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Predictors of Posttraumatic Growth in Cancer Patients Post Treatment

Abstract: The aim of this study was to investigate the level of posttraumatic growth of cancer patients post-treatment in the context of selected sociodemographic characteristics, clinical markers, and psychological variables (positive and negative emotions, anxiety and depressive symptoms, gratitude, forgiveness, hope, importance of the spiritual aspect of life and the practice of religious faith). The study sample consisted of 110 patients post-treatment aged 22-79 years and with an average time since the completion of the last treatment ranging from 5 to 396 months. The Posttraumatic Growth Inventory, the Positive and Negative Affect Schedule, screening methods to measure anxiety (General Anxiety Disorder-7) and depression (Patient Health Questionnaire-9), and questionnaires to measure dispositional gratitude (Gratitude Questionnaire GQ-6), dispositional hope (Adult Dispositional Hope Scale), and forgiveness (Heartland Forgiveness Scale) were used to measure the psychological variables. There were no differences in the level of posttraumatic growth in terms of sociodemographic characteristics and clinical markers. Partner status, employment status, presence of recurrence, and comorbidities did not differentiate its level either. The rate of posttraumatic growth was related to the experience of positive emotions, gratitude, the importance of the spiritual aspect of life, and the practice of religious faith. In the regression model that explained 21.90% of the variance in posttraumatic growth, only the level of positive emotions was a significant predictor. The results of the present research point suggest that the level of posttraumatic growth is associated with several areas of emotional experience and cognitive adjustment of cancer patients post-treatment.

Keywords: cancer survivorship, posttraumatic growth, emotional experience, gratitude, dispositional hope, forgiveness

INTRODUCTION

We view cancer as an event that represents chronic trauma (Calhoun & Tedeschi, 1998). Such trauma lasts for a period of time (it is not a single, specific experience) and involves several events (announcement of diagnosis, worsening prognosis, physical, psychological, and social consequences of treatment, etc.) that may be unrelated but ultimately interfere with the process of posttraumatic growth. Cancer patients are one of the first populations in which posttraumatic growth has been studied. This trend continues to the present day, with most attention being paid to breast cancer patients (Kou et al., 2021). Posttraumatic growth can be observed in people who have survived trauma, recovered from it, returned their every-

day functioning to pre-trauma levels, and additionally harnessed its potential for positive psychological change (Tedeschi et al., 1998). Thus, it is not only about surviving the traumatic event, but also about positive transformation at the emotional, cognitive, and behavioral level. In the context of cancer, we see it as significant that a person is becoming more resilient or expanding his repertoire of coping strategies through the process of posttraumatic growth (Tedeschi et al., 2018).

According to the posttraumatic growth theory and model, cancer represents a challenge that can bring emotional distress. Constructive rumination and self-disclosure, specifically in cancer patients, are essential for coping and subsequently acceptance of the situation. Rumination is a sign of an ongoing cognitive process, and



if it becomes constructive, it leads to finding the meaning of the event, identifying the changes it brought, and subsequently to its mastery and acceptance (Tedeschi et al., 2018). Considering the chronicity of cancer, we can assume that the process of posttraumatic growth begins already at the beginning of treatment, which is proved, for example, by the results of longitudinal research by Danhauer et al. (2013) in leukemia patients. As we have already stated, in the context of cancer patients, self-disclosure also has a specific purpose during treatment, mostly expressing emotions (Manne et al., 2004). The process of posttraumatic growth is also influenced by many sociocultural factors, such as social support, acceptance by the community, or reactions from other people (Tedeschi et al., 2018). In cancer patients, it plays a role from the beginning of treatment to remission (e.g., Alfalakseir et al., 2018). Equally important are factors on the individual's side such as character strengths (e.g., hope), preferred coping strategies, personality traits, creativity or spiritual and religious orientation (Tedeschi et al., 2018).

