J Clin Psychol Med Settings (2017) 24:47–58
DOI 10.1007/s10880-016-9482-7

Women with Ovarian Cancer: Examining the Role of Social Support and Rumination in Posttraumatic Growth, Psychological Distress, and Psychological Well-being

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Published online: 25 January 2017

Abstract The present study examined the role of social support and rumination (deliberate vs. intrusive) in posttraumatic growth (PTG), psychological distress (PD), and psychological well-being (PWB) among women with ovarian cancer. Sixty-seven women who had experienced ovarian cancer were recruited through social media and cancer-related websites, and completed an online survey. Contrary to hypotheses, results indicated that social support was not predictive of PTG, and the mediation of rumination was not significant in the regression of social support on PTG. Social support was, however, positively correlated with the Relating to Others domain of PTG. Deliberate rumination was positively predictive of PTG, and intrusive rumination was positively predictive of PD and negatively predictive of PWB. Social support was negatively predictive of PD, and positively predictive of PWB. Results are discussed with reference to clinical implications and future research needed in understanding the ovarian cancer experience.

Keywords Cancer · Posttraumatic growth · Social support · Rumination · Psychological distress · Well-being

Introduction

Although ovarian cancer is a relatively rare form of cancer, it poses a significant threat to the patient's physical and mental health (Jayson, Kohn, Kitchener, & Ledermann, 2014; Roland, Rodriguez, Patterson, & Trivers, 2013). The symptoms of ovarian cancer can be vague, including pelvic pain and abdominal distention; as a result, women often do not immediately seek care for such symptoms and late-stage diagnoses are common (Jayson et al., 2014). Treatment programs for ovarian cancer can be lengthy and invasive including procedures such as cytoreduction surgery and chemotherapy. Unfortunately, most women diagnosed at a late stage experience recurrence within 18 months, and some tumors eventually develop chemoresistance, making treatment of the disease especially challenging. Quality of life and control of symptoms, including abdominal pain, nausea, and constipation, are therefore central in the management of ovarian cancer during both active treatment and palliative care (Jayson et al., 2014).

As a result of late stage diagnoses and invasive treatment protocols, many women see their diagnosis of ovarian cancer as an absolute death sentence (Ferrell, Smith, Cullinane, & Melancon, 2003a). Such perceptions may be influenced by comparisons with the prevalence and survival rates of more common forms of cancer; for example, the 5 years survival rate for ovarian cancer was only 45% between 2004 and 2010, compared to a 91% 5 years survival rate for breast cancer during the same time period (Siegel, Miller, & Jemal, 2015). Ovarian cancer patients report significant psychological distress, particularly at the time of diagnosis, and fear of death or recurrence is common among both early and late-stage patients (Roland et al., 2013). Additionally, the relative lack of attention given to ovarian cancer in terms of resources and discussion in the media may be contributing factors in patients perceiving ovarian cancer as a "forgotten cancer" (Power, Brown, & Ritvo, 2008), which, in turn, may fuel perceptions of isolation and anxiety in this population.

It is evident that a diagnosis of cancer, and ovarian cancer specifically, can be a traumatic experience for these

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women. Indeed, posttraumatic stress symptoms and even posttraumatic stress disorder (PTSD) can develop in individuals with cancer (Abbey, Thompson, Hickish, & Heathcote, 2015). Specifically, in reviewing studies of cancer survivors, Abbey et al. (2015) reported that 12.6% showed lifetime cancer-related PTSD, which in many cases was related to younger age, more advanced disease, and recent completion of treatment. However, the prevalence of PTSD varies widely across studies of ovarian cancer survivors; one longitudinal study found that only 30% of participants did not meet the criteria for PTSD at any of the assessment points during the study (Goncalves, Jayson, & Tarrier, 2011), while another study found that 74% of participants had stress levels not indicative of PTSD (Matulonis et al., 2008). In a recent investigation, Shand, Brooker, Burney, Fletcher, and Ricciardelli (2015) reported that just 9.25% of ovarian cancer patients in their study met diagnostic criteria for PTSD, which paralleled the prevalence of PTSD in the general female population. However, their study also indicated that one-third of the sample met PTSD criteria in at least two symptom clusters, indicating that cancer-related factors (e.g., perception of foreshortened future related to diagnosis/prognosis, and the difficulty concentrating that is associated with treatment side effects) may contribute to elevated PTSD symptoms in this population.

