

CANCER AS A SOURCE OF POSTTRAUMATIC GROWTH: A BRIEF REVIEW

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SUMMARY

The diagnosis and treatment of cancer represents an experience that is potentially psychologically traumatizing for patients. However, cancer can contribute to the experience of positive psychological changes, namely posttraumatic growth. We conducted a review of empirical studies (n=44) on posttraumatic growth in cancer patients. We focused on the relations of posttraumatic growth to socio-demographic, medical, and psychological adjustment correlates. Results from forty-four reviewed articles indicated that age, gender, and ethnicity were consistently associated with posttraumatic growth in cancer. Regarding illness-related factors, the majority of relationships were positive and were found between subjective severity of cancer, chemotherapy, and experienced growth. The review revealed inconsistent relationships between indicators of psychological adjustment (emotional distress, posttraumatic stress symptoms, and quality of life) and perceived positive changes in the case of the cancer patients. Longitudinal studies might resolve this inconsistency by showing that posttraumatic growth has benefits for later psychological adjustment, as other studies have already documented.

Key words: posttraumatic growth - cancer - trauma - socio-demographic - psychological adjustment

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INTRODUCTION

Posttraumatic stress disorder (PTSD) is most commonly studied among war veterans (Jakšić et al. 2015), but the DSM-IV-TR (Diagnostic and Statistical Manual of Mental Disorders Fourth Edition, Text Revision) provides a long list of other potential sources of trauma. The list includes 'being diagnosed with a life-threatening illness' as a potential cause of posttraumatic stress disorder (American Psychiatric Association 2000) as well. Cancer, as a life-threatening illness, could also be considered a traumatic event and may therefore have a number of negative consequences. The physical symptoms cause a number of disruptions in patients' social and family life and in their daily activities, also illness burden includes the painful side effects of treatments (Bellizzi et al. 2007).

By contrast, a growing body of literature has recently shown that a highly stressful life event can contribute to the experience of positive psychosocial changes in various life domains. Jakovljević et al. (2012) suggest an integrative approach of PTSD that integrates possible psychological and spiritual growth with trauma vulnerability. Jakšić et al. (2012) have found that PTSD is associated with self-transcendence. The phenomenon of trauma having positive aspects has been coined in various ways in the literature, such as posttraumatic growth (PTG), benefit finding (BF), and positive

changes (PC) (Tedeschi & Calhoun 2004). In this review, we use the term 'posttraumatic growth' (PTG) to designate this phenomenon. According to Tedeschi and Calhoun (2004), "posttraumatic growth is the experience of positive change that occurs as a result of the struggle with highly challenging life crises" (p. 1). These positive changes can appear in five major domains: (1) a greater appreciation of life and a changed sense of priorities, (2) more meaningful relationships with others, (3) an increased sense of personal strength, (4) new possibilities for one's life, and (5) a richer existential and spiritual life (Tedeschi & Calhoun 2004).

Cancer, as a potentially traumatic experience, may also be a source of positive life changes (Svetina & Nastran 2012). In this present review, we briefly summarize the results of the most important recent studies focusing on the relationship between cancer and PTG. Empirical data from forty-four recently published (2001-2015) studies were collected. We focused on those studies that investigate socio-demographic, medical, and psychological variables associated with positive changes resulting from the experience of cancer (see Table 1). The main goals of this review are to a) describe the nature of PTG in cancer patients (commonly occurring positive changes and frequency of PTG), b) present the relations between PTG and socio-demographic and illness-related factors, and c) identify the nature of the relationship between indicators of psychological adjustment and PTG.