Following the posttraumatic growth model by Tedeschi et al. (2018), we identify changes across five domains in cancer patients. First is the quality of social relationships, namely the building of new relationships, the strengthening of existing relationships or the breaking of pathological ties. At the same time, a person may discover greater compassion, empathy, and the need to help others within. The second area is individual strengths. One becomes aware of one's fragility and vulnerability, but at the same time finds feelings of confidence, inner strength, and undergoes a transformation from victim to survivor. The third area is new possibilities that would not otherwise come into the person's life (e.g., new life pathways, interests, or habits). The fourth area is the appreciation for life, from the little things of everyday life to significant moments and a more intense sense of their value. The final, fifth area is spiritual and existential change, which can lead to an understanding of spiritual matters, clarity about life and death issues, finding meaning in life or life harmony, as well as strengthening of religious beliefs, including engagement with faith and religious persuasion.

Cancer patients report many negative consequences of their disease and treatment, including unmet physical and daily living needs, fear of disease progression (Nik Jaafar et al., 2022), or depressive experience (Heidarzadeh et al., 2016; Li, 2022; Romeo et al., 2022). According to the aforementioned research, all of these difficulties are associated with lower levels of posttraumatic growth. A relationship with levels of anxiety has not been reported consistently (Cormio et al., 2017; Mystakidou et al., 2008), but recent work by Fekih-Romdhane et al. (2022) found a positive relationship. In addition to the negative aspects of patients' experiences, some research has also focused on constructs that are central to positive psychology. For instance, posttraumatic growth in cancer patients has been found to be related to hope (Baglama & Atak, 2015; Heidarzadeh et al., 2016; Karami et al., 2018), humor (Karami et al., 2018), self-esteem and optimism (Lisica

et al., 2019), happiness (Leloirain et al., 2010), positive affectivity (Leloirain et al., 2010), coping focused on positive emotions and problem solving (Kroemeke et al., 2017), and social support (Li, 2022). To a lesser extent, research has focused on relationship-oriented gratitude (Ruini & Vescovelli, 2013) or forgiveness. This area is where we see the contribution of the present research, in which we also focus on these constructs. In the context of our research, we understand gratitude, forgiveness, and hope as a more permanent predisposition, i.e. a tendency to experience and show gratitude (McCullough et al., 2002), a willingness to forgive oneself, others, or a situation (Thompson et al., 2005). Hope, based on Snyder's (2000) concept, is understood as the ability to find motivation for achieving goals (Agency), and at the same time to find ways for their fulfillment (Pathway). Since the retrospective assessment of posttraumatic growth can be greatly influenced not only by more permanent predispositions but also by actual emotional experiencing, we also focused on the current level of positive and negative affectivity in cancer survivors.

In cancer patients, posttraumatic growth is also examined in the context of socio-demographic characteristics and specific clinical markers that are directly related to the disease. Higher levels of posttraumatic growth have been identified in women (e.g., Romeo et al., 2022) and in cancer patients in a partnership or marriage (e.g., Li, 2022; Mystakidou et al., 2008). Cormio et al. (2015) did not find empirical support for the findings above. Research findings vary with respect to age, but most authors report higher posttraumatic growth in younger patients (e.g., Liu et al., 2021; Cormio et al., 2017), while the contrary was reported by Romeo et al. (2022). According to the findings of Cormio et al. (2017), education and occupational status also differentiate the rate of posttraumatic growth, in favor of employed patients and patients with higher education.

Higher levels of posttraumatic growth were reported by Nik Jaafar et al. (2021) in patients with multicomponent treatment, while Mystakidou et al. (2008) did not find a correlation. No association with recurrence was found in a population-based study in Germany (Liu et al., 2021). Higher posttraumatic growth was reported by Cormio et al. (2017) in patients without comorbidities, and by Li (2022) in patients without metastases. The inconsistent findings may be related to differences in the level of institutional care in different countries or regions. Other psychosocial influences may also play a role in the examined relationships.

