Received: 11 February 2021 | Revised: 22 April 2021 | Accepted: 22 April 2021

DOI: 10.1002/cpp.2604

RESEARCH ARTICLE

WILEY

Locus of control, personality and depression symptoms in cancer: Testing a moderated mediation model

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Funding information
Coordination for the Improvement of Higher Education Personnel (CAPES)

Abstract

Objective: To investigate the mediator role of locus of control on the relationship between the Big Five personality traits and the manifestation of depression symptoms in cancer outpatients.

Method: Participants consisted of 220 cancer outpatients (138 women and 82 men), evaluated individually at the hospital waiting room. The measures applied were as follows: The NEO-Five Factor Inventory (NEO-FFI), Multidimensional Health Locus of Control (MHLC) Scale and Hospital Anxiety and Depression Scale (HADS).

Results: The factor structure of NEO-FFI was reexamined. A moderated mediation model was found for the powerful others external locus of control (LOC), depression symptoms and extraversion and conscientiousness traits across sex.

Conclusions: Extraverted individuals can seek for others' support and use their attachments to find someone to guide them; conscientious patients can rely on their physician and follow every rule and orientation demanded, temporarily delegating to others the responsibility for their lives. All these strategies can help to decrease symptoms of depression. The perception of control can be taught, and it may be specifically relevant for mental health and in the performance of health behaviours.

KEYWORDS
cancer, depression, locus of control, moderated mediation, personality

1 | INTRODUCTION

Depression is a main global public health problem, and it has as its main features: fatigue, low mood, decreased capacity to experience pleasure, increased sense of worthlessness and concern about death (Everson et al., 1998; Kouzis et al., 1995). According to DSM-5, depression is characterized by a group of symptoms, being two of them: depressed mood and loss of interest or pleasure, which causes clinically significant impairment in the most important areas of individuals' functioning (American Psychiatric Association, 2013).

It should be noted that depression is an important health issue in cancer patients and is one of the most common mental disorders faced through this population (Mehnert & Koch, 2008; Tung et al., 2016) along with anxiety disorders (Niedzwiedz et al., 2019). Depressive symptoms can be found in 10% to 37% of cancer patients (Arrieta et al., 2013; Muzzatti et al., 2018; Yusof et al., 2016), causing poorer quality of life, reduced social functioning and increased pain (Aarts et al., 2015; Hopko et al., 2008). Literature indicates that there is a relationship between depression and personality, both in the general population and in cancer patients.

Personality factors are associated with physical symptoms in both clinical and nonclinical populations (Carver & Connor-Smith, 2010) and with greater risk of depression and diseases (Kotov et al., 2010; Noteboom et al., 2016; Weiss et al., 2009). According to some theorists, certain personality factors might easier cause the emergence of depressive symptoms in cancer patients (Bozo et al., 2017).

A systematic review of the literature searched for articles that analysed predict factors for longer term distress around the time of cancer diagnosis and found 13 papers indicating that personality features can determine the presence of anxiety and depression

(Cook et al., 2018). Other studies found that personality traits such as neuroticism may increase the risk for developing symptoms of depression, as well as cancer patients with more levels of extraversion may have a lower risk for developing those symptoms (Champagne et al., 2016; İzci et al., 2020).

Investigations through personality factors reveal that neuroticism leads to higher levels of psychological distress, stress (de Jong et al., 1999) and depression symptoms (Nakaya et al., 2006) that might be related to a dysregulation of the immune system (Kiecolt-Glaser et al., 2002). This association was found in studies with both the general population (Kendler et al., 2004) and cancer patients (Goodwin et al., 2004; Hjerl et al., 2003).

Even if comparisons are not straightforward with personality factors, locus of control (LOC) is also influenced by parents, the culture from the country of origin, education, economic stress and social capital (Ali & Lindstrom, 2008). Obviously not in the same weight as personality, but authors such as Rotter (1966, 1990) understood that the basic LOC orientations and the development of LOC expectancies are originally learned through children's experiences with their parents. LOC refers to individuals' generalized expectancy regarding the connection between their behaviour and its consequences in a problem-solving context. Those who fail to see a connection between what they do and what happens to them and instead understand what happens to them as the outcome of luck, fate or chance, among others, are seen as externally controlled (ELOC). On the other hand, those who tend to perceive a connection between their actions and what happens are considered internally controlled (ILOC) (Golding et al., 2017; Rotter, 1954).

Focusing on the idea of LOC related to health subjects, health locus of control (HLOC) can be related to health status perception and underlying behaviours (Wallston et al., 1978). HLOC is one of the important factors for cancer patients' psychological health and plays a significant role in patients' health-related quality of life and decrease of depression symptoms (Aarts et al., 2015; Brown et al., 2015; Panagiotou et al., 2014). The differences in the perceptions of HLOC tend to influence the patient's behaviour, and the patient's orientation can influence the adaptation and disease coping (Berglund et al., 2014; Theofilou & Saborit, 2013). For example, if one believes that does not have responsibility for the events around health problems, one cannot understand the importance of health behaviours, health literacy and prevention, such as screening exams. This belief can lead to a higher risk for all types of mental and physical diseases.

The results of empirical studies into the link between HLOC and depression in cancer patients are mixed. Some of them showed that external LOC is related to higher depression (Brown et al., 2017; Panagiotou et al., 2014; Sharif, 2017), and other research show that the individuals with greater external LOC show less psychological distress, including depression symptoms (Burish et al., 1984; Gwandure & Mayekiso, 2010; Sargent-Cox & Anstey, 2015).

The relationship between depressive symptoms and personality cannot be considered exclusively unidimensional, because there is a complex connection between these two aspects. Therefore, studies suggest the development of research that contemplate the existence of multidimensional relationships between personality profiles and depressive patterns (Bagby et al., 2008; Chien et al., 2007; Murphy & Moret-Tatay, 2021), perhaps including some mechanism or factor that may mediate the connection between them. Work in this field is of interest for training programmes and alternatives for someone coping with such a difficult situation. Particularly, if it is possible to change HLOC by leading new interventions that could reduce depression among cancer patients (Moorey et al., 1998; Moshki et al., 2014; Zimbardo et al., 2009).

Moreover, limited studies were found using combinations of traits, rather than single personality traits, to identify personality profile dimensions or emotional and behavioural characteristics that may increase the risk for depressive symptoms in cancer outpatients (Morgan et al., 2017). In this scenario, this study aimed to investigate the role of the LOC on the relation between Big Five personality traits and the manifestation of depression symptoms in cancer outpatients.

Key Practitioner Message

- Powerful others external LOC can help not to not try to control their chronic disease, avoiding distress and depressive symptoms during cancer.
- Conscientiousness seems to influence depression symptoms in cancer patients.
- Women may be more vulnerable to symptoms of depression in cancer disease.

