



Social Problem Solving and Posttraumatic Growth New Possibilities in Postoperative Breast Cancer Survivors

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Abstract

The purpose of this study was to examine whether social problem solving (SPS) would relate to posttraumatic growth (PTG), particularly new life possibilities in breast cancer survivors. Participants included 85 women who had undergone surgical intervention for breast cancer at least 6 months prior to study participation. Participant ages ranged from 29 to 88 years. The majority of the sample was White (86%), married (58%), and had received at least some postsecondary education (73%), and all participants spoke English. This IRB-approved cross-sectional study was part of a larger study examining psychosocial protective and risk factors in breast cancer survivors at a university-affiliated private hospital. We hypothesized that better SPS ability would relate to PTG new possibilities above and beyond age, annual income, and time since surgery. Results from this study indicate that a positive problem orientation and lack of impulsive/careless problem-solving style appear to play a role in posttraumatic growth among breast cancer survivors, particularly in developing beliefs about one's ability to positively change one's life. Given the established benefits of active/approach coping in cancer populations, it makes sense that similar interventions such as problem-solving therapy, a cognitive-behavioral therapy that includes challenging and reframing negative beliefs about self and situation, may promote new possibility beliefs in this population.

Keywords Psycho-oncology · Positive problem orientation · Impulsive/careless style · New possibilities · Survivorship · Posttraumatic growth · Social problem-solving · Breast cancer

There will be over 1,735,000 new cancer diagnoses in the United States in 2018, approximately 15% of which will be breast cancer (American Cancer Society, 2018). It is well established that many survivors experience a significant and impairing level of psychological distress including depressive, anxiety, and posttraumatic stress symptoms

(Jim & Jacobsen, 2008; Zabora, Britzenhofeszog, Curbow, Hooker, & Piantados, 2001). At this point, there are several known psychosocial interventions that can effectively reduce psychological distress in cancer survivors, including problem-solving therapy (Raingruber, 2011; Nezu, Nezu & D'Zurilla, 2013; Nezu, Nezu, Felgoise, McClure, & Houts, 2003). Although research on psychological distress in breast cancer survivors is essential to ethical care, research focusing solely on detection of distress and its correlates may paint an incomplete and potentially misleading picture of adjustment to cancer (Adler & Page, 2008). A growing body of evidence suggests that many cancer survivors also report psychological growth following a diagnosis of cancer. Tedeschi and Calhoun (2004) conceptualized posttraumatic growth (PTG) as the experience of positive psychological change that occurs as a result of the struggle with highly challenging life crises or circumstances. PTG is manifested in a variety of ways including an increased appreciation for life, a sense of personal strength, an existential or spiritual

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life, as well as more meaningful interpersonal relationships (Tedeschi & Calhoun, 2004).

Many studies measure PTG with the Posttraumatic Growth Inventory (PTGI), a self-report questionnaire that measures five factors of PTG: relating to others; new possibilities; personal strength; spiritual change; and appreciation of life (Taku, Cann, Calhoun, & Tedeschi, 2008). The new possibilities subscale of the PTGI, which is the primary focus of the current study, measures positive beliefs about establishing a new path in life, developing new interests, changing things for the better, and pursuing new opportunities. A review of the PTG literature showed that a relatively small percentage of breast cancer survivors experienced posttraumatic stress disorder (PTSD), a psychiatric condition that can develop after a person experiences or witnesses a traumatic or terrifying event in which serious harm occurred or was threatened, while the majority reported PTG, most often new possibilities (Koutrouli, Anagnostopoulos, & Potomianos, 2012). In other words, although cancer and its treatment can result in traumatic stress, it more often evokes positive growth such as the development of beliefs that life also holds new opportunities and alternatives. Andrykowski, Steffens, Bush, and Tucker (2013) further suggested that the cancer experience, compared to life without cancer in healthy controls, may add a clinically significant degree of positive value to an individual's life. Most commonly, survivors report new possibilities experienced in domains of social resources; personal resources, which include within-person capacities of self-efficacy; and coping skills (Jim & Jacobsen, 2008).