The aim of the present study was, a correlational-comparative research design, to (a) investigate differences in the level of posttraumatic growth in terms of socio-demographic characteristics (gender, partner status, employment status), (b) establish whether there is a difference in the level of posttraumatic growth in cancer survivors in terms of clinical markers (incidence of recurrence and comorbidities), and (c) examine the relationships between posttraumatic growth and psychological variables (positive and negative emotions, anxiety and depressive symptoms, gratitude, forgiveness, hope, importance of the spiritual aspect of life, and practicing religious faith).

METHOD

Research Sample

The research was conducted in several helping organizations, self-help groups and spa facilities providing services to cancer patients. A number of participants took part in the research by completing an online questionnaire. 200 participants took part in the research. The established inclusion criteria for research participation (age over 18 years, history of cancer diagnosis, time since treatment completion of at least 5 months, completion of all administered methods) were met by 110 participants. Participants' age ranged from 22-79 years ($M = 54.19$; $SD = 11.94$). Time since completion of last treatment varied significantly across participants, ranging from 5 to 396 months ($Mdn = 18.00$; $IQR = 50.00$). Women (91.8%) and breast cancer patients (68.3%) formed the majority of the cohort. Patients who had survived skin, lymph node, colon, ovarian, rectal, kidney, cervical, prostate, bone, thyroid, head and neck, lung, leukemia, or other cancer diagnosis were also included (ranging from .8%-4.9% for each diagnosis). History of cancer recurrence was present in 8 participants. Comorbidity of multiple oncological diagnoses was reported by 11 participants. Of the total participants, 47.2% were employed full- or part-time at the time of data collection. The majority of participants (70.6%) were currently in a partnered relationship.

Measures

The Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) contains 21 items ($\omega = .96$) that measure levels of posttraumatic growth in five domains: relationships with others, new possibilities, personal strengths, spiritual change, and appreciation for life. The participants respond to the items using a 6-point response scale (0 – no change caused by the crisis; 5 – very large change caused by the crisis). The total score is an indicator of the level of posttraumatic growth. Participants were instructed to focus on the changes after overcoming the cancer (e.g., After overcoming the oncological disease... I changed my priorities about what is important in life, ... I have a greater appreciation for the value of my own life, ... I have developed new interests). Participants administered a Slovak translation of the questionnaire, the reliability of which were verified in a sample of patients with hematological oncological diseases, including Hodgkin's and non-Hodgkin's lymphoma, myeloma and leukemia ($\alpha = .94$; Baník, 2012) and also in a sample of cancer survivors ($\lambda^2 = .77$ and $\omega = .83$; Dědová & Baník, 2021).

Indicators of actual emotional experiencing were summative indexes of positive and negative emotions on PANAS (Positive and Negative Affect Schedule; Watson et al., 1988), and scores on screening questionnaires measuring anxiety (General Anxiety Disorder-7; GAD-7; Spitzer et al., 2006) and depression (Patient Health Questionnaire-9; PHQ-9; Kroenke et al., 2001). McDonald's omega values were satisfactory for each measure ($\omega = .90$ for positive emotions, $\omega = .91$ for negative emotions, $\omega = .89$ for the GAD-7, and $\omega = .88$ for the