Table 1. Summary of Studies and Methodologies

Study	Type of Cancer	Stage	Moment of Measurement	n	Measures ^a
Andrykowski et al. 2005	Mixed (HSCT patients) ^b	NR ^c	M=7 years post-HSCT	662	PTGI
Barakat et al. 2006	Mixed	NR	NR	150	PCS
Bellizzi et al. 2007	NHL ^d	NR	M=3.5 years postdx ^e	308	LIS
Bellizzi et al. 2009	Breast	0-III	NR	802	PTGI
Bower et al. 2005	Breast	I-II	M=3.4 years postdx	763	PMV scale
Carboon et al. 2005	Mixed	NR	NR	62	PTGI
Carver & Antoni 2004	Breast	0-II	3-12 months post-surgery	96	BFS
Chan et al. 2011	Breast	0-III	M=15.59 months postdx	170	PTGI
Cordova et al. 2007	Breast	I-III	M=9.4 months postdx	65	PTGI
Creswell et al. 2007	Breast	I-II	M=20 weeks posttx ^f	63	Written essay
Danhauer et al. 2013	Breast	I-III	M=4.7 months postdx	653	PTGI
Dunn et al. 2011	Mixed	NR	M=87.5 weeks postdx	439	BFS
Greenwald & McCorkle 2007	Cervical	NR	6-29 years postdx	208	PTGI
Ho et al. 2004	Mixed	NR	> 5 years postdx	188	PTGI
Jaarsma et al. 2006	Mixed	NR	M=3.9 years postdx	294	PTGI
Karanci & Erkam 2007	Breast	I-IV	M=15.39 years post-surgery	90	SRGS
Katz et al. 2001	Mixed	NR	M=9 years postdx	88	PQ
Kinsinger et al. 2006	Prostate	I-II	6-18 months posttx	250	BFS
Lechner et al. 2003	Mixed	0-IV	M=38.8 months postdx	83	PTGI
Lelorain et al. 2010	Breast	I-III	M=10 years postdx	307	PTGI
Lelorain et al. 2011	Breast	I-II	5-15 years postdx	28	Interview
Manne et al. 2004	Breast	0-III	M=4.5 months postdx	162	PTGI
Mols et al. 2009	Breast	I-II	NR	183	PTGI
Morill et al. 2008	Breast	I-II	M=4 years postdx	161	PTGI
Mystakidou et al. 2008	Breast	IV	M=6.11 years postdx	100	PTGI
Park et al. 2010	Mixed	NR	M=3.5 years postdx	167	PBS
Penedo et al. 2009	Prostate	I-II	M=15.2 months postdx	191	PCS-C
Ransom et al. 2008	Breast, prostate	0-III	M=10.5 days post-radiotherapy	83	PTGI
Sabiston et al. 2007	Breast	NR	3-8 years postdx	20	Interview
Salsman et al. 2009	Colorectal	0-III	M=13 months postdx	55	PTGI
Schroevers et al. 2010	Mixed	I-IV	M=8 years postdx	206	SLQ
Schroevers & Teo 2008	Mixed	I-IV	M=45 months postdx	113	PTGI
Schulz & Mohamed 2004	Mixed	NR	M=12 months post-surgery	105	BFS
Schwarzer et al. 2006	Mixed	I-IV	3 times ^g	117	Seven-item scale
Shand et al. 2014	Mixed	-	-	116	PTGI, BFS
Svetina & Nastran 2012	Breast	NR	NR	190	PTGI
Tanyi et al. 2015	Breast, prostate	I-IV	M=3.5 months postdx	152	PTGI
Thombre et al. 2010	Mixed	I-III	M=11.3 months postdx	61	PTGI
Thornton & Perez 2006	Prostate	NR	M=1 year post-surgery	82	PTGI
Urcuyo et al. 2005	Breast	0-II	3-12 months post-surgery	230	BFS
Weiss 2004	Breast	0-II	M=38.7 months postdx	72	PTGI
Widows et al. 2005	Mixed (BMT patients) ^h	II-IV	M=24.05 months post-BMT	72	PTGI
Yanez et al. 2009	S1:Breast, S2: NR ⁱ	NR	S1: M=5.6 months post-surgery; S2: M=3.5 years postdx	S1:418; S2:165	S1:PTGI; S2:BFS
Zwahlen et al. 2010	Mixed	NR	M=18 months postdx	224	PTGI

Note: ^aPTGI = Posttraumatic Growth Inventory; PCS = Perceptions of Changes in Self; LIS = Life Impact Scale; PMV scale = Perceptions of Meaning and Vulnerability scale; BFS = Benefit Finding Scale; SRGS = Stress-Related Growth Scale; PQ = Psychosocial Questionnaire; PBS = Perceived Benefit Scale; PCS-C = Positive Contributions Scale-Cancer; SLQ = Silver Lining Questionnaire; ^bHSCT = hematopoietic stem-cell transplantation; ^cNR = not reported; ^dNHL = Non-Hodgkin's lymphoma; ^epostdx = postdiagnosis; ^fposttx = posttreatment; ^gT1: in the week before surgery; T1: one month post-surgery; T3: 12 months post-surgery; ^hBMT = bone marrow transplantation; ⁱS1 = Study1; S2 = Study2