2 | MATERIALS AND METHODS

2.1 | Participants

The participants were recruited using convenience sampling, and consisted of 220 outpatients, being 138 (62.7%) women and 82 (37.3%) men. The age mean was 54.66 (standard deviation, $SD = 13.30$) years, and the education level mean was 8.32 ($SD = 3.76$) years of study. The sample size was calculated grounded on Brazilian National Cancer Institute (Inca) estimates to 2016–2017 biennium to the city of Porto Alegre (RS, Brazil), considering new cases of cancer and rates incidence (nearly 9,044), applying a 5% of sample error estimation and a 95% confidence level (Instituto Nacional do Câncer [Inca], 2016). More information regarding sociodemographic and clinical data can be found in Table 1.

2.2 | Instruments

a. The NEO-Five Factor Inventory (NEO-FFI) was chosen to address Personality, employing the Brazilian version developed by Flores-Mendonza (2007). This is a 60-item instrument that is used to assess five personality domains: neuroticism, extraversion,

TABLE 1 Sociodemographic and clinical data of the sample ($N = 220$)

Variables		*N*	%	Depression (mean)	*SD*
Sex	Women	138	62.7	5.16	4.21
	Men	82	37.3	3.74	3.20
Age (years)	Mean (*SD*)	54.66 (13.30)			
Years of study	Average	8.32			
	SD	3.76		4.31	3.46
	9 or more years	93	42.3		
	5 to 8 years	88	40.0	4.82	4.06
	0 to 4 years	39	17.7	4.59	3.99
Marital status	Married	124	56.4	4.29	3.48
	Single	49	22.3	4.96	4.57
	Widowed	26	11.8	4.96	3.75
	Divorced	21	9.5	5.48	4.89
Occupational situation	Inactive	147	66.8	3.84	3.48
	Active	53	24.1	5.03	4.07
Occupational situation status	Retired for disability	71	32.3		
	Retired	70	31.8		
	Unemployed	06	2.7		
Type of cancer	Breast	61	27.7		
	Lung	37	16.8		
	Kidney/prostate	37	16.8		
	Low digestive	23	10.5		
	High digestive	15	6.8		
	Haematological	13	5.9		
	Gynaecological	10	4.5		
	Others	24	11.0		
Time since diagnosis	Mean (*SD*)	36.21 (39.8)			
(months)	0 to 12	78	35.9	4.73	3.76
	13 to 36	76	35.0	5.20	4.48
	37 to 60	30	13.8	3.63	3.20
	>60	33	15.0	3.91	3.33
Treatment	Chemotherapy	158	71.8		
	Surgery	158	71.8		
	Radiotherapy	91	41.4		

Note: Source: Research data (2017).

openness to experience, agreeableness and conscientiousness (Costa & McCrae, 1992). Each of the five domains is evaluated using 12 self-rated items utilizing a 5-point Likert scale (i.e., 0 = *strong disagreement*, 1 = *disagreement*, 2 = *neutral*, 3 = *agreement* and 4 = *strong agreement*). Higher scores specify higher levels of each factor. In the study of Morgan et al. (2017), Cronbach's alphas for the NEO-FFI were .87 for neuroticism, .80 for extraversion, .77 for openness to experience, .76 for agreeableness and .84 for conscientiousness. The global Cronbach's alpha found in the present study was .682. However, the subscales were: .46 for neuroticism, .45 for extraversion, .12 for openness to experience, .28 for agreeableness and .24 for conscientiousness. As internal consistency did not reach optimal values for the subscales, the factor structure was revisited. After a confirmatory factor analysis, as described in Section 3, Cronbach's alphas for the new NEO-FFI did reach adequate values, described as follows: .76 for neuroticism, .74 for extraversion, .60 for openness to experience, .55 for agreeableness and .77 for conscientiousness.

b. Multidimensional Health Locus of Control (MHLC) Scale (Wallston et al., 1978; Wallston & Wallston, 1981), translated and validated in Brazil by Della Coleta (1995), is composed by three LOC dimensions: internal and external (attribution to powerful others and chance/luck). It is a 6-point Likert scale with 18 total items. The scores provide, respectively, the degree of self-belief, of powerful

others and chance, as sources of health control. The LOC orientation that reaches the highest score indicates the individual prevalence of LOC. The original scale found Cronbach's alpha coefficients of .66 for internal, .58 for external powerful others and .59 for external chance. On the other hand, the Brazilian study that translated and validated the scale found .63 for internal and .64 to external powerful others and external chance. The current study found similar values, globally as $\alpha = .72$, and any subscale described as follows: Cronbach's alpha coefficients of .56 for internal, .62 for external powerful others and .53 for external chance.

c. Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14 items self-evaluation scale to measure symptoms of anxiety and depression, in two subscales of seven items each, that score from 0 to 21. The total score can vary between 0 and 42. The response is scored on a 4-point Likert scale ranging from 0 to 3. The Portuguese translated version adapted to Brazil by Botega et al. (1995) was used in the present study, and the 08 cut-off point was adopted, indicating that patients who reached 08 or more in each one of the subscales (depression and anxiety) reflect a clinically significant symptomatology. This specific cut-off point was chosen based on other studies with cancer patients that found relevant results and proper reliability values (Arrieta et al., 2013; Hartung et al., 2017; Srivastava et al., 2016). Cronbach's alphas of the Portuguese version scale are .68 for HADS-A and .67 for HADS-D (Botega et al., 1995). The global Cronbach's alpha found in the present study was .87, while each subscale also depicted optimal values, .80 for HADS-A and .80 for HADS-D.

2.3 | Procedure

This research was approved by an Ethical Research Committee, recognized by the National Health Council (CNS). This committee analyses research projects that are carried out at the university and at the University Hospital, where the data collection took place. The hospital oncology department was contacted and the department's chief aloud the data collection in the hospital waiting room while patients waiting for the doctor's appointment. Patients were invited to participate in the study and fulfil the instruments under the supervision of a psychologist and two trained psychology undergraduate students. Each patient was evaluated individually, in a single meeting, with an average duration of 45 min.

All the participants voluntarily signed the Free and Informed Consent (TCLE). Confidentiality was assured, and the sample identity was undisclosed. The inclusion criteria were (a) individuals over 18 years, who voluntarily participated in the study, signing the TCLE, and (b) a cancer diagnosis confirmed, reported by the patient himself.

2.4 | Data analysis

The statistical analysis was performed using SPSS 20. As some internal consistency did not depict good values, a confirmatory factor analysis was carried out. The confirmation of the adequacy of the model has been used within the absolute fit indices; the chi-square statistic χ^2, the comparative fit index (CFI), the incremental fit index (IFI) and, within parsimony adjustment indices, the error of the root-mean-square approximation (RMSEA).

The authors also conducted a mediational analysis using process macro for SPSS (Hayes, 2015) to test the hypothesis that external LOC mediate the effect of some personality traits in depression. In this way, regression-based mediation procedures were executed employing bootstrapping procedures (Fairchild & MacKinnon, 2009; Hayes, 2009). More precisely, a regression coefficient (and associated *t* test) was first calculated on the mediational variable, the independent variable on the dependent variable without the inclusion of mediator and the independent variable on the dependent variable after the mediator was included. Moreover, a moderation was included regarding the variable sex, ending up with a moderation mediational model.