PHQ-9). Participants rated their emotional experience over the past two weeks. The GAD-7 and PHQ-9 questionnaires are part of the NEUROPSY battery, and were standardized for the Slovak population in 2021 (Hajdúk, 2021). The PANAS questionnaire was translated by the authors of the study, who verified its internal consistency ($\alpha = .85$ for both positive and negative emotions) and sufficiently strong relationships with manifestations of emotional distress – depression, anxiety and stress (Hajdúk & Boleková, 2015). The questionnaire battery also included measures of dispositional gratitude (Gratitude Questionnaire GQ-6; McCullough et al., 2002, $\omega = .80$) and dispositional hope (Adult Dispositional Hope Scale; Snyder et al., 1991, translated by Halama, 2001; $\omega = .81$). The Gratitude Questionnaire was translated by the authors and its psychometric properties were verified in a non-clinical population of university students (Boleková, 2019). As part of the validity verification, relationships with both current and dispositional positive affectivity were established. The research results also indicated an acceptable internal consistency ($\alpha = .78$) and a 1-factor structure of the questionnaire. Halama (2001) reports on the translation and adaptation of the Slovak version of the Dispositional Hope Scale. He states sufficient internal consistency and convergent validity. Other researches found positive correlations of hope with satisfaction with life, meaningfulness in life, extraversion, and conscientiousness (Halama, 2010; Halama & Dědová, 2007). Levels of forgiveness were measured through the Heartland Forgiveness Scale (Thompson et al., 2005; translated by Chlebcová & Greškovičová, 2019). The questionnaire items focus on forgiveness of self, other people, and also the situation. Bariaková and Schwarz (2023) found good internal consistency of the questionnaire ($\alpha = .81$) and also moderate to strong relationships of forgiveness with anxiety and meaningfulness of life. In this research, we state good reliability in terms of internal consistency ($\omega = .79$). The instructions for the questionnaires measuring the level of gratitude, hope, and forgiveness emphasized the usual experiences and reactions to the described situations (e.g., I am grateful to a wide variety of people.; I can think of many ways to get the things in life that are important to me.; I don't stop criticizing myself for negative things I've felt, thought, said, or done.). The importance of the spiritual aspect of life and the practice of religious faith was measured through two separate items with a 7-point Likert scale (ranging from "don't agree at all" to "strongly agree").

Data Analysis Methods

Statistical and practical significance of the difference between the subgroups of participants was tested using the Mann Whitney U test and Cohen's d coefficient with correction for nonparametric tests (taking into account the U value and the size of the groups being compared). The Spearman's rank correlation coefficient was used as an indicator of the strength of the relationship between scores from each questionnaire. Predictors of posttraumatic growth were evaluated using linear regression analysis.

Standardized residuals were assessed before regression analysis was performed. Cook's distance was used to find influential outliers in a set of predictor variables. The presence of multicollinearity was detected through correlation analysis and calculation of the variance inflation factor (VIF). In this paper, we present reliability estimates expressed as the McDonald's omega coefficient.

Ethical Aspects of Research

The research was conducted within the grant task GA/3/2019 Predictors of Post-Traumatic Growth in Cancer Patients Post Treatment, which was approved by the Ethics Committee of the Pan-European University. Participants were provided with information about the aim of the research and the essentials of their participation.

RESULTS

The basic descriptive statistics of the variables in the present study are summarized in Table 1. Our participants scored between 4 and 104 ($Mdn = 80.50$, $IQR = 25.90$) in the Posttraumatic Growth Questionnaire. We found no differences in the level of posttraumatic growth in terms of sociodemographic characteristics and clinical markers. Its level was not differentiated by gender ($U = 451.0$; $p = .97$; $d = .01$), partner status ($U = 1147.0$; $p = .57$; $d = .11$), employment status ($U = 1177.5$; $p = .09$; $d = .33$), presence of recurrence ($U = 392.5$; $p = .86$; $d = .03$), or comorbidity ($U = 542.5$; $p = .84$; $d = .04$).

Posttraumatic growth total score was positively correlated with experiencing gratitude ($r_s = .29$, $p = .003$), positive emotions ($r_s = .26$, $p = .006$), the importance of the spiritual aspect of life ($r_s = .30$, $p = .001$), and practicing religious faith ($r_s = .23$, $p = .017$). Importance of spirituality and practicing one's faith were correlated with scores on the spiritual change dimension. Significant relationships were found between gratitude and scores on the dimensions of relationships

with others, spiritual change, new possibilities, and appreciation for life. There was also a correlation coefficient between forgiveness and understanding of life on the borderline of a moderate-strength relationship. The correlation between posttraumatic growth and the indicators of negative experience was not significant. The values of the correlation coefficients are presented in Table 2.