Table 2. The Most Frequently Reported Domains of Posttraumatic Growth in Cancer

Study	Domains of Positive Change	Prevalence	Type of Cancer	n	Measures
Bellizzi et al. 2007	Relationship with family members+friends	42.7%	NHL ^a	308	LIS ^b
	Religious or spiritual belief	41.8%			
	Relationship with his/her children	39.7%			
	Ability to enjoy life	36.2%			
Cordova et al. 2007	Ability to count on people	83%	Breast	65	PTGI ^c
	Greater appreciation for the value of life	82%			
	Learning about how wonderful people are	82%			
	A sense of closeness with others	80%			
Creswell et al. 2007	New/enhanced life goals	19%	Breast	63	Written essay
	Greater awareness of the present moment	17%			
	New /enhanced spirituality/faith	17%			
	Feelings of growth	14%			
Greenwald & McCorkle 2007	Greater appreciation for the value of life	66%	Cervical	208	PTGI
	Better appreciation for each day	61.4%			
	Ability to handle difficulties	51.9%			
	Ability to count on people	49.1%			
Lelorain et al. 2010	More compassion for others	87.3%	Breast	307	PTGI
	Greater appreciation for the value of life	87%			
	Discovered strength	86.3%			
	Better appreciation for each day	86.3%			
Sabiston et al. 2007	Psychological strength	89%	Breast	20	Interview
	Closer relationship	75%			
	New possibilities and opportunities	75%			
Schroevers & Teo 2008	More compassion for others	93%	Mixed	113	PTGI
	Greater appreciation for the value of life	92%			
	Better appreciation for each day	92%			
Widows et al. 2005	Greater appreciation for the value of life	92%	Mixed	72	PTGI
	Changing in priorities	90%			
	Better appreciation for each day	90%			
	Learning about how wonderful people are	86%			

Note: ^aNHL = Non-Hodgkin's lymphoma; ^bLIS = Life Impact Scale; ^cPTGI = Posttraumatic Growth Inventory

THE NATURE AND FREQUENCY OF PTG IN CANCER

In the past years, the number of studies investigating the relationship between cancer and PTG has rapidly increased. To some extent, this increase may be due to the fact that cancer is included in the top ten leading causes of death, and therefore, a large amount of people with this illness have to struggle with psychological trauma as well. There is a burgeoning literature that provides evidence that a high percentage of patients report at least one positive change resulting from being diagnosed with cancer. As Sumalla et al. (2009) have pointed out, this number is approximately 80% of the research participant group. Most of the patients found at least some benefit in non-Hodgkin's lymphoma (77.9%; n=308) (Bellizzi et al. 2007) and breast cancer (79.2%; n=183) (Mols et al. 2009), and even adolescents in mixed-cancer groups have found some benefits (84.7%; n=150) (Barakat et al. 2006).

Studies have also found evidence showing that patients may experience positive changes across all five domains of PTG. Several researchers have tried to specify in which domains of PTG cancer patients typically report such positive changes. In 2002, Thornton identified three domains in which coping with cancer may bring benefits for patients: greater appreciation of life and changes in priorities, more intimate relationships, and benefits associated with the self. Since the Thornton's study, a large number of studies have been published that aimed to explore the nature of PTG, as cancer patients experience it. The findings of these studies have corroborated the results of Thornton (2002) (see Table 2).

The first frequently mentioned domain of PTG is a greater appreciation of life and a change in priorities (Greenwald & McCorkle 2007, Widows et al. 2005). Regarding cancer patients, they may cherish each day and moment of their lives to a larger extent than before; they can rejoice more from minor experiences in their lives (e.g., a child's smile); their awareness of the illness can

motivate them to reevaluate their previous priorities and their life philosophy; as well as their values (e.g., health). For example, Widows et al. (2005) reported that 92% of a mixed cancer group (n=72) felt an increased appreciation of life.

The second most common domain of PTG is experiencing more meaningful interpersonal relationships. Individuals with cancer may realize the significance of social relationships and feel that they are getting closer to their loved ones because of the cancer. In addition, patients may start to invest more time and energy in their interpersonal relationships. Furthermore, empathy toward others may also increase (Bellizzi et al. 2007, Cordova et al. 2007, Schroevers & Teo 2008). For example, Lelorain et al. (2010) found that 87.3% of breast cancer patients (n=307) mentioned that they started to feel more compassion for others as a result of their illness.

The third most frequently experienced domain of PTG is an increased sense of personal strength. Many cancer patients have reported experiencing that their struggle with cancer strengthened them psychologically. Patients may start to devote more time to themselves and their satisfaction with their own achievements and problem-solving skills may increase (Greenwald & McCorkle 2007, Lelorain et al. 2010, Sabiston et al. 2007).

Studies measuring the positive consequences of psychological traumas have used both interview and questionnaire measures. One of the most frequently used and standardized questionnaires is the Posttraumatic Growth Inventory (PTGI). This measure was developed by Tedeschi and Calhoun (1996) and consists of 21 items covering the following five factors: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life. Items are rated from '0' ('I did not experience this change as a result of my crisis/specific

trauma') to '5' ('I experienced this change to a very great degree as a result of my crisis/specific trauma'). Adding the scores of five subscales yields a total PTGI score (0-105). As shown in Table 3, the mean total PTGI scores in the recent cancer literature range from 32.9 (Ransom et al. 2008) to 73.12 (Schroevers & Teo 2008). It is important to note that in the majority of these studies, the stage of cancer in patients ranged from 0 to III, and only a few studies measured PTG in more severe cancer. For example, Mystakidou et al. (2008) found a mean PTGI score of 43.76, which reflects a relatively moderate degree of positive changes, in a sample of 100 women with advanced breast cancer (see Table 3).