3 | RESULTS

The NEO-FFI has provided a large body of research in its adaptations through principal component analysis (PCA), exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) approaches (Rosellini & Brown, 2011). This issue added to the fact that the current profile sample might have present differences to the general population, as well as the poor internal consistency values found, led us to carry out confirmatory factor analysis. Appendix A depicts factor loading. In this way, some items were excluded but maintaining a similar structure than the expected one. This reduced version showed a good goodness of fit: $\chi^2/DF = 1.54$; IFI = .80; CFI = .78; RMSEA = .05. Therefore, this was the solution employed for further analysis.

The HADS results indicated that 47 patients (21.4%) were identified with clinically relevant depressive symptoms. Powerful others external LOC orientation (60.9%) was the prevalent orientation in the sample. All variables tested were standardized previously in the analysis.

Nonparametric approaches (Kruskal–Wallis) were carried out for sociodemographic variables, which more than one group across HADS, MHLC and NEO-FFI. No differences were found for years of study, marital status and type of cancer or treatment ($p > .05$). However, statistically differences were found for scores in neuroticism, anxiety and external LOC, regarding time since diagnosis. On the other hand, the nonparametric approach Mann–Whitney *U* test showed statistical differences between men and women for scores in depression, neuroticism and external others LOC ($p < .05$). Therefore, these variables, sex and time since diagnose, were included in the previous analysis. As suggested in previous literature (Hayes, 2017; Moret-Tatay et al., 2018), partial correlations regarding sex and time since diagnose were carried out, in order to examine the strength among the variables of interest (see Table 2).

A linear regression analysis was carried out previously to the mediational model. As depicted in Table 3, scores in depression were

TABLE 2 Partial correlations between locus of control, personality and depression

	1	2	3	4	5	6	7	8	9	10
Conscientiousness (1)	1.000									
Agreeableness (2)	−.063	1.000								
Openness to experience (3)	.345**	.112	1.000							
Extraversion (4)	.474**	−.069	.397**	1.000						
Neuroticism (5)	−.218**	.274**	−.067	−.225	1.000					
Internal (6)	.243**	.074	.037	.169**	−.007	1.000				
External others (7)	.209**	.081	.101	.198**	−.183**	.398**	1.000			
External chance (8)	.164**	.140	−.014	.188**	.070	.225**	.347**	1.000		
Anxiety (9)	−.184**	.086	.077	−.177**	.521**	−.022	−.095	.084	1.000	
Depression (10)	−.352**	.061	−.221**	−.339**	.403**	−.150**	−.172**	.031	.618**	1.000

*Correlation is significant at the .05 level (two-tailed).
**Correlation is significant at the .01 level (two tailed).

TABLE 3 Linear regression on the variables of interest

Model	*B*	SE	Beta	*t*	Sig.
Constant	−.423	.237		−1.781	**.076**
Conscientiousness	−.178	.075	−.176	−2.391	**.018**
Agreeableness	−.047	.065	−.047	−.724	.470
Openness	−.060	.070	−.060	−.865	.388
Extraversion	−.156	.074	−.156	−2.111	**.036**
Neuroticism	.321	.068	.322	4.710	**.000**
Sex	.275	.131	.132	2.099	**.037**
Time diag.	−.044	.061	−.047	−.729	.467
Internal	−.078	.068	−.078	−1.140	.256
External others	−.040	.074	−.040	−.545	.587
External chance	.106	.069	.104	1.526	.129

Note: The dependent variable was the scores on depression.

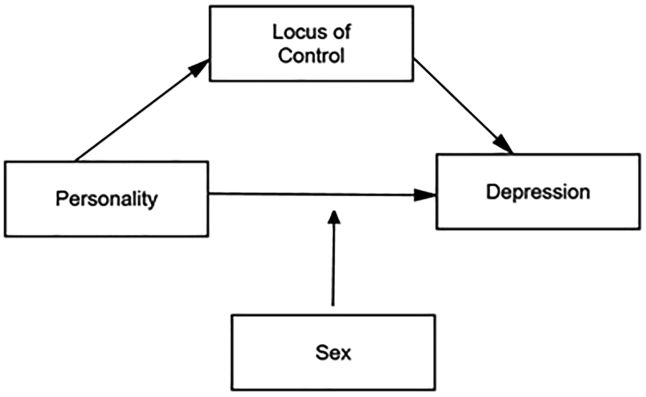

FIGURE 1 Moderated mediation proposed across the variable of interest: personality, locus of control and depression

predicted by conscientiousness, extraversion, neuroticism and sex. For this reason, the variable sex was included in further analysis, and the role of sex was considered as a moderated mediation. Figure 1 depicts the proposal model supported by some literature, where LOC might mediate the relation between personality and depression. Moreover, sex was considered as a moderation variable through the statistical approach previously conducted. All possibilities across LOC and personality, on the prediction of depression, were tested. Models on internal LOC or external chance did not reach the statistical significance. As described in Table 4, external others LOC was statistically significant in a model related to conscientiousness and almost, a second model related to extraversion (as the extraversion showed a $p = .07$ and LLCI and ULCI contained the 0 value). Nor other NEO-FFI personality variables reached the statistical significance. This table also illustrates confidence interval (CI) that at 95% was statistically significant with a CI that does not include the zero value. The moderation indicated that depression was moderated by sex, being the worse scenario for women (see Figure 2).

4 | DISCUSSION

This study aimed to investigate the mediator role of LOC on the relationship between the Big Five personality factors and the manifestation of depression symptoms in cancer outpatients. As sex was a variable that showed statistical differences in previous analysis, a moderation was also included in the model, ending up in a moderated mediation model. The findings in Table 2 indicated that all five factors were significantly correlated to symptoms of depression. However, only extraversion and conscientiousness were predictors of these symptoms. These results are in line with other studies that have found that these two personality factors were prospective predictors of depression (Johnson, 2014; Lahortiga-Ramos et al., 2018; Naragon-Gainey & Watson, 2014); that is, extraversion and conscientiousness can predict a decrease in these symptoms.