Variables that were not significantly correlated with the rates of posttraumatic growth, negative emotions ($r_s = -.05$, $p = .60$), rates of anxiety symptoms ($r_s = -.02$, $p = .85$), and

Table 1. Descriptive Statistics of Investigated Variables

	Range	M	SD	Mdn
Posttraumatic Growth	4-104	75.54	18.22	80.50
Relationships with Others	0-35	25.19	6.51	26.60
Personal Strengths	1-20	14.56	3.69	16.00
Spiritual Change	0-10	6.46	2.90	7.00
New Possibilities	1-25	17.21	5.16	19.00
Appreciation for Life	0-15	12.12	3.05	13.00
Gratitude	19-42	32.62	6.14	33.00
Positive Emotions	10-45	29.76	8.34	29.50
Negative Emotions	10-39	18.89	7.51	17.00
Anxiety Symptoms	0-20	5.75	4.63	5.00
Depression Symptoms	0-23	7.55	5.42	7.00
Hope	15-31	23.15	3.19	24.00
Forgiveness	47-122	81.98	13.30	80.00
The Importance of the Spiritual Aspect of Life	1-7	5.46	1.92	6.00
The Importance of Practicing Religious Faith	1-7	4.12	2.33	4.00

Table 2. Correlations of Study Variables

	Posttraumatic Growth	Relationships with Others	Personal Strengths	Spiritual Change	New Possibilities	Appreciation for Life
Gratitude	.29**	.32**	.16	.34**	.23*	.26**
Positive Emotions	.26**	.21*	.27**	.04	.26**	.23*
Negative Emotions	-.05	.01	-.14	.10	-.09	-.16
Anxiety Symptoms	-.02	.06	-.09	.06	-.02	-.17
Depression Symptoms	.05	.06	-.05	.12	.02	.01
Hope	.14	.14	.24*	-.03	.14	.17
Forgiveness	.19	.17	.15	.12	.15	.29**
The Importance of the Spiritual Aspect of Life	.30**	.27**	.12	.60**	.20*	.15
The Importance of Practicing Religious Faith	.23*	.07	.12	.66**	.13	.04

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

levels of depression ($r_s = .05$, $p = .64$), were not included in the regression analysis. We verified the presence of multicollinearity through correlation analysis and calculation of the variance inflation factor (VIF). The values of the correlation coefficients between the predictors ranged between $r_s = .05 - .60$. The VIF factor for each variable showed values between 1.28 - 2.06 (tolerance: .49 - .78).

In the first step, four outliers of the dependent variable were deleted. Results of analysis of standard residuals were acceptable (Std. Residual Min = -2.64, Std. Residual Max = 1.96, Cook's distance - Max = .13). The skewness (Skw = -.57) and kurtosis (Kurt = -.59) coefficients were equally acceptable.

Model that included forgiveness, gratitude, hope, positive emotions, importance of the spiritual aspect of life, and importance of practicing religious faith as predictors explained 21.9% of the variance in posttraumatic growth ($F(6, 97) = 4.53$, $p < .001$, $R^2 = .22$, $R^2_{Adjusted} = .17$). The level of positive emotions was a significant predictor of posttraumatic growth in the model (Beta = .28, $t(103) = 2.75$, $p = .007$). We present the results of the regression analysis in Table 3.

We found empirical support for the findings of Michalczyk et al. (2022) and Cormio et al. (2017) who found that posttraumatic growth in cancer patients is not related to partner status. On the contrary, according to Li (2022), patients in a relationship experience higher levels of posttraumatic growth. We also did not find a difference with respect to the patients' employment status, which contradicts previous findings of Cormio et al. (2017). Authors of several studies report higher levels of posttraumatic growth in women (Ahmadi et al., 2022; Vishnevsky et al., 2010), but we did not find a difference in the present research. However, these results may be influenced by the low number of males (8.2%) in the research sample. In terms of clinical markers, we did not find empirical support for a relationship of posttraumatic growth with the presence of recurrence (in line with Liu et al., 2021) or comorbidities (in contrast with Cormio et al., 2017).