RELATIONSHIP BETWEEN PTG AND SOCIO-DEMOGRAPHIC VARIABLES

A number of studies in psycho-oncology have aimed to define the associations between PTG and socio-demographic variables (gender, age, marital status, education, income level, and ethnicity). In most of them, women tended to report significantly more PTG than men (Dunn et al. 2011, Jaarsma et al. 2006, Shand et al. 2015, Tanyi et al. 2015, Zwahlen et al. 2010) (see Table 4). Beyond the oncology literature, Helgeson et al. (2006) have shown this association in a meta-analytic review. There are numerous explanations for this phenomenon, including the view that females are more willing or able to express their sense of personal growth (Zwahlen et al. 2010). It is also possible that women are more likely than men to perceive an event as threatening. Such a perception may lead to a relatively more drastic reconstruction of their schemata about the world and self, which in turn can contribute to feelings of greater PTG (Vishnevsky et al. 2010).

Table 3. Summary of Total PTGI Scores

Study	Mean (SD)	Type of Cancer	Stage	n	Measures
Andrykowski et al. 2005	66.3 (NR)	Mixed ^a	NR ^b	662	PTGI ^c
Bellizzi et al. 2009	47.4 (28.1)	Breast	0-III	802	PTGI
Carboon et al. 2005	55.1 (24.7)	Mixed	NR	62	PTGI
Cordova et al. 2007	57.8 (25.4)	Breast	I-III	65	PTGI
Ho et al. 2004	69.99 (NR)	Mixed	NR	188	PTGI
Jaarsma et al. 2006	47.87 (24.04)	Mixed	NR	294	PTGI
Lelorain et al. 2010	59.9 (20)	Breast	I-III	307	PTGI
Morill et al. 2008	73 (21)	Breast	I-II	161	PTGI
Mystakidou et al. 2008	43.76 (16.21)	Breast	IV	100	PTGI
Ransom et al. 2008	32.95 (26.3)	Breast, prostate	0-III	83	PTGI
Schroevers & Teo 2008	73.12 (19.75)	Mixed	I-IV	113	PTGI
Tanyi et al. 2015	63.53 (22.07)	Breast, prostate	I-IV	152	PTGI
Thombre et al. 2010	34.8 (4.84)	Mixed	I-III	61	PTGI
Thornton & Perez 2006	46.6 (25.56)	Prostate	NR	82	PTGI
Weiss 2004	57.9 (24.5)	Breast	0-II	72	PTGI
Widows et al. 2005	64.67 (21.30)	Mixed ^d	II-IV	72	PTGI

Note: ^aHSCT (hematopoietic stem-cell transplantation) patients; ^bNR = not reported; ^cPTGI = Posttraumatic Growth Inventory (range=0-105); ^dBMT (bone marrow transplantation) patients