Conscientiousness has been related to lower levels of depression in several studies (Jerant et al., 2010; Karsten et al., 2012; Morgan et al., 2017; Weber et al., 2012). Characteristics like self-efficacy, achievement-striving, self-discipline, cautiousness and dutifulness are

	Coeff	SE	t	p	LLCI	ULCI
Model 1	.4	.13	3.01	.002	.14	.669
External others	−.16	.07	2.26	.024	−.3	−.02
Conscientiousness	−.55	.15	3.69	.003	−.85	−.26
Sex	.31	.12	2.44	.015	.06	.56
Sex interaction	−.7	.31	2.22	.027	−1.33	−.07
Model 2	.35	.1	3.514	.005	.157	.558
External others	−.12	.06	1.8	.07	−.263	.01
Extraversion	−.42	.1	4.01	.0001	−.62	−.21
Sex	.34	.12	2.797	.005	.1	.59
Sex interaction	−.68	.19	3.55	.0001	−1.06	−.3

TABLE 4 Effects of personality (Model 1 = conscientiousness and Model 2 = extraversion) on depression, mediated by external others locus of control and moderated by sex, standard error (SE), statistical significance and lower and upper (LLCI and ULCI) levels

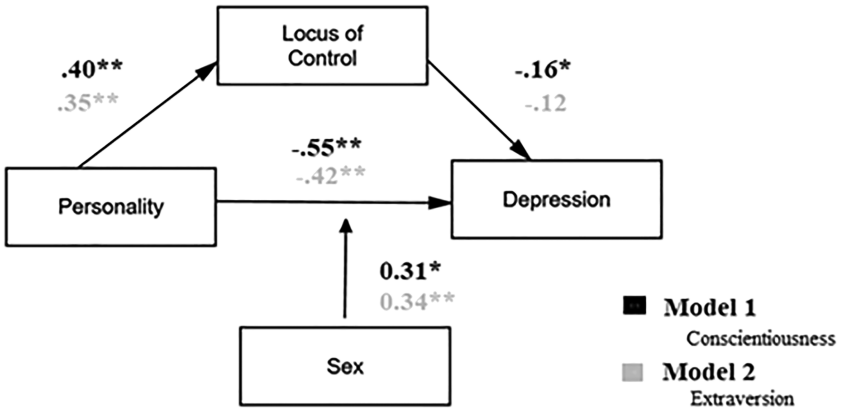

FIGURE 2 Moderated mediation model tested regarding the external locus of control (powerful others) in personality and depression

a person's important indicators of those who have high levels of conscientiousness (Costa & McCrae, 1989; Johnson, 2014).

Moreover, the sense of commitment to oneself and others, the hardness on oneself and with rules, helps conscientious individuals to do others' wishes and commands. Evidence suggests that conscientiousness influences health outcomes (physical and mental health results) through its effects on health behaviours (Hampson et al., 2015), which can prevent the development of depressive symptoms.

The other factor, extraversion, is characterized by assertiveness, activity level, excitement-seeking and positive emotions (Costa & McCrae, 1989; Johnson, 2014). Extraverted people are sociable, talkative and assertive (McCabe & Fleeson, 2012) and tend to seek social support when they need it, which can make easier the perception of situations as less stressful (Karabay et al., 2016). Besides that, people with high extraversion usually have energy and a need to seek contact with others, which are some of the opposite feelings of depressive people. Also, they usually interact and communicate with different people, in a different social environment, which increases the possibilities to speak about their daily life concerns with friends and family members, preventing loneliness and the development of emotional suffering (Mutlu et al., 2010).

The results of the present study also indicate that the mediational model tested revealed that the powerful others external LOC was a mediator between conscientiousness and depression, and almost the same pattern was found for the trait of extraversion. External-LOC individuals tend to ignore problems, perform insecure-avoidant behaviours (Basım et al., 2009; Rees & Cooper, 1992) or to delegate those issues to others.

People with external LOC orientation do not usually think much about their experiences and the consequences of their actions and they have different ways of coping with stressors, such as a cancer diagnosis or treatment. Usually, they have a fatalistic coping style, characterized by low levels of anxiety and depression, low sense of control, resignation and passive acceptance of fate (Burgess et al., 1988; Lazarus & Folkman, 1984; Pettingale et al., 1985).

Different explanatory hypotheses can be used to understand the results of this study. One is that the powerful others external LOC can help this sample to not try to control their chronic disease, avoiding distress and depressive symptoms. Oncological patients who consider that they have little control over their disease can feel more comfortable and safe delegating control to their oncologist (Helmes et al., 2002). Current studies found that the external LOC seemed to be associated with a lower prevalence of depression in cancer patients (Aarts et al., 2015; Wilson et al., 2018).

Another possible explanation is that individuals guided by their extraversion features can seek others' opinions and support and use their attachments to find someone to guide them and to take control of their current situation. As a strategy to better regulate their emotions (Baumeister et al., 2003), they can also easily seek for situations

that can bring them joy and relax among friends and relatives, because they have a higher inclination to try out positive emotions than other people (Costa & McCrae, 1980).

On the other way, due to their conscientiousness features, they can truly trust in their physician and follow every rule and orientation demanded by the health team, temporarily delegating or sharing with others the responsibility for their lives. External powerful others LOC was already found to have a positive relationship with trust in the physician, indicating a tendency for these individuals to expect doctors to take care of their health problems and decisions (Brincks et al., 2010; Lima, Machado, & Irigaray, 2018) or to use participative decision making (Selart, 2005). All of this can result in less distress and negative affect (Burish et al., 1984), less anxiety and depression symptomatology.

It should be noted that personality has stronger biological roots than LOC (Cloninger, 2000). The relationship between the two personality traits and lower levels of depressive symptoms is of interest in this specific sample, as it seems to be sensitive to the influence (mediation) of the powerful others external LOC. This is explained in terms of external orientation, which interferes with how patients with high extraversion and conscientiousness. In other words, external orientation understanding and behaviours to deal with the disease, as well as cancer treatment, and the involvement with the health team help to reduce the emergence of depressive symptoms.

The findings of the current study also suggest, through the role of moderation in the proposed model, that the predicted paths linking personality and depression are stronger among women compared to men, as suggested in previous literature (Hinz et al., 2019; Moret-Tatay et al., 2016). Studies showed that women score higher than men on some conscientiousness facets, such as order, self-discipline and dutifulness, but no significant gender distinction has been found in this factor at the Big Five trait level. The same outcomes were found regarding extraversion. Sex differences are small on the overall domain level, but women seem typically score higher than men, especially on warmth, gregariousness and positive emotional facets (Costa et al., 2001).

Literature has also claimed that women have upon twice the depression rates as men (van de Velde et al., 2010), including female cancer patients, who also show more depression symptoms than male patients (Fanger et al., 2010; Lima, Oliveira, & Irigaray, 2018; Polidoro Lima & Osório, 2014). Addressing these considerations, a moderation approach provides greater confidence in the reliability of the findings when differential associations are hypothesized between men and women. Therefore, we encourage researchers to test the moderating effects of sex in relationships linking the underlying variables.

The findings underline that powerful other external LOC has a mediation role in the relationship between extraversion and conscientiousness personality factors and depression symptoms in cancer patients, which is also moderated by sex. From these findings, the authors conclude that LOC, personality and the relationship between both are important factors to understand the patient's ways of coping with cancer and can predict the emergence or not of depression symptoms. Moreover, women would be more sensitive to these results.