The body of literature regarding which variables contribute to PTG among breast cancer survivors is limited in comparison to more extensive research that has been done studying predictors of distress. However, the existing literature is consistent in its established association between positive or approach-related coping strategies and PTG in breast cancer survivors, as well as its noted pattern that PTG tends to increase over time since diagnosis or treatment initiation (Danahauer et al., 2013; Lelorain, Bonnaud-Antignac & Florin, 2010; Lelorain, Tessier, Florin & Bonnaud-Antignac, 2012; Maners & Champion, 2011; Schand, Cowlshaw, Brooker, Burney & Ricciardelli, 2015; Svetina & Nastran, 2012). Further, PTG has consistently been shown to be associated with higher quality of life, improved adherence to medical recommendations, and lower relapse risk (Hefferon, Grealy & Mutrie, 2010).

Similar positive outcomes have been found to be associated with Social Problem Solving (SPS), the self-directed cognitive-behavioral process individuals engage in to discover ways of coping with problems that arise in their daily lives (Nezu et al., 2013). Nezu et al. have conceptualized cancer, as well as the many difficulties that occur as a consequence of cancer and its treatment such as missed work,

financial stress, treatment decision-making, increased caregiving needs, as a particular constellation of problems to which cancer survivors and their loved-ones must apply their SPS skills (Nezu, Nezu, Friedman, Faddis, & Houts, 1998). Over several decades, Nezu et al. (2013) developed the conceptualization of SPS as composed of two orientations and three styles. The orientations are ways of thinking about problems and are grouped into positive and negative. Positive problem orientation is the tendency to perceive problems as challenges and experience optimism that problems are solvable, as well as self-efficacy regarding one's ability to solve problems. Negative problem orientation is the tendency to perceive problems as threatening, and to demonstrate low self-efficacy and poor frustration tolerance when solving problems. The first of three problem-solving styles is rational problem solving, which is an active, systematic, and thorough process of defining problems, brainstorming solutions, and selecting and implementing the solution that is likely to solve the problem with the fewest negative consequences. The others are avoidant style: the tendency to avoid solving problems; and impulsivity/careless style: the tendency to solve problems quickly without much deliberation. It is theorized that positive problem orientation has a direct effect on adaptive or positive outcomes as well as an indirect effect through rational problem solving, while negative problem orientation has a direct effect on maladaptive or negative outcomes as well as indirect effects through avoidant style and impulsivity/careless style (D'Zurilla & Nezu, 2007).

The majority of research to date on SPS in breast cancer survivors has focused on the associations between SPS and psychosocial distress as well as the efficacy of problem-solving therapy, a therapy aimed at improving SPS, in order to reduce psychosocial distress and improve quality of life in breast cancer survivors (Nezu et al., 1998, 2003, 2013). If cancer survivors are using SPS to cope with cancer-related stressors, SPS may also be related to growth from the cancer experience. However, there have been no studies examining the relationship between SPS and PTG.

Given that PTG is associated with higher quality of life, improved adherence to medical recommendations, and lower relapse risk, it is particularly important to promote factors related to PTG in breast cancer survivors (Hefferon et al., 2010). Further, given the established benefits of problem solving and the effectiveness of problem-solving therapy in cancer populations, it is important to examine the potential relationship between SPS and PTG. This is relevant in particular for new possibilities, given the cognitive-behavioral parallel with SPS in their processes of identifying and approaching new possibilities as an alternative to revisiting ineffective strategies, and their shared emphasis on open-mindedness and self-efficacious beliefs about self and situation. An individual high on new possibilities would also be

more likely to utilize positive reframing, which could also support PTG.

The purpose of the current study was to gain a better understanding of the relationship between SPS and PTG new possibilities and to initiate a discussion of the potential clinical implications of these relationships. We chose to focus on the new possibilities aspect of PTG in the present study given aforementioned cognitive-behavioral parallel between this construct within PTG and SPS. The aim of the current study was to examine the relationships between the components of SPS and PTG new possibilities and to examine whether SPS would be related to PTG new possibilities in breast cancer survivors. We hypothesized that positive problem orientation and rational problem solving would be positively correlated with PTG new possibilities, and negative problem orientation, avoidant style, and impulsive/careless style would be negatively correlated with PTG new possibilities. We also hypothesized that SPS would be related to PTG new possibilities after accounting for time since surgery, income, and age; and positive problem orientation would have the strongest relationship with PTG. These hypotheses were based on the problem-solving therapy model described by D’Zurilla & Nezu (2007). However, this is the first study to empirically examine the relationship between the SPS orientations and styles and PTG in breast cancer survivors.