Table 4. Relationships between Variables and Posttraumatic Growth

Variables	Relationships	Studies
<i>Socio-demographic</i>		
Gender	Female	Dunn et al. 2011; Jaarsma et al. 2006; Shand et al. 2015; Tanyi et al. 2015; Zwahlen et al. 2010
	NS	Lechner et al. 2003; Schulz & Mohamed 2004; Thombre et al. 2010; Widows et al. 2005
Age	Postive	Carver & Antoni 2004
	Negative	Bellizzi et al. 2007; Bellizzi et al. 2009; Bower et al. 2005; Cordova et al. 2007; Jaarsma et al. 2006; Lechner et al. 2003; Manne et al. 2004; Mystakidou et al. 2008; Salsman et al. 2009; Schroevers et al. 2010; Shand et al. 2015; Tanyi et al. 2015; Widows et al. 2005
	NS	Chan et al. 2011; Dunn et al. 2011; Schulz & Mohamed 2004; Svetina & Nastran 2012; Thombre et al. 2010
Marital status	Married	Bower et al. 2005; Mystakidou et al. 2008; Tanyi et al. 2015
	NS	Chan et al., 2011; Dunn et al. 2011; Lechner et al. 2003; Svetina & Nastran 2012; Schulz & Mohamed 2004
Education	Postive	Bellizzi et al. 2007; Chan et al., 2011; Cordova et al. 2007
	Negative	Carver & Antoni 2004; Kinsinger et al. 2006; Morill et al. 2008; Salsman et al. 2009; Urcuyo et al. 2005; Weiss 2004; Widows et al. 2005; Yanez et al. 2009
	NS	Bower et al. 2005; Lechner et al. 2003; Mystakidou et al. 2008; Svetina & Nastran 2012; Tanyi et al. 2015; Thombre et al. 2010
Income level	Postive	Bower et al. 2005; Chan et al., 2011
	Negative	Karanci & Erkam 2007; Kinsinger et al. 2006; Morill et al. 2008
	NS	Cordova et al. 2007; Lechner et al. 2003; Thombre et al. 2010
Ethnicity	Minority	Bellizzi et al. 2009; Bower et al. 2005; Kinsinger et al. 2006; Penedo et al 2006; Urcuyo et al. 2005
	NS	Thombre et al. 2010
<i>Cancer-related</i>		
Stage	Postive	Bellizzi et al. 2009; Carver & Antoni 2004; Urcuyo et al. 2005
	Negative	Mols et al. 2009; Tanyi et al. 2015
	NS	Cordova et al. 2007; Thornton & Perez 2006
Subjective/ sequel severity	Postive	Barakat et al. 2006; Cordova et al. 2007; Lechner et al. 2003; Schroevers et al. 2010; Tanyi et al. 2015; Widows et al. 2005
	NS	Thombre et al. 2010
Time since diagnosis/treatment	Postive	Danhauer et al. 2013; Manne et al. 2004; Salsman et al. 2006; Schwarzer et al. 2006; Yanez et al. 2009;
	Negative	Weiss 2004
	NS	Cordova et al. 2007; Dunn et al. 2011; Kinsinger et al. 2006; Lechner et al. 2003; Lelorain et al. 2010; Tanyi et al. 2015; Thombre et al. 2010
Type of surgery	Mastectomy/ prostatectomy	Tanyi et al. 2015; Yanez et al. 2009
	NS	Thombre et al. 2010; Thornton & Perez 2006
Radiotherapy	Negative	Mols et al. 2009
	NS	Cordova et al. 2007; Mystakidou et al. 2008; Thombre et al. 2010
Chemotherapy	Postive	Bower et al. 2005; Lelorain et al. 2011; Schroevers et al. 2010; Tanyi et al. 2015; Yanez et al. 2009
	NS	Cordova et al. 2007; Mystakidou et al. 2008; Thombre et al. 2010
Hormonal therapy	Postive	Urcuyo et al. 2005
	NS	Cordova et al. 2007
<i>Psychological adjustment</i>		
Depression	Negative	Carver & Antoni 2004; Dunn et al. 2011; Karanci & Erkam 2007; Mystakidou et al. 2008; Shand et al. 2015; Urcuyo et al. 2005
	NS	Jaarsma et al. 2006; Salsman et al. 2009; Schulz & Mohamed 2004; Schwarzer et al. 2006

Note: NS = not significant; PTSS = posttraumatic stress symptoms

Table 4. Continues

Variables	Relationships	Studies
Anxiety	NS	Dunn et al. 2011; Jaarsma et al. 2006; Mystakidou et al. 2008; Salsman et al. 2009
General distress	Postive	Widows et al. 2005
	Negative	Carver & Antoni 2004; Ho et al. 2004; Katz et al. 2001; Shand et al. 2015; Urcuyo et al. 2005
	NS	Schroevvers & Teo 2008
Intrusion	Postive	Dunn et al. 2011; Jaarsma et al. 2006
	NS	Carboon et al. 2005; Chan et al., 2011; Manne et al. 2004; Salsman et al. 2009
Avoidance	Postive	Carboon et al. 2005
	NS	Chan et al. 2011; Dunn et al. 2011; Jaarsma et al. 2006
Overall PTSS score	Postive	Barakat et al. 2006; Morill et al. 2008; Shand et al. 2015; Thornton & Perez 2006
	NS	Cordova et al. 2007; Salsman et al. 2009; Widows et al. 2005
Quality of life, well-being	Postive	Bower et al. 2005; Carver & Antoni 2004; Lelorain et al. 2010; Penedo et al. 2006; Tanyi et al. 2015; Urcuyo et al. 2005
	Negative	Bellizzi et al. 2009
	NS	Dunn et al. 2011; Kinsinger et al. 2006; Mols et al. 2009; Park et al. 2010; Schulz & Mohamed 2004; Schwarzer et al. 2006; Thornton & Perez 2006

Note: NS = not significant; PTSS = posttraumatic stress symptoms

Among the most recent investigations of cancer patients, thirteen studies demonstrated a significant negative association between age and PTG, indicating that younger patients are more likely to experience PTG (see Table 4). A possible explanation for this finding might be that a diagnosis of cancer is more threatening and more distressing for young people, and a greater threat may prompt more growth (Manne et al. 2004, Mystakidou et al. 2008). Another explanation is that for older patients, cancer is a less significant event because they are dealing with other, more salient normative life events associated with the aging process (Bellizzi et al. 2007). In addition, younger persons diagnosed with cancer are more inclined to re-evaluate their priorities and life goals, compared to older patients, who have already experienced significant life events with radical effects on their schemata and beliefs about the world, prior to their cancer diagnosis (Mystakidou et al. 2008).

Some researchers have documented that PTG may be higher in patients who are married or are in a committed relationship compared to those with no partners. This finding reflects the importance of social support in the development of positive changes (Bower et al. 2005, Mystakidou et al. 2008). However, other researchers found no such association between marital status and the perceived benefits of cancer (see Table 4).