Despite the significant outcomes, this study has limitations. The heterogeneity of the sample, the collecting data only from one hospital and using a convenience sampling technique limits the generalizability of the findings. The data collection performed in the waiting room, despite all the care taken, may have interfered with data confidentiality. Finally, the original and the Brazilian version of the HLOC scale presents values with little satisfactory internal consistency, indicating that the results should be interpreted with caution.

The study concludes that personality traits and LOC can influence health outcomes, even in powerful conditions, such as living with cancer. Besides that, both are important to consider when evaluating the symptoms experienced by cancer outpatients. Recognizing that personality traits are generally stable over the life course, it is possible to consider developing interventions and assistive programme to change HLOC orientation, aiming to reduce the high risk of depressive symptoms in cancer patients.

In this context, researches underline that to a large extent, perception of control can be taught, and, in the context of cancer, it may be specifically influential in the performance of health behaviours and the development of mental symptoms. Thus, more knowledge in this field may have therapeutic implications, because it is possible to change HLOC, and new interventions could reduce depression among cancer patients (Moorey et al., 1998; Moshki et al., 2014; Zimbardo et al., 2009).

ACKNOWLEDGEMENTS

The authors want to acknowledge the support of Coordination for the Improvement of Higher Education Personnel (CAPES) on the development of this research.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DECLARATION OF INTEREST STATEMENT

All the authors declare that this article has not been previously published nor has it been submitted to another journal. This research was approved by an Ethical Research Committee, recognized by the National Health Council (CNS) under the number 63367316.0.0000.5336.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available upon request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

M. P. L. collected the data, drafted, wrote and submitted the manuscript. C. M. T planned the statistics analysis, analysed data, wrote the methodology and assisted in manuscript revision. T. Q. I. oversaw data collection, advised on data analysis and revised the manuscript.

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REFERENCES

Aarts, J. W. F., Deck, L., van Abbema, D. L., Tjan-Heijnen, V. C. G., van den Akker, M., & Buntin, F. (2015). The relation between depression, coping and health locus of control: Differences between older and younger patients, with and without cancer. *Psycho-Oncology*, *24*, 950–957. https://doi.org/10.1002/pon.3748

Ali, S. M., & Lindstrom, M. (2008). Psychosocial work conditions, unemployment and health locus of control: A population based study. *Scandinavian Journal of Public Health*, *36*, 429–435. https://doi.org/10.1177/1403494807088452

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC.

Arrieta, O., Ângulo, L. P., Nunez-Valencia, C., Dorantes-Gallareta, Y., Macedo, E. O., Martínez-López, D., Alvarado, S., Corona-Cruz, J.-F., & Oñate-Ocaña, L. F. (2013). Association of depression and anxiety on quality of life, treatment adherence, and prognosis in patients with advanced non-small cell lung cancer. *Annals of Surgical Oncology*, *20*, 1941–1948. https://doi.org/10.1245/s10434-012-2793-5

Bagby, R. M., Quilty, L. C., & Ryder, A. C. (2008). Personality and depression. *The Canadian Journal of Psychiatry*, *53*(1), 14–25. https://doi.org/10.1177/070674370805300104

Basım, H. N., Çetin, F., & Meydan, C. H. (2009). The role of locus of control in interpersonal conflict resolution approaches. *Selçuk University Institute of Social Sciences Journal*, *21*, 57–69.

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest*, *4*, 1–44. https://doi.org/10.1111/1529-1006.01431

Berglund, E., Lytsy, P., & Westerling, R. (2014). The influence of locus of control on self-rated health in context of chronic disease: A structural equation modeling approach in a cross sectional study. *BMC Public Health*, *14*(1), 492. https://doi.org/10.1186/1471-2458-2458-14-492

Botega, N. J., Bio, M. R., Zomignani, M. A., Garcia Júnior, C., & Pereira, W. A. (1995). Transtornos do humor em enfermaria de clínica médica e validação de escala de medida (HAD) de ansiedade e depressão. [Mood disorders among medical in-patients: A validation study of the hospital anxiety and depression scale (HAD)]. *Revista de Saúde Pública*, *29*, 355–363. https://doi.org/10.1590/S0034-89101995000500004

Bozo, Ö., Ar, Y., & Eldoğan, D. (2017). Does marital adjustment mediate type c personality-depressive symptoms relation? A comparison between breast cancer patients and cancer-free women. *Current Psychology*, *38*, 1–8. https://doi.org/10.1007/s12144-017-9693-6

Brincks, A. M., Feaster, D. J., Burns, M. J., & Mitrani, V. B. (2010). The influence of health locus of control on the patient–provider relationship. *Psychology Health and Medicine*, *15*, 720–728. https://doi.org/10.1080/13548506.2010.498921

Brown, A. J., Sun, C. C., Urbauer, D. L., Bodurka, D. C., Thaker, P. H., & Ramondetta, L. M. (2015). Feeling powerless: Locus of control as a potential target for supportive care interventions to increase quality of life and decrease anxiety in ovarian cancer patients. *Gynecologic Oncology*, *138*, 388–393. https://doi.org/10.1016/j.ygyno.2015.05.005

Brown, A. J., Thaker, P. H., Sun, C. C., Urbauer, D. L., Bruera, E., Bodurka, D. C., & Ramondetta, L. M. (2017). Nothing left to chance? The impact of locus of control on physical and mental quality of life in terminal cancer patients. *Supportive Care in Cancer*, *25*(6), 1985–1991. https://doi.org/10.1007/s00520-017-3605-z

Burgess, C., Morris, T., & Pettingale, K. W. (1988). Psychological response to cancer diagnosis II. Evidence for coping styles. *Journal of Psychosomatic Research*, *20*, 795–802. https://doi.org/10.1016/0022-3999(88)90067-0

Burish, T. G., Carey, M. P., Wallston, K. A., Stein, M. J., Jamison, R. N., & Lyles, J. N. (1984). Health locus of control and chronic disease: An external orientation may be advantageous. *Journal of Social and Clinical Psychology*, *2*, 326–332. https://doi.org/10.1521/jscp.1984.2.4.326

Carver, C. S., & Connor-Smith, J. (2010). Personality and coping. *Annual Review of Psychology*, *61*, 679–704. https://doi.org/10.1146/annurev.psych.093008.100352

Champagne, A. L., Brunault, P., Huguet, G., Suzanne, I., Senon, J. L., Body, G., Rusch, E., Magnin, G., Voyer, M., Réveillère, C., & Camus, V. (2016). Personality disorders, but not cancer severity or treatment type, are risk factors for later generalised anxiety disorder and major depressive disorder in non metastatic breast cancer patients. *Psychiatry Research*, *236*, 64–70. https://doi.org/10.1016/j.psychres.2015.12.032

Chien, L., Ko, H., & Wu, J. Y. (2007). The five-factor model of personality and depressive symptoms: One-year follow-up. *Personality and Individual Differences*, *43*, 1013–1023. https://doi.org/10.1016/j.paid.2007.02.022

Cloninger, C. R. (2000). Biology of personality dimensions. *Current Opinion in Psychiatry*, *13*(6), 611–616. https://doi.org/10.1097/00001504-200011000-00024

Cook, S. A., Salmon, P., Hayes, G., Byrne, A., & Fisher, P. L. (2018). Predictors of emotional distress a year or more after diagnosis of cancer: A systematic review of the literature. *Psycho-Oncology*, *27*(3), 791–801. https://doi.org/10.1002/pon.4601

Costa, P. T. Jr., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology*, *38*, 668–678. https://doi.org/10.1037/0022-3514.38.4.668

Costa, P. T. Jr., & McCrae, R. R. (1989). *The NEO-PI/NEO FFI manual supplement*. Odessa, FL: Psychological Assessment Resources Inc.

