.e.

turning against self). Moreover, turning against the object might be related with higher level of energy and, indirectly, with reduced physical impairment and lower disability in performing working and daily life tasks. Unfortunately, the cross-sectional design prevents any conclusion regarding direction of causality.

In summary, this study underlined the relevance of difficulty in emotional processing and defence mechanisms in modulating psychological adjustment in women affected by breast cancer, suggesting that these might represent targets of psychological intervention for this population. However, the study has several limitations: the use of a cross-sectional design does not allow to establish whether difficulty in identifying feelings and TAO defence profile might be regarded as liability factors for poor quality of life, rather than its effects. Furthermore, the use of a convenience sample may limit, to some extent, the generalisability of the findings. Since this study relied on self-reported information, the effect of recall bias cannot be fully excluded, though the effect of TAS-20 F1 and DMI TAO were still significant after adjusting for stage of illness. Finally, it cannot be excluded that the relation between quality of life and personality factors was influenced by other non-assessed variables (including characteristics of the tumour, stressful events, social support and psychiatric comorbidities). Therefore, further investigations are warranted.

Conflicts of interest
None.

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