Results taken from recent studies that have examined the relationship between educational level and PTG are highly inconsistent. Many of these studies (n=8) found negative association between the two variables, including that greater reports of benefit finding (BF) are related to lower educational levels (see Table 4). For example, in a sample of women with breast cancer BF was inversely related to educational level ($r=-0.21$; $p<0.01$; $n=230$) (Urcuyo et al. 2005). It is possible that people with

higher education have already engaged in a kind of cognitive processing that may produce growth, and thus, such individuals have less potential for psychological growth (Weiss 2004). In contrast, some investigations have shown a positive association (Bellizzi et al. 2007, Chan et al. 2011, Cordova et al. 2007) or no association (Bower et al. 2005, Lechner et al. 2003, Mystakidou et al. 2008, Svetina & Nastran 2012, Tanyi et al. 2015, Thombre et al. 2010) between educational level and PTG. In addition, eight studies have assessed the relationship between income level and PTG. The results are mainly inconsistent, showing that income level was negatively (n=3) and positively (n=2) associated, or not significantly (n=3) associated with PTG (see Table 4).

PTG is mostly influenced by ethnicity, as members of minority groups (e.g., African Americans and Hispanics) usually report higher PTG in comparison to white patients (n=5, see Table 4). According to researchers, this finding can be explained by some specific components of the patients' ethnic identity, such as spirituality or religiosity, which can be an indicator of greater social support (e.g., from church friends) and religious coping, as well as increases of the experienced benefits (Bellizzi et al. 2009, Bower et al. 2005, Kinsinger et al. 2006). For example, Bellizzi et al. (2009) found that in a group of breast cancer patients (n=802), the relationship between PTG and ethnicity was mediated by religiosity.

PTG AND CANCER-RELATED VARIABLES

Most studies attribute great importance to the exploration of the relationship between PTG and the medical characteristics of cancer. The most commonly examined illness-related variables include cancer stage (as objec-

tive severity of the stressor), subjective/sequel severity, time passed since the diagnosis/treatment, and types of treatment (surgery, radiotherapy, chemotherapy, and hormonal therapy).

Cancer severity is usually defined by its stage (based on Tumour-Node-Metastasis clinical classification). Three investigations found that the stage of disease was positively associated with perceived growth, showing that persons who had more severe cancer tended to report more PTG (Bellizzi et al. 2009, Carver & Antoni 2004, Urcuyo et al. 2005). Moreover, Lechner et al. (2003) reported a curvilinear association between the stage of cancer and BF, given that that patients with stage II cancer had significantly higher BF scores (87.9) than those with either stage I (70.2) or stage IV (62.8) cancer. The subjective/sequel severity of cancer is usually measured by questions that ask the patients to appraise to the extent to which they feel life threatened, consider their illness to be a trauma/severe stressor, or have specific emotions (e.g., helplessness) characterizing a trauma. Investigations of cancer populations have primarily found a positive association between the subjective appraisal of cancer and PTG, showing that persons perceiving their cancer as a trauma/highly stressful event were more likely to report PTG (Barakat et al. 2006, Cordova et al. 2007, Lechner et al. 2003, Schroevers et al. 2010, Tanyi et al. 2015, Widows et al. 2005) (see Table 4). These findings corroborate the theory of posttraumatic growth, which states that a certain level of threat is necessary to challenge one's existing assumptions about the world, which will start a cognitive process promoting the experience of growth (Tedeschi & Calhoun 2004).

Cross-sectional studies found that the duration since diagnosis/treatment was either positively or not significantly related to PTG; however, longitudinal studies found that PTG usually increased with time (i.e., between measurements). In part, studies have shown that PTG can be enhanced as time passes (e.g., Salsman et al. 2009). For example, Schwarzer et al. (2006) reported that BF significantly increased from Time 1 (the week before surgery) to Time 3 (12 months post-surgery) ($BF_{Time1}: 2.93; BF_{Time3}: 3.18; p < 0.01$). In another longitudinal study, breast cancer patients showed a significant increase in PTGI scores over 18 months ($PTG_{Time1}: 49.0; PTG_{Time2}: 52.8; PTG_{Time3}: 55.7, p = 0.0037$) (Manne et al. 2004). This increase in personal growth between two time points may be due to cognitive processing of the trauma or other intercurrent stressful events that may also serve as triggers for PTG. However, some studies found no significant association between the duration of time since the diagnosis/treatment and PTG (see Table 4).