Costa, P. T. Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five Factor Inventory (NEO-FFI) professional manual*. Odessa, FL: Psychological Assessment Resources Inc.

Costa, P. T. Jr., Terracciano, A., & McCrae, R. R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology*, *81*, 322–331. https://doi.org/10.1037/0022-3514.81.2.322

de Jong, G. M., van Sonderen, E., & Emmelkamp, P. M. G. (1999). A comprehensive model of stress. *Psychotherapy and Psychosomatics*, *68*, 290–298. https://doi.org/10.1159/000012346

Della Coleta, M. F. (1995). O Modelo de Crenças em Saúde: uma aplicação à prevenção e controle da doença cardiovascular [*thesis*]. [The Health Belief Model: An application to the prevention and control of cardiovascular disease]. Brasília (DF): Universidade de Brasília.

Everson, S. A., Roberts, R. E., Goldberg, D. E., & Kaplan, G. A. (1998). Depressive symptoms and increased risk of stroke mortality over 29 years. *Archives of Internal Medicine*, *158*(10), 1133–1138. https://doi.org/10.1001/archinte.158.10.1133

Fairchild, A. J., & MacKinnon, D. (2009). A general model for testing mediation and moderation effects. *Prevention Science*, *10*(2), 87–99. https://doi.org/10.1007/s11121-008-0109-6

Fanger, P. C., Azevedo, R. C. S., Mauro, M. L. F., Lima, D. D., Gaspar, K. C., Silva, V. F., do Nascimento, W. T. J., & Botega, N. J. (2010). Depressão e comportamento suicida em pacientes oncológicos hospitalizados: Prevalência e fatores associados. *Revista da Associação Medica Brasileira*, *56*(2), 173–178. https://doi.org/10.1590/S0104-42302010000200015

Flores-Mendonza, C. E. (2007). *Inventário de personalidade NEO-Revisado. Manual técnico*. São Paulo: Vetor Editora.

Golding, J., Gregory, S., Iles-Caven, Y., & Nowicki, S. (2017). The antecedents of women's external locus of control: Associations with characteristics of their parents and their early childhood. *Heliyon*, *3*, e00236. https://doi.org/10.1016/j.heliyon.2017.e00236

Goodwin, J. S., Zhang, D. D., & Ostir, G. V. (2004). Effect of depression on diagnosis, treatment, and survival of older women with breast cancer. *Journal of the American Geriatrics Society*, *52*(1), 106–111. https://doi.org/10.1111/j.1532-5415.2004.52018.x

Gwandure, C., & Mayekiso, T. (2010). Predicting HIV risk using a locus of control-based model among university students. *Journal of Child and Adolescent Mental Health*, *22*(Suppl. 2), 119–129. https://doi.org/10.2989/17280583.2010.528579

Hampson, S. E., Edmonds, G. W., Goldberg, L. R., Dubanoski, J. P., & Hillier, T. A. (2015). A life-span behavioral mechanism relating childhood conscientiousness to adult clinical health. *Health Psychology*, *34*, 887–895. https://doi.org/10.1037/hea0000209

Hartung, T. J., Brahler, E., Faller, H., Harter, M., Hinz, A., Johansen, C., Keller, M., Koch, U., Schulz, H., Weis, J., & Mehnert, A. (2017). The risk of being depressed is significantly higher in cancer patients than in the general population: Prevalence and severity of depressive symptoms across major cancer types. *European Journal of Cancer*, *72*, 46–53. https://doi.org/10.1016/j.ejca.2016.11.017

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, *76*(4), 408–420. https://doi.org/10.1080/03637750903310360

Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research*, *50*(1), 1–22. https://doi.org/10.1080/00273171.2014.962683

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Publications.

Helmes, A. W., Bowen, D. J., & Bengel, J. (2002). Patient preferences of decision-making in the context of genetic testing for breast cancer risk. *Genetics and Medicine*, *4*, 150–157. https://doi.org/10.1097/00125817-200205000-00009

Hinz, A., Herzberg, P. Y., Lordick, F., Weis, J., Faller, H., Brähler, E., Härter, M., Wegscheider, K., Geue, K., & Mehnert, A. (2019). Age and gender differences in anxiety and depression in cancer patients compared with the general population. *European Journal of Cancer Care*, *28*(5), e13129. https://doi.org/10.1111/ecc.13129

Hjerl, K., Andersen, E. W., Keiding, N., Mouridsen, H. T., Mortensen, P. B., & Jørgensen, T. (2003). Depression as a prognostic factor for breast cancer mortality. *Psychosomatics*, *44*(1), 24–30. https://doi.org/10.1176/appi.psy.44.1.24

Hopko, D., Bell, J., Armento, M., Robertson, S., Hunt, M., Wolf, N. J., & Mullane, C. (2008). The phenomenology and screening of clinical depression in cancer patients. *Journal of Psychosocial Oncology*, *26*, 31–51. https://doi.org/10.1300/J077v26n01_03

Instituto Nacional do Câncer (Inca). (2016). Brasil. *Estimativa 2016: Incidência de câncer no Brasil*. [Internet] Rio de Janeiro: Ministério da Saúde. Recuperado de: http://www.inca.gov.br/estimativa/2016/tabelaestados.asp?UF=RS

İzci, F., Sarsanov, D., Erdoğan, Z. İ., İlgün, A. S., Çelebi, E., Alço, G., Kocaman, N., Ordu, Ç., Öztürk, A., Duymaz, T., Pilavcı, K. N., Elbüken, F., Ağaçayak, F., Aktepe, F., Ünveren, G., Özdem, G., Eralp, Y., & Özmen, V. (2020). Impact of personality traits, anxiety, depression and hopelessness levels on quality of life in the patients with breast cancer. *European Journal of Breast Health*, *14*(2), 105–111. https://doi.org/10.5152/ejbh.2018.3724

Jerant, A., Chapman, B., Duberstein, P., & Franks, P. (2010). Effects of personality on self-rated health in a 1-year randomized controlled trial of chronic illness self-management. *British Journal of Health Psychology*, *15*(Pt 2), 321–335. https://doi.org/10.1348/135910709X464353