Gratitude was found to be related to overall posttraumatic growth as well as to all of its dimensions, with the strongest relationships being in the dimensions of spiritual change and relationships with others. Ruini and Vescovelli

Table 3. Results of Regression Analysis with Posttraumatic Growth as the Dependent Variable

	Beta	<i>t</i>	95% CI		<i>p</i>
			<i>LL</i>	<i>UL</i>	
(Constant)		2.86	10.47	58.06	.005
Gratitude	.15	1.40	-.15	.86	.165
Positive Emotions	.28	2.75	.14	.84	.007
Hope	.03	.27	-.83	1.09	.786
Forgiveness	.09	.92	-.12	.32	.363
The Importance of the Spiritual Aspect of Life	.03	.22	-1.75	2.18	.828
The Importance of Practicing Religious Faith	.20	1.70	-.20	2.63	.092

DISCUSSION

The development in clinical oncology is associated with an increasing number of cured patients, or patients in long-term remission. The attention of psychologists is thus increasingly turning to their quality of life, which is affected by the disease itself, the treatment, and the belated effects of treatment. In addition to the negative impact on the patient's life, we also observe positive changes as a result of coping with cancer. Posttraumatic growth is a growing topic in psycho-oncology. Our aim was therefore to map posttraumatic growth in the relationship to positive aspects of human experience (gratitude, forgiveness, positive emotions), negative experience (negative emotions, anxiety, depression), but also with respect to spirituality, religiosity, and selected socio-demographic and clinical markers. These are constructs that represent either risk or protective factors in relation to the patient's coping, even long after completing cancer treatment.

(2013) arrived at similar conclusions in breast cancer patients. The relationship of posttraumatic growth with hope was weak, but the association with the level of realized strengths was substantial. Finding the feelings of self-confidence and inner strength are typical of development in the personal strengths domain, where we see as a link to hope as a personality trait. People with higher levels of dispositional hope are better able to find motivation and ways to pursue their goals despite life crises, in the context of our outcomes. Heidarzadeh et al. (2016) confirmed the association of hope in cancer patients not only with the ability to identify strengths, but also with other dimensions of posttraumatic growth. The latter, according to our findings, is also related to the dimension of forgiveness, namely in the area of appreciation for life. The association of forgiveness and posttraumatic growth was found by Ye et al. (2022) in hemodialysis patients and by Martinčková & Klatt (2017) in grieving mothers after the loss of a child. Forgiveness, specifically the last phase of the forgiveness process (the deepening phase) according to the model by Enright and Fitzgibbons (2015), was

associated with the discovery of a new life perspective and priorities, a life goal. Here we see a link to the change in appreciation for life within posttraumatic growth. We examined forgiveness as a personality trait, i.e. the way in which a person typically responds, the extent to which they are able to forgive (self, others, situation) and live a “forgiving life” (Thompson et al., 2005). This predisposition, according to our findings, may be related to posttraumatic growth in other challenging life situations than the grievance itself. This means that the tendency to forgive in general is also related to positive changes in other areas of life. However, this hypothesis requires further investigation.