The type of surgery, receipt of radiotherapy or hormonal therapy are medical variables of cancer that generally were found not to relate to PTG (Cordova et al. 2007, Mystakidou et al. 2008, Thombre et al. 2010, Thornton & Perez 2006), except in a few studies (Mols

et al. 2009, Urcuyo et al. 2005, Tanyi et al. 2015, Yanez et al. 2009). Only chemotherapy was found to be positively associated with PTG in five independent investigations, which found that individuals who received chemotherapy were likely to report more positive changes (Bower et al. 2005, Lelorain et al. 2011, Schroevers & Teo 2008, Tanyi et al. 2015, Yanez et al. 2009). A possible explanation for this relationship is that undergoing an aggressive treatment, such as chemotherapy, may cause more disruptions in the patient's life and therefore promote greater PTG (Stanton et al. 2006). Nevertheless, not all investigations support this relationship (Cordova et al. 2007, Mystakidou et al. 2008, Thombre et al. 2010) (see Table 4).

RELATIONSHIP BETWEEN PSYCHOLOGICAL ADJUSTMENT TO CANCER AND PTG

Most of the studies interested in psycho-oncology focus on 'mapping' the nature of the relationship between psychological adjustment to cancer and PTG. Such studies use several indicators of adjustment, including emotional distress (depression and anxiety), post-traumatic stress symptoms (avoidance and intrusion), and perceived quality of life.

Regarding the association between emotional distress and PTG, results on the nature of this relationship are inconsistent. A few cross-sectional studies have found negative association between depression and PTG (Dunn et al. 2011, Karanci & Erkam 2007, Mystakidou et al. 2008, Shand et al. 2015, Urcuyo et al. 2005), while other studies have found only non-significant correlations ($n=4$; see Table 4). A longitudinal study on breast cancer patients found that initial BF predicted lower distress and depression at the follow-up (four-seven years later). Thus, positive psychological changes might promote increased well-being over time (Carver & Antoni 2004). In contrast, these investigations found that anxiety, another indicator of psychological distress, was consistently unrelated to PTG (Dunn et al. 2011, Jaarsma, et al. 2006, Mystakidou et al. 2008, Salsman et al. 2009). Studies that assessed patients' general level of distress (and not anxiety or depression separately) found a negative relationship between distress level and PTG (Carver & Antoni 2004, Ho et al. 2004, Katz et al. 2001, Shand et al. 2015, Urcuyo et al. 2005). Thus, the experience of PTG appears to be associated with reduced emotional distress in some cases but not in others. Researchers have interpreted the finding that PTG may have varied associations with the negative feelings of anxiety and depression differently. Positive outcomes (PTG) and emotional distress may not be mutually exclusive (not opposite end-points of a single dimension) but exist as different, independent constructs, and thus, different dimensions of experiencing reality may co-exist as well (Jaarsma et al. 2006).

The majority of investigations examined the relationship between posttraumatic stress symptoms (PTSS) and PTG using the Impact of Event Scale (IES) and the PTSD Checklist–Civilian Version (PCL-C). Approximately half of these studies revealed a positive relationship between PTSS and PTG, and the other half found no association between these two variables (see Table 4; intrusion, avoidance, and overall PTSS). A study by Barakat et al. (2006) found that PTSS and PTG were positively associated ($r=0.35$ $p<0.005$) in a group of adolescent cancer survivors. Dunn et al. (2011) revealed a positive correlation between PTG and intrusion ($r=0.15$, $p<0.01$) but not between PTG and avoidance. Another study that included various types of cancer samples reported similar findings (Jaarsma et al. 2006). Intrusive thoughts may reflect cognitive processing of the cancer experience on a deeper level (Dunn et al. 2011), which is postulated to play an essential role in the process of PTG (Tedeschi & Calhoun 2004). Overall, these contradictory results on PTSS can be resolved using the assertion of Cordova and Andrykowski (2003), who suggest that extant data support the view that cancer patients and survivors may experience both post-traumatic stress and growth at the same time. Therefore, cancer as a ‘psychosocial transition’ may lead to both positive and negative outcomes.

In seven recent studies, health-related quality of life and well-being were not associated with perceived growth; however, some investigations ($n=6$) reported that higher PTG was associated with a higher level of perceived quality of life (see Table 4). For example, Lelorain et al. (2010) found that the mental health and vitality subscales of the overall quality of life scale were significantly related to PTG (mental health: $r=0.12$, $p<0.05$; vitality: $r=0.19$, $p<0.01$). In Carver and Antoni’s (2004) longitudinal study, initial BF predicted higher quality of life after four–seven years in breast cancer patients. In another longitudinal study, Schwarzer et al. (2006) found no association between the initial BF score and later well-being; however, the change in BF significantly predicted well-being one year later. In contrast to these results, Bellizzi et al. (2009) discovered an inverse relationship between PTG and the mental health component of quality of life. Thus, the nature of the relationship between quality of life and PTG remains unclear.