Johnson, J. A. (2014). Measuring thirty facets of the five factor model with a 120-item public domain inventory: Development of the IPIP-NEO-120. *Journal of Research in Personality*, *51*, 78–89. https://doi.org/10.1016/j.jrp.2014.05.003

Karabay, M. E., Akyüz, B., & Elçi, M. (2016). Effects of family-work conflict, locus of control, self-confidence and extraversion personality on employee work stress. *Procedia - Social and Behavioral Sciences*, *235*, 269–280. https://doi.org/10.1016/j.sbspro.2016.11.030

Karsten, J., Penninx, B. W., Riese, H., Ormel, J., Nolen, W. A., & Hartman, C. A. (2012). The state effect of depressive and anxiety disorders on big five personality traits. *Journal of Psychiatry Research*, *46*(5), 644–650. https://doi.org/10.1016/j.jpsychires.2012.01.024

Kendler, K. S., Kuhn, J., & Prescott, C. A. (2004). The interrelationship of neuroticism, sex, and stressful life events in the prediction of episodes of major depression. *American Journal of Psychiatry*, *161*(4), 631–636.

Kiecolt-Glaser, J. K., Robles, T. F., Heffner, K. L., Loving, T. J., & Glaser, R. (2002). Psycho-oncology and cancer: Psychoneuroimmunology and cancer. *Annals of Oncology*, *13*(14), 165–169. https://doi.org/10.1093/annonc/mdf655

Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, *136*, 768–821. https://doi.org/10.1037/a0020327

Kouzis, A., Eaton, W. W., & Leaf, P. J. (1995). Psychopathology and mortality in the general population. *Social Psychiatry and Psychiatric Epidemiology*, *30*, 165–170. https://doi.org/10.1007/bf00790655

Lahortiga-Ramos, F., Unzueta, C. R., Zazpe, I., Santiago, S., Molero, P., Sánchez-Villegas, A., & Martínez-González, M. A. (2018). Self-perceived level of competitiveness, tension and dependency and depression risk in the SUN cohort. *BMC Psychiatry*, *18*(241), 1–11. https://doi.org/10.1186/s12888-018-1804-x

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York, NY: Springer.

Lima, M. P., Machado, W. L., & Irigaray, T. Q. (2018). Predictive factors of treatment adherence in cancer outpatients. *Psycho-Oncology*, *27*, 1–6. https://doi.org/10.1002/pon.4897

Lima, M. P., Oliveira, D. S., & Irigaray, T. Q. (2018). Symptoms of depression and anxiety in cancer outpatients: Predictive variables. *Psicooncologia*, *15*(2), 373–384. https://doi.org/10.5209/PSIC.61443

McCabe, K. O., & Fleeson, W. (2012). What is extraversion for? Integrating trait and motivational perspectives and identifying the purpose of extraversion. *Psychological Science*, *23*, 1498–1505. https://doi.org/10.1177/0956797612444904

Mehnert, A., & Koch, U. (2008). Psychological co-morbidity and health-related quality of life and its association with awareness, utilization and need for psychosocial support in a cancer register-based sample of long-term breast cancer survivors. *Journal of Psychosomatic Research*, *64*, 383–391. https://doi.org/10.1016/j.jpsychores.2007.12.005

Moorey, S., Greer, S., Bliss, J., & Law, M. (1998). A comparison of adjuvant psychological therapy and supportive counselling in patients with cancer. *Psycho-Oncology*, *7*, 218–228. https://doi.org/10.1136/bmj.304.6828.675

Moret-Tatay, C., Beneyto-Arrojo, M. J., Laborde-Bois, S. C., Martínez-Rubio, D., & Senent-Capuz, N. (2016). Gender, coping, and mental health: A Bayesian network model analysis. *Social Behavior and Personality: An International Journal*, *44*(5), 827–835. https://doi.org/10.2224/sbp.2016.44.5.827

Moret-Tatay, C., Lami, A., Oliveira, C. R., & Beneyto-Arrojo, M. J. (2018). The mediational role of distracting stimuli in emotional word recognition. *Psicologia: Reflexão e Crítica*, *31*(1), 1–5. https://doi.org/10.1186/s41155-017-0082-8

Morgan, S., Cooper, B., Paul, S., Hammer, M. J., Conley, Y. P., Levine, J. D., Miaskowski, C., & Dunn, L. B. (2017). Association of personality profiles with depressive, anxiety, and cancer-related symptoms in patients undergoing chemotherapy. *Personality and Individual Differences*, *117*, 130–138. https://doi.org/10.1016/j.paid.2017.05.039

Moshki, M., Baloochi Beydokhti, T., & Cheravi, K. (2014). The effect of educational intervention on prevention of postpartum depression: An

application of health locus of control. *Journal of Clinical Nursing*, *23*, 2256–2263. https://doi.org/10.1111/jocn.12505

Murphy, M., & Moret-Tatay, C. (2021). Personality and attitudes confronting death awareness during the COVID-19 outbreak in Italy and Spain. *Frontiers in Psychiatry*, *12*. https://doi.org/10.3389/fpsyt.2021.627018

Mutlu, T., Balbag, Z., & Cemrek, F. (2010). The role of self-esteem, locus of control and big five personality traits in predicting hopelessness. *Procedia Social and Behavioral Sciences*, *9*, 1788–1792. https://doi.org/10.1016/j.sbspro.2010.12.401

Muzzatti, B., Mella, S., Bomben, F., Flaiban, C., Gipponi, K., Piccinin, M., Busato, S., & Annunziata, M. A. (2018). Intensity and prevalence of depressive states in cancer patients: A large sample descriptive study. *European Journal of Cancer Care*, *27*(1), 1–5.

Nakaya, N., Hansen, P., Schapiro, I., Eplov, L. F., Saito-Nakaya, K., Uchitomi, Y., & Johansen, C. (2006). Personality traits and cancer survival: A Danish cohort study. *British Journal of Cancer*, *95*(2), 146–152. https://doi.org/10.1038/sj.bjc.6603244

Naragon-Gainey, K., & Watson, D. (2014). Consensually defined facets of personality as prospective predictors of change in depression symptoms. *Assessment*, *21*, 387–403. https://doi.org/10.1177/1073191114528030

Niedzwiedz, C. L., Knifton, L., Robb, K. A., Katikireddi, S. V., & Smith, D. J. (2019). Depression and anxiety among people living with and beyond cancer: A growing clinical and research priority. *BMC Cancer*, *19*(1), 943. https://doi.org/10.1186/s12885-019-6181-4

Noteboom, A., Beekman, A. T., Vogelzangs, N., & Penninx, B. W. (2016). Personality and social support as predictors of first and recurrent episodes of depression. *Journal of Affective Disorders*, *190*, 156–161. https://doi.org/10.1016/j.jad.2015.09.020

Panagiotou, I., Tsilika, E., Parpa, E., Patiraki, E., Zygogianni, A., Kouloulias, V., & Mystakidou, K. (2014). Locus of control and distressing symptoms in young cancer patients when assessing depression. *Journal of BUON: Official Journal of the Balkan Union of Oncology*, *19*(3), 792–798.