Method

Sample and Design

This research was retrospective and cross-sectional. The study was approved by the Institutional Review Boards of both the university-affiliated hospital as well as the university where several researchers were employed or enrolled as graduate students. This study was part of a larger study examining psychosocial protective and risk factors in breast cancer survivors at a university-affiliated private hospital, focused on body image-specific outcomes in the context of a body image intervention included in standard of care for women undergoing surgical intervention. Eligible participants were English-speaking women age 18 or older, who had undergone surgical intervention for breast cancer (ranging from lumpectomy to double mastectomy with or without immediate reconstruction). Eligible women were identified from a tumor register at a university-affiliated private hospital in a metropolitan area in the Northeastern United States. Research assistants contacted eligible women by phone and those who agreed to participate completed a battery of self-report questionnaires online through a link provided via e-mail or using paper-and-pencil questionnaires received by U.S. mail.

Of 696 eligible participants contacted via telephone, 85 responded and completed the study questionnaire. The time since surgery ranged from 0.50 to 3.34 years ($M = 2.10$, $SD = .89$). The participants’ ages ranged from 29 to 88 ($M = 59.46$, $SD = 12.00$). The majority of participants was White (85.9%), married (57.6%), and had received at least some postsecondary education (73%). Across religions, the largest proportion of participations was Catholic (45.9%). The participants were asked to indicate the range of their annual family income. Eighty participants responded and 5 participants (6%) left the question blank.

Procedures

The tumor register provided the names of 793 individuals, 97 of whom did not meet the inclusion criteria due to cancer-related factors, and a small number of whom were reported to be deceased or cognitively impaired and thus unable to participate. This left 696 individuals eligible for the study. Research assistants made 1387 recruitment attempts by phone call, which included a minimum of three phone calls made to each individual, unless the individual declined prior to the third call or the individual’s contact information was out of service or invalid. Five hundred and fifty-eight individuals could not be reached by phone. The vast majority did not answer or respond to voicemails. For some, voicemail was not an option or their phone numbers were out of service. One hundred and thirty-eight individuals answered the telephone calls or returned voicemail messages, 89 of whom completed the surveys and 49 of whom declined the invitation to participate due to lack of access to mail or internet, lack of interest, or perceived burden. This resulted in a 12.7% participation rate among those who were eligible and a 62.3% response rate among those who answered the phone calls. Thirty-seven individuals (41.6%) completed the paper-and-pencil version, and 52 (58.4%) completed the online version of the questionnaires. After data completion, 4 additional participants were excluded due to missing data ranging from complete PTGI or SPSI measures to relevant control variables missing. This resulted in a final sample of 85 participants. No group differences were found between paper-and-pencil and online completions.

Measures

Personal Information Form

Participants completed a form consisting of items relating to demographic variables (age, race, income, relationship status, employment, religious affiliation, education level) as well as time since surgery.

Posttraumatic Growth Inventory

The Posttraumatic Growth Inventory (PTGI) is a 21-item self-report questionnaire (Tedeschi & Calhoun, 1996). Respondents indicate on a 6-point Likert scale the extent to which they agree with statements related to posttraumatic growth, with higher scores indicating more PTG endorsed in that domain. The PTGI has a total score as well as scores for the following five factors of PTG: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life (Tedeschi & Calhoun, 1996). The complete PTGI was administered as part of the larger study, although the 5-item PTGI new possibilities subscale was used in the present study and included the following items: “I developed new interests,” “I established a new path for my life,” “I am able to do better things with my life,” “new opportunities are available which wouldn’t have been otherwise,” and “I am more likely to try to change things which need changing.” The internal consistency of the new possibilities subscale of the PTGI in the current study was good at $\alpha = .89$. The internal consistency for the overall PTGI was excellent at $\alpha = .95$. The majority of research on PTG within the cancer population utilizes the PTGI to measure PTG. These studies report internal consistency in new possibilities: $\alpha = 0.84$; significant item–total PTGI correlations in the moderate range ($r = .35$ – $.63$), strong correlations of factors with the PTGI total score ($r = .62$ – $.83$) and acceptable test–retest reliability ($r = .71$ total, ranging from $r = 0.65$ – 0.74 across factors; Tedeschi & Calhoun, 1996).