Posttraumatic growth was also related to both the importance of spirituality and the practice of religious faith (spirituality practice), especially in the area of spiritual change. The same findings have been reported by Dědová and Baník (2021) and Gesselman et al. (2017). In the presented research, we focused on the actual perceived importance of spirituality and religiosity (two separate questions) and the perceived change in these areas as a outcome of transformation after the trauma (PTGI, Spiritual Change dimension). The PTGI questionnaire reflects both of these dimensions of spirituality, the spiritual and religious aspects of growth. The results show that the importance given to spirituality in a person's life is related to growth in this area. At the same time, greater growth can be predicted for people who practice religious faith on a daily basis (Karami & Kahrazi, 2018) or people more involved to the formal religious group (Currier et al., 2013). The findings of Currier et al. (2013) further indicate that faith and spirituality are among the factors that influence the process of posttraumatic growth. We find it beneficial to use a version of the PTGI-X questionnaire that is enriched with an existential dimension in future research (Tedeschi et al., 2017). We also perceive the significance of the presented findings with regard to the religious orientation of the inhabitants of the country in which the research was conducted. In Slovakia, almost 70% of the adult population is religious, or subscribes to a particular religion, and thus not only spirituality in general, but also the practice of faith plays an important role in the lives of people in Slovakia. However, further research is needed to verify the present associations.

Actual emotional experiencing significantly affects the evaluation of various long-term phenomena in a person's life. For example, Seligman (2013) states that the assessment of overall satisfaction with life is up to 70% determined by the current emotional state. For this reason, we included in the research the experiencing of emotions (positive emotions, negative emotions, depression, anxiety) in the past two weeks. The findings of several studies have consistently reported that patients with higher levels of depressive symptoms also have lower levels of posttraumatic growth (e.g., Heidarzadeh et al., 2016; Li, 2022; Romeo et al., 2022). Mystakidou et al. (2008) confirmed this relationship only in the dimension of new possibilities. Given the non-significant relationship, our research findings are consistent with the those of Villanova

Quiroga et al. (2020) and Fekih-Romdhane et al. (2022). We likewise did not find a relationship with anxiety or negative emotions. Our results suggest that posttraumatic growth is not in the relationship to the level of depression and anxiety symptoms, and patients may experience growth regardless of their negative experiences. We agree with Taku et al. (2021) that the positive and negative consequences of trauma, or the changes resulting from experiencing trauma, are not just the opposite ends of one dimension. Vehling et al. (2021) modified the PTGI in their research, with each item asking patients to comment on whether they experienced positive or negative change in that domain. They found that the level of positive change was not related to depression or anxiety experience. Finding negative changes as a result of cancer survivorship was related to them on the contrary.

The resulting regression model showed that positive emotions were the only significant predictor of posttraumatic growth. Similar conclusions were reached by Lelorain et al. (2010). In addition to positive affect, adaptive coping is also a significant predictor according to their findings. The present research suggests that only positive experience in terms of interest, decisiveness, activity, or enthusiasm is a significant predictor of posttraumatic growth. The evaluation of posttraumatic growth can therefore depend on the current state of a person, who in a positive emotional state can retrospectively evaluate the benefits of posttraumatic growth more favorably.

We interpret the present findings with respect to several limitations of the conducted research. The majority of the research population was female, especially breast cancer patients. Patients with other types of oncological disease were represented in small numbers in the individual groups, which limited the possibilities of data analysis and comparison of the level of the studied variables by the diagnosis. As part of the initial analyses, we compared patients with breast cancer and patients with other types of diagnoses. The differences were negligible or small in terms of substantive significance. For this reason, we worked with the whole research sample in further analyses. Differences in the level of posttraumatic growth due to the type of oncological disease are reported, for example, by Liu et al. (2021) or Arpawong et al. (2013). Thus, we can consider disregard of the specific experiences of patients with different diagnoses to be a limitation. The majority refers to physical challenges, for example, lymphedema and premature menopause in breast cancer patients, bowel dysfunction in colorectal cancer patients, or impaired pulmonary function in lung cancer patients. Across various diagnoses, it is neuropathy, fatigue, cognitive dysfunction, and mental health issues, especially anxiety and depression (Gegechkori et al., 2017).