Overall, findings taken from several studies on the association between psychological adjustment and PTG show a large discrepancy. On the one hand, some results suggest that PTG can co-occur with certain forms of higher emotional distress (e.g. posttraumatic stress symptoms); on the other hand, results show negative (e.g., depression) or nonsignificant associations (e.g., anxiety) between these variables. According to the model of PTG, a traumatic event may shatter assumptions about the self and the world. During the reconstruction of these core beliefs, process people can experience

higher distress and PTSD symptoms (Tedeschi & Calhoun 2004). In the beginning phase of reconstruction, PTG experiences may arise and co-exist with poor psychological adjustment. This view is supported by findings that PTG can be perceived directly after the traumatic event (as soon as two weeks later) (Wortman 2004). In addition, a meta-analytic review found that global distress is positively related to PTG only when the traumatic event is recent (Helgeson et al. 2006). After finishing the reconstruction of core beliefs, symptoms of distress may decrease and later disappear, but experiences of growth may remain. In their review article, Zoellner and Maercker (2006) pointed out that cross-sectional studies reveal inconsistent or nonsignificant associations between adjustment and PTG, while longitudinal studies find PTG to be a predictor of lower distress and better quality of life after a certain time lapse. Therefore, PTG may in fact have adaptive relevance for future psychological adjustment.

DISCUSSION

In this review of recent literature, we aspired to provide a comprehensive view of the latest results on the associations between cancer and PTG. We have pointed out that several socio-demographic, illness-related factors and kinds of psychological adjustment have a significant role supporting positive changes during a life-threatening illness. The majority of cancer patients (approximately 70-90%) experience PTG in the following 3 ways: (1) patients begin to appreciate their life more and reevaluate their priorities; (2) patients begin to feel an increased personal strength; and (3) patients tend to become closer to their loved ones and other people in general.

The socio-demographic variables of gender, age, and ethnicity were found to be associated with PTG. Specifically, younger people, women and members of minority groups reported higher PTG. In addition, illness-related factors, such as the subjective severity of cancer and chemotherapy, were positively related to PTG. Presumably, each of these factors can trigger or modify the subjective feelings related to trauma and threat and thus prompt more PTG. It can be concluded that some people may experience cancer as a greater subjective trauma than others for different reasons. Young people may experience cancer as more traumatizing because it may cause disruptions in their normal developmental trajectory (Park & Rosenstein 2015); members of minority groups have less access to health care (Burgess et al. 2008) and lower socioeconomic status (Williams et al. 2010), women can experience more negative affect as a result of their more emotional coping style (Matud 2004). Moreover, chemotherapy, which has serious and often traumatic side effects (e.g., vomiting, hair loss), may also increase the subjective severity of cancer and, in so doing, may foster feelings of personal growth.

We found that PTG was related to psychological adjustment in an inconsistent way because it co-existed with higher posttraumatic stress symptoms in some studies but with lower depression and lower levels of distress in others. Future longitudinal studies might be able to resolve this contradiction and validate the importance of PTG in predicting better psychological health. If studies repeatedly prove PTG to be a significant factor, a highly relevant question will be whether clinicians should facilitate PTG by means of psychotherapy, to promote better physical and psychological well-being. A study conducted by Cruess et al. (2000) showed that cognitive-behavioral stress management (CBSM) decreased the level of serum cortisol, and this effect was mediated by an increase in BF among women with early-stage breast cancer. McGregor et al. (2004) also found that CBSM intervention significantly increased the perceived benefits in breast cancer patients. Moreover, changes in BF (between Time 1 and Time 2) predicted increases in lymphocyte proliferation at the three-month follow up (Time 3). These findings show the importance of PTG in maintaining physical and psychological health. In our view, the integration of psychotherapy methods facilitating PTG into psycho-oncological praxis is promising, and could be seriously considered.

The limitation of our brief review is that we did not discuss the role of coping, personality characteristics and social support, which are also known determinants of positive psychological changes in cancer patients. Moreover, we did not focus on religiosity, which can also have a significant influence of patients' ability to find positive meaning while facing a life-threatening illness (e.g., "God sent me the illness to overcome a challenge"). Further studies should address the differences between the particular types of cancer, as different symptoms may influence different aspects of illness-related quality of life. Exploring and reviewing the forementioned variables and the relationships between them may be the focus of future studies.

CONCLUSION

We focused on the relations of posttraumatic growth to socio-demographic, medical, and psychological adjustment correlates. Results from forty-four reviewed articles indicated that age, gender, and ethnicity were consistently associated with posttraumatic growth in cancer. Regarding illness-related factors, the majority of relationships were positive and were found between subjective severity of cancer, chemotherapy, and experienced growth. The review revealed inconsistent relationships between indicators of psychological adjustment (emotional distress, posttraumatic stress symptoms, and quality of life) and perceived positive changes in the case of the cancer patients. Longitudinal studies might resolve this inconsistency by showing that posttraumatic growth has benefits for later psychological adjustment, as other studies have already documented.

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Zsuzsanna Tanyi is an author, who has contributed to the original idea, has done literature search and has written the first draft of the manuscript.

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