Social Problem-Solving Inventory, Revised: Short Form

The Social Problem-Solving Inventory, Revised: Short Form (SPSI-R:S) is a 25-item self-report questionnaire that measures a person’s ability to solve problems and make effective decisions (D’Zurilla and Nezu, 1990; D’Zurilla, Nezu, & Maydeu-Olivares, 2002). It examines multiple facets of problem solving, including orientation and style processes. Items load onto factors within categories of problem orientation or problem-solving style. Within the problem orientation domain, subscales include positive and negative problem orientations. Within the problem-solving style domain, subscales include rational, impulsivity/careless, or avoidance problem-solving style. This measure demonstrates strong internal consistency ($\alpha = 0.69$ – 0.95 for each subscale) and test–retest reliability ($\alpha = 0.72$ – 0.91). The internal consistency of the SPSI subscales in this study were $\alpha = .77$ for positive problem orientation, $\alpha = .80$ for negative problem orientation, $\alpha = .83$ for rational problem solving, $\alpha = .70$ for impulsivity/careless style, and $\alpha = 0.81$ for AS.

Statistical Analysis

After data collection, participants were excluded from analysis if their completed surveys were missing any relevant data ($n = 4$). Analyses conducted included: descriptive analyses and zero-order correlations examining the relationship between the PTGI new possibilities and the SPSI subscale scores (reported in Tables 1 and 2), as well as a hierarchical multiple regression examining whether the SPSI relates to PTGI new possibilities, with age, income, and time since surgery as control variables (reported in Table 3). Five separate regressions were conducted with each SPSI subscale entered as the only independent variable in the second step of the regression due to sample size limitations and potential for multicollinearity between the SPSI subscales. These control variables were all included in the regression analysis, despite income being the only one significantly related to PTGI new possibilities in the current study, given the current literature’s consistent support of these factors’ individual contributions to PTG development. Cancer diagnosis was not included as a control variable in the present study due to uniformity in general diagnosis of breast cancer across participants; more detailed information on cancer stage and grade was not collected in the current study. The PTGI new possibilities subscale score was the dependent variable. The PTGI total score was excluded from the current study due to variance across subscales within the PTGI, and in accordance with goal to further explore a specific outcome within the broader realm of PTG.

Results

Descriptive Statistics

Means and standard deviations for the PTGI new possibilities subscale as well as the SPSI subscales are reported in Table 2. When comparing the SPSI scores to the standardized averages for adults in a similar age group, the positive problem orientation and rational problem-solving style scores of this sample were similar to the norm group averages reported by D’Zurilla et al. (2002). The negative problem orientation, impulsivity/careless style, and avoidant style scores of this sample were above the norm group averages (D’Zurilla et al., 2002). Clinical cutoff scores are not available for the PTGI. Possible scores for the PTGI new possibilities subscale ranged from 0 to 30. The mean score of 15.52 in the present study suggests that participants in this study experienced some PTG but not very high levels of PTG.

Table 1 Characteristics of participants

Variable	M	SD	n (%)
Age (range = 29 to 88 years)	59.46	12.00	76 (89.4)
Race			85 (100)
Black			5 (5.9)
White			73 (85.9)
Hispanic			2 (2.4)
Asian/Pacific Islander			1 (1.2)
Other			1 (1.2)
Income			80 (94.1)
Less than 20,000			10 (11.8)
20,000–34,999			7 (8.2)
35,000–49,999			8 (9.4)
50,000–74,999			19 (22.4)
75,000–99,999			13 (15.3)
100,000–134,999			7 (8.2)
135,000–149,999			4 (4.7)
Over 150,000			12 (14.1)
Relationship status			82 (96.5)
Single			5 (5.9)
In a significant relationship			4 (4.7)
Married			49 (57.6)
Divorced			10 (11.8)
Widowed			14 (16.5)
Employment			82 (96.5)
Full time			25 (29.4)
Part time			12 (14.1)
Stay at home			6 (7.1)
Retired			30 (35.3)
Unemployed			2 (2.4)
Disability			7 (8.2)
Religious affiliation			82 (96.5)
Catholic			39 (45.9)
Protestant			17 (20.0)
Jewish			4 (4.7)
Baptist			7 (8.2)
Other			7 (8.2)
None			8 (9.4)
Education			82 (96.5)
Did not complete high school			5 (5.9)
High school/GED			13 (15.3)
Completed trade school			2 (2.4)
Some college			12 (14.1)
Graduated college (2 year)			10 (11.8)
Graduated college (4 year)			26 (30.6)
Graduate School (Masters)			14 (16.5)