Similarly to the authors (e.g. Holtmaat et al., 2017), we consider the variability in time since the end of treatment to be a limitation of the research. Defining the appropriate time since the end of treatment is one of the greatest methodological challenges in the research of

posttraumatic growth in oncology patients. Recent review study (Tanyi et al., 2020) indicated that researches in this specific population are carried out even a few months after the diagnosis. Manne et al. (2004) state that oncology patients report the first positive changes in their lives shortly after the diagnosis, but the first manifestations of posttraumatic growth appear after 18 months. Likewise, Occhipinti et al. (2015) believe that it takes years, not months, to detect the presence of posttraumatic growth. Posttraumatic growth is both a process and an outcome (Tedeschi et al., 2018). In this context, we perceive the importance of its investigation in the different time ranges since the end of the treatment. We base this conclusion on the findings of researches, according to which, in a large part of patients with breast cancer (Danhauer et al., 2013; Wang et al., 2014) or colorectal cancer (Occhipinti et al., 2015), the assessment of posttraumatic growth is stable over time. However, like the above-mentioned authors, we are aware of the heterogeneity of the individual growth trajectories of oncology patients and the limits of a broadly formulated inclusion criterion. The evaluation of the positive aspects of the trauma with a time range over a horizon of several years can be influenced by memory optimism or distortion due to forgetting. If the time interval since the end of the treatment was short, the evaluation of the patients could be influenced by the current feeling of happiness and euphoria resulting from coping with a difficult life situation (Mareš, 2012). Especially in patients with a shorter time since the end of treatment could occur, the so-called illusory posttraumatic growth. It consists of a positive illusion that allows patients to manage the negative effects of a traumatic event in the short term. If it is part of a denial coping strategy, it does not bring benefit, because it prevents the processing of the traumatic event on a cognitive and emotional level (Maercker & Zoellner, 2004). The tendency to self-deceptive enhancement decreases with increasing time since treatment (Maercker & Zoellner, 2004; Wagner et al., 2007; Zoellner & Maercke, 2006). Therefore, in some patients in the research sample, we cannot rule out reports of illusory posttraumatic growth, which may have been caused by the persistent perception of a threat stemming from an oncological disease. It is therefore possible that the assessment of the benefits arising from this challenging experience were overestimated for this reason. The authors of the concept of illusory posttraumatic growth (Maercker & Zoellner, 2004) state that while the constructive component is related to openness to experience, a significant correlate of the illusory component is optimism. In our research, we measured a related construct – hope. The weak correlations between hope and overall posttraumatic growth may indicate that patients were not reporting illusory change. However, this assumption requires a more detailed verification, as the chosen design did not allow us to differentiate the described two components of posttraumatic growth.

Neither causal relationships nor temporal sequence of phenomena can be identified from a cross-sectional study. Other methodological limitations include the lack of

statistical power of the measurement instruments administered, the measurement of the importance of the spiritual aspect of life and the practice of religious faith by a single question only, without verification of the findings by interview or a more comprehensive measurement instruments. The present research also did not account for the amount and nature of previous traumatic events (Michalczyk et al., 2022). The inconsistency of some of our findings with previous research may also be due to the sociocultural specificities of the research sample.

The trauma associated with cancer is chronic in nature and the process of posttraumatic growth is conditioned by multiple factors over time. In the future, we consider it beneficial to conduct longitudinal research with repeated measures, and a more precise assessment of the posttraumatic experience, by mapping posttraumatic depreciation to explore the coexistence of positive and negative consequences of trauma more comprehensively (Taku et al., 2021).

COMPLIANCE WITH ETHICAL STANDARDS

This manuscript is original, has not been previously published, and is not under current consideration elsewhere. The manuscript has been reviewed and approved by all authors and all authors have contributed to the manuscript in a meaningful way. The authors confirm that we have access to the original data on which the article reports. The authors declare that they have no conflict of interest.

The study was performed in accordance with the ethical standards as set forth in the 1964 Declaration of Helsinki and its later amendments. The research was conducted within the grant task GA/3/2019 Predictors of Post-Traumatic Growth in Cancer Patients Post Treatment, which was approved by the Ethics Committee of the Pan-European University. Participants were provided with information about the aim of the research and the essentials of their participation.

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