Pettingale, K. W., Morris, T., Greer, S., & Haybittle, J. L. (1985). Mental attitudes to cancer: An additional prognostic factor. *Lancet*, *30*, 750–762. https://doi.org/10.1016/S0140-6736(85)91283-8

Polidoro Lima, M., & Osório, F. L. (2014). Indicators of psychiatric disorders in different oncology specialties: A prevalence study. *Journal of Oncology*, *2014*, 1–7. https://doi.org/10.1155/2014/350262

Rees, D., & Cooper, C. L. (1992). Occupational stress in health service workers in the UK. *Stress Medicine*, *8*(2), 79–90.

Rosellini, A. J., & Brown, T. A. (2011). The NEO Five-Factor Inventory: Latent structure and relationships with dimensions of anxiety and depressive disorders in a large clinical sample. *Assessment*, *18*(1), 27–38. https://doi.org/10.1177/1073191110382848

Rotter, J. B. (1954). *Social learning and clinical psychology*. Englewood Cliffs, N. J: Prentice-Hall. https://doi.org/10.1037/10788-000

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied*, *80*(1), 1–28. https://doi.org/10.1037/h0092976

Rotter, J. B. (1990). Internal versus external control of reinforcement: A case history of a variable. *American Psychologist*, *45*, 489–493. https://doi.org/10.1037/0003-066X.45.4.489

Sargent-Cox, K., & Anstey, K. J. (2015). The relationship between age-stereotypes and health locus of control across adult age-groups. *Psychology & Health*, *30*(Suppl. 6), 652–670. https://doi.org/10.1080/08870446.2014.974603

Selart, M. (2005). Understanding the role of locus of control in consultative decision-making: A case study. *Management Decision*, *43*(3), 397–412. https://doi.org/10.1108/00251740510589779

Sharif, S. P. (2017). Locus of control, quality of life, anxiety, and depression among Malaysian breast cancer patients: The mediating role of uncertainty. *European Journal of Oncology Nursing*, *27*, 28–35. https://doi.org/10.1016/j.ejon.2017.01.005

Srivastava, V., Ansari, M. A., Kumar, A., Shah, A. G., Meena, R. K., Sevach, P., & Singh, O. P. (2016). Study of anxiety and depression among breast cancer patients from North India. *Journal of Clinical Psychiatry*, *2*, 1–7. https://doi.org/10.21767/2471-9854.100017

Theofilou, P., & Saborit, A. R. (2013). Health locus of control and diabetes adherence. *Journal of Psychology & Psychotherapy*, *3*, 1–2. https://doi.org/10.4172/2161-0487.S3-e002

Tung, H. Y., Chao, T. B., Lin, Y. H., Wu, S. F., Lee, H. Y., Ching, T. Y., Hung, K.-W., & Lin, T. J. (2016). Depression, fatigue, and QoL in colorectal cancer patients during and after treatment. *Western Journal of Nursing Research*, *38*(7), 893–908. https://doi.org/10.1177/0193945916630256

van de Velde, S., Bracke, P., & Levecque, K. (2010). Gender differences in depression in 23 European countries. Cross-national variation in the gender gap in depression. *Social Science & Medicine*, *71*, 305–313. https://doi.org/10.1016/j.socscimed.2010.03.035

Wallston, K. A., & Wallston, B. S. (1981). Health locus of control scale. In H. M. Lefcourt (Ed.), *Research with the locus of control construct: Assessment methods* (pp. 189–244). New York: EUA, Academic Press.

Wallston, K. A., Wallston, B. S., & Devellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health Education Monographs*, *6*, 160–170. https://doi.org/10.1177/109019817800600107

Weber, K., Giannakopoulos, P., Bacchetta, J. P., Quast, S., Herrmann, F. R., Delaloye, C., Ghisletta, P., De Ribaupierre, A., & Canuto, A. (2012). Personality traits are associated with acute major depression across the age spectrum. *Aging & Mental Health*, *16*(4), 472–480. https://doi.org/10.1080/13607863.2011.630375

Weiss, A., Sutin, A. R., Duberstein, P. R., Friedman, B., Bagby, R. M., & Costa, P. T. Jr. (2009). The personality domains and styles of the five-factor model are related to incident depression in Medicare recipients aged 65 to 100. *The American Journal of Geriatric Psychiatry*, *17*, 591–601. https://doi.org/10.1097/JGP.0b013e31819d859d

Wilson, C., Giles, K., Nettelbeck, T., & Hutchinson, A. (2018). Locus of control, optimism, and recollections of depression and self-reported cognitive functioning following treatment for colorectal cancer. *Psycho-Oncology*, *27*(2), 676–682. https://doi.org/10.1002/pon.4567

Yusof, S., Zakaria, F. N., Hashim, N. K., & Dasiman, R. (2016). Depressive symptoms among cancer patients undergoing chemotherapy. *Procedia Social and Behavioral Science*, *234*, 185–192. https://doi.org/10.1016/j.sbspro.2016.10.233

Zigmond, A. S., & Snaith, R. P. (1983). The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica*, *67*, 361–370. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x

Zimbardo, P., Johnson, R., McCann, V., & Birnie, S. (2009). *Psychologie, een inleiding*. Amsterdam: Pearson Education.

How to cite this article: Lima, M. P., Moret-Tatay, C., & Irigaray, T. Q. (2022). Locus of control, personality and depression symptoms in cancer: Testing a moderated mediation model. *Clinical Psychology & Psychotherapy*, *29*(2), 489–500. https://doi.org/10.1002/cpp.2604

APPENDIX A

TABLE A1 Factor loadings for the NEO-Five Factor Inventory (NEO-FFI) after a varimax rotation

	Component				
	1	2	3	4	5
N1					
E2			.566		
O3					
A4					
C5	.412				
N6		.451			
E7			.617		
O8				.573	
A9					.594
C10	.622				
N11		.667			
E12					
O13				.483	
A14					
C15		.543			
N16					
E17			.616		
O18					
A19					
C20	.547				
N21		.614			
E22			.527		
O23					
A24					.419
C25	.476				
N26		.545			
E27					
O28					
A29			.485		
C30					
N31					
E32	.476				
O33					
A34			.504		
C35	.523				
N36		.596			
E37			.623		
O38					
A39					.421
C40	.510				
N41		.467			
E42					
O43				.608	

(Continues)

TABLE A1 (Continued)

	Component				
	1	2	3	4	5
A44		.452			
C45					
N46					
E47					
O48					
A49					
C50	.662				
N51		.485			
E52	.527		.424		
O53				.484	
A54					.425
C55					
N56		.535			
E57					
O58				.411	
A59					.580
C60	.583				

Note: Values lower than .40 were excluded.