Relationships Between Posttraumatic Growth and Social Problem Solving

Zero-order correlations examining the relationship between

the PTGI new possibilities subscale scores and the SPSI subscale scores are also reported in Table 2. The PTGI new possibilities subscale was significantly positively related to the SPSI positive problem orientation ($r = .30, p < .01$), and was significantly negatively related to negative problem orientation ($r = -.22, p < .05$), and impulsivity/careless style ($r = -.26, p < .05$). The PTGI new possibilities subscale was not significantly related to rational or avoidant problem-solving.

The results are presented in Table 3. The two social problem-solving subscales that emerged as significant were positive problem orientation ($\beta = .29, p = .02$) and impulsive/careless style ($\beta = -.28, p = .02$), each explaining an additional 7% of the variance in PTGI new possibilities.

Discussion

This cross-sectional study examined the relationship between SPS and PTG new possibilities in 85 breast cancer survivors who have undergone surgical intervention. Findings indicate that breast cancer survivors with higher positive problem orientation and a less impulsive or careless social problem-solving style reported that as a result of their experience with cancer, their priorities changed, and they become more open-minded to new possibilities. For example, women with these social problem-solving characteristics endorsed exploring new interests and identifying opportunities for positive change in their life after receiving cancer treatment. This finding echoes existing literature stating that active coping techniques such as positive interpretation may correlate significantly to new possibilities (Morris, Shakespeare-Finch & Scott, 2007). Morris et al. (2007) posit that taking an active role in one's own cancer treatment or life process through positive framing of the situation may be an important precursor to adaptively process the experience and be cognitively able to envision positive change. These findings complement this perspective by suggesting that utilizing a thoughtful and complete approach to problem solving further supports this capacity. Further, more impulsive/careless style may present as a barrier to potential PTG development, which would in turn highlight an area for clinical intervention.

The current study adds to the existing literature by specifically establishing a role for SPS in place of a broader "active coping" approach, in particular between positive problem orientation and openness to new possibilities. Findings suggest an individual's orientation toward, or way of viewing, a problem may underlie PTG development. This offers an interesting broader point of view to the literature on the established relationship between negative problem orientation and posttraumatic stress in cancer populations. It is notable that throughout relevant literature examining the

Table 2 Correlations between social problem solving and posttraumatic growth in female breast cancer survivors

Measure	Mean	SD	1	2	3	4	5	6
1. PTGI NP	15.52	7.15	–	.30**	–.22*	.14	–.26*	–.14
2. SPSI PPO	2.48	.85	–	–	–.29*	.65**	.10	.29**
3. SPSI NPO	2.88	.86	–	–	–	.10	.64**	.71**
4. SPSI RPS	2.32	.96	–	–	–	–	–.21	.25*
5. SPSI ICS	3.14	.75	–	–	–	–	–	.64**
6. SPSI AS	3.20	.80	–	–	–	–	–	–

PTGI NP = Posttraumatic Growth Inventory New Possibilities; SPSI PPO = Social Problem Solving Inventory Positive Problem Orientation; SPSI NPO = Social Problem Solving Inventory Negative Problem Orientation; SPSI RPS = Social Problem Solving Inventory Rational Problem Solving; SPSI ICS = Social Problem Solving Inventory Impulsivity/Carelessness Style; SPSI AS = Social Problem Solving Inventory Avoidant Style

** $p < .01$, * $p < .05$, two-tailed

Table 3 Hierarchical multiple regression analysis predicting posttraumatic growth new possibilities from social problem-solving subscales ($n = 85$)

Predictor	β	Adjusted R^2	ΔR^2	F	Sig. F change
Step 1: Control variables		.02	.06	1.58	.20
Time since surgery	.18				
Income	.11				
Age	–.15				
Step 2 ^a : SPSI PPO	.29*	.08	.07	5.46	.02
Step 2: SPSI NPO	–.21	.05	.04	2.82	.10
Step 2: SPSI RPS	.07	.01	<.01	0.36	.55
Step 2: SPSI ICS	–.28*	.08	.07	5.65	.02
Step 2: SPSI AS	–.14	.03	.02	1.21	.28

SPSI PPO = Social Problem Solving Inventory Positive Problem Orientation; SPSI NPO = Social Problem Solving Inventory Negative Problem Orientation; SPSI RPS = Social Problem Solving Inventory Rational Problem Solving; SPSI ICS = Social Problem Solving Inventory Impulsivity/Carelessness Style; SPSI AS = Social Problem Solving Inventory Avoidant Style

^aSPSI subscales were each entered in separate regressions to avoid multicollinearity

* $p < .05$

relationship between posttraumatic stress and SPS in cancer survivors, negative problem orientation has been significantly related to posttraumatic stress and cancer-related distress (D’Zurilla & Nezu, 2007; Nezu et al., 2013). It would be plausible to hypothesize that negative problem orientation would therefore have a negative relationship with PTG; however, this was not the case. In contrast, PTGI new possibilities was positively associated with positive problem orientation but demonstrated no relationship with negative problem orientation. This expands upon an alternative theory in the literature that dichotomous development of PTG and posttraumatic stress might stem from an individual’s pattern of framing and approaching a problem. This theory asserts that

cancer might precipitate both posttraumatic stress and PTG, and that coping techniques may play a role in their differential development (Danahauer et al., 2015; Koutrouli et al., 2016). The current study suggests that it may be a generally positive orientation to a problem, coupled with complete and careful implementation of a coping strategy, which is most associated with PTG development. It further suggests that fostering adaptive qualities such as positive appraisal and self-efficacy, while also refining careless problem-solving patterns, may enable women to identify and create new possibilities in life.

Overall, the aforementioned results of the current study suggest that interventional efforts, such as problem-solving therapy aimed at enhancing positive problem orientation and reducing impulsive problem solving, may aid in facilitating PTG new possibilities. Brief interventions to foster a positive orientation and self-efficacy may be beneficial as well. The following visualization approaches may be helpful (Nezu et al., 2013):

1. A patient may describe a cancer-related problem and then imagine what it will feel like after the problem is solved. Regardless of how they solve the problem, they can focus on the positive feelings they will experience afterward.
2. A patient could remember a time after they solved a problem well in the past, and focus on re-experiencing those positive feelings.
3. A patient could think of someone they admire and how they solved a problem. Then focus not on what the person did, but on the qualities that made that person good at solving problems in general, and try to emulate those qualities.

Given that PTG is associated with higher quality of life, improved adherence to medical recommendations, and lower relapse risk, it is particularly important to promote factors positively related to SPS in postoperative breast cancer

survivors (Hefferon et al., 2010). Emphasis on the strengths-based or positive psychology intervention elements aimed at fostering patient self-efficacy, precision, and perseverance has the potential to optimize positive treatment outcomes. This may be achieved through motivational interviewing targeting ambivalence about problem solving or self-management, or reinforcement of effective self-management, active patient-centered collaboration, and patient empowerment to engage in positive health behavior change in order to play an active role in one's own treatment and medical outcomes.

Limitations and Future Directions

First, it is critical to consider the implications of the study's small sample size. When determining effects using a small sample size, significance testing is often misleading. Limited statistical significance in the current sample may be a function of the small sample size rather than a direct indicator of the size of other SPSI subscales, specifically negative problem orientation, rational, impulsive/careless and avoidant styles, and effect on PTGI new possibilities.

The small sample size of the current study was a result of recruitment barriers. Many individuals who returned voicemails reported they had not answered the phone due to the unfamiliar incoming phone number. Time of recruitment was a barrier due to staffing changes at the recruitment site as well as concurrent presidential campaigning and is likely a large contributor to the low response rate. In addition, many phone numbers were out of service or voicemail boxes were full. Further barriers identified by eligible participants included lack of access to or knowledge of how to use the internet, as well as transient living situations preventing paper-and-pencil surveys to be mailed. It is also important to note the possibility of a self-selection bias in participants who chose to complete the study questionnaires: for example, participants with a positive treatment experience who are more motivated to contribute to the affiliated hospital, or patients with particular interest in their cancer-related psychological experience. Although sample size goals were not met, efforts were taken to enhance the reliability of other aspects of the study. These included recruiting a sample with a uniform cancer diagnosis history, improving our ability to draw conclusions about this specific population, and using measures with established, reliable psychometric properties.

Second, the effect size was small to moderate. This suggests limited practical significance to results. The existing literature confirms a multitude of demographic, psychosocial, environmental, and cancer-related variables with influence over PTG new possibilities beyond SPS, including family and social support variables. In order to keep patient burden to a minimum, these variables were not measured in the current study. There are also many known cancer-specific correlates

of PTG including age at diagnosis, type and stage of cancer, invasiveness, duration and side effects of cancer and treatment, and related posttreatment pain and physical body changes. Other conceptual aspects of the cancer experience requiring further exploration include the difficulty in identifying a single stressor within the cancer experience, the survivors' locus of control regarding cancer development, cancer's chronic course, and the uncertain future threat level of recurrence. PTG new possibilities development in cancer survivors is likely a byproduct of the circumstances surrounding cancer interacting in complex ways. Including these factors in future studies will provide insight into this process.

Third, the design of the current study prevents the establishment of causality and the clarification of the nature of observed relationships, and self-report measures pertaining to PTG are retrospective rather than concurrent to time of cancer diagnosis and treatment. Future research should utilize longitudinal paradigms to aid in identifying the point at which SPS and its specific components impact the development of PTG new possibilities, and contribute to the current research demonstrating that PTG tends to increase over time since diagnosis or treatment initiation. This may enable clinicians to identify the opportunity or critical window for intervention to optimize medical and psychological outcomes. Although the current study comprehensively assessed general cognitive and behavioral aspects of both SPS and PTG new possibilities, an important next step is to monitor and utilize real-time behavioral rather than retrospective self-report measures of SPS and PTG. A behavioral measure of SPS might be quantity of instances per month a patient effectively utilizes problem-solving skills. A behavioral measure of PTG may be actual posttraumatic positive life changes such as adjusting one's schedule to spend more time with family, returning to school to complete a degree, or making healthier lifestyle choices. Finally, the current findings are limited to a mostly Caucasian, Catholic, married population of breast cancer survivors from one cancer treatment center. Given that known demographic variables associated with PTG include race, religious involvement, marital status, and cancer-specific factors, it is important to examine the relationship between SPS and PTG new possibilities across a diverse demographic population, cancer types, and treatment centers to further address whether these results are generalizable. In particular, the current study included 86% White women; future researchers should prioritize recruitment of racially diverse women in order to examine the impact of race on PTG development.

Conclusions

The current study provides novel insight into understanding the specific relationship between SPS and PTG new possibilities. Findings suggest that SPS may have an important

relationship with PTG new possibilities and begin to explain the underlying mechanisms of this relationship by highlighting particular components at play, particularly positive problem orientation and impulsive/careless approach to problem solving. Future studies should replicate the current study with a larger population and longitudinal designs in order to better speak to statistical and practical significance. Future studies should also consider examining additional correlates of PTG to more comprehensively examine PTG new possibilities development in breast cancer survivors. Finally, investigators should consider developing interventional problem-solving therapy studies with the aim of fostering PTG new possibilities development and further assessing their effectiveness in enhancing both medical and quality of life outcomes.

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Compliance with Ethical Standards

Conflict of Interest Elisabeth S. Markman, Kelly S. McClure, Cori E. McMahon, Nataliya Zelikovsky, Brian W. Macone, Anastasia J. Bullcock declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee (Cooper University Hospital Institutional Review Board, IRB Number: 15-137EX) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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