Despite the distress associated with a traumatic event like cancer, posttraumatic growth (PTG) can also occur as a result of the experience. PTG is a psychological outcome established by Tedeschi and Calhoun (1996), who observed that when trauma occurs, it has the potential to lead to psychological distress but also considerable positive growth and development. PTG is typically measured across five domains: (1) relating to others, i.e., developing closer and more meaningful connections; (2) new possibilities, e.g., taking a new path or direction in life, possibly related to the trauma (such as becoming a cancer activist once in remission); (3) personal strength, i.e., believing that one is now better able to handle major problems and crises; (4) spiritual change, e.g., becoming closer to a higher power, or greater engagement with existential questions; and (5) appreciation of life, i.e., finding special meaning and importance of the smaller things in life that were previously overlooked or unrecognized (Tedeschi & Calhoun, 1996, 2004). The experience of PTG has been documented across a variety of traumatic experiences (Tedeschi & Calhoun, 2004), including among individuals with cancer (e.g., Arpawong, Oland, Milam, Ruccione, & Meeske, 2013; Cordova, Cunningham, Carlson, & Andrykowski, 2001; Koutrouli, Anagnostopoulous, & Potamianos, 2012; Morris & Shakespeare-Finch, 2011).

Cancer research has linked social support to the degree to which patients experience PTG (McDonough, Sabiston, & Wrosch, 2014; Morris & Shakespeare-Finch, 2011; Prati & Pietrantoni, 2009). In examining factors associated with PTG, Tedeschi and Calhoun (2004) suggested that social support may aid trauma victims in finding meaning in their experience. That is, social support may largely play an indirect role in promoting PTG. In research among cancer patients, social support appears to foster reflection and facilitate positive coping strategies (Morris & Shakespeare-Finch, 2011; Prati & Pietrantoni, 2009). In a related vein, social support has been shown to play a role in minimizing psychological distress in ovarian cancer survivors (Matulonis et al., 2008; Price et al., 2010).

In addition to social support, the cognitive processing of the cancer experience appears to be an important factor in PTG and other psychological outcomes in cancer patients (Morris & Shakespeare-Finch, 2011). Specifically, rumination refers to the cognitive processing of the event that involves continuously thinking about the event/experience (Calhoun, Cann, Tedeschi, & McMillan, 2000). Two types of rumination have been identified: intrusive rumination and deliberate rumination (Cann et al., 2011). Intrusive rumination involves undesired and unsolicited negative, brooding thoughts about one's experience (e.g., automatic thoughts of the event, reliving the experience, etc.), while deliberate rumination refers to voluntarily and intentionally reflecting on one's experience (e.g., making sense of the event, processing one's feelings about the event, etc.), the latter being a form of cognitive processing that tends to be more positive (Cann et al., 2011). Notably, Cann et al. (2011) emphasized that intrusive rumination is a natural response to a major life event/trauma, and may help to facilitate deliberate rumination. Indeed, the two forms of rumination have been found to be positively correlated (Cann et al., 2011; Morris & Shakespeare-Finch, 2011), while differentially related to posttraumatic outcomes. Specifically, multiple studies have found deliberate rumination to be positively correlated with PTG; in contrast, intrusive rumination has been found to be positively correlated with posttraumatic stress (Chan, Ho, Tedeschi, & Leung, 2011; Danhauer et al., 2013; Stockton, Hunt, & Joseph, 2011; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012).

PTG has been examined among various types of cancer (e.g., Morris & Shakespeare-Finch, 2011; Schroevers, Helgeson, Sanderman, & Ranchor, 2010); however, there has been limited research focused on women with ovarian cancer. While some qualitative research revealed growth and changed perspectives on life in relation to ovarian cancer (Ferrell, Smith, Cullinane, & Melancon, 2003b; Wenzel et al., 2002), to our knowledge, there have only been two studies that have measured and examined posttraumatic growth in this population (Monahan et al., 2008; Ponto, Ellington, Mellon, & Beck, 2010). While Monahan et al. (2008) found that ovarian germ cell tumor survivors experienced more PTG compared to controls, Ponto et al. (2010)

examined various predictors of adjustment and growth (e.g., age, years in relationship, symptom distress, performance status, etc.) and found no significant predictors of PTG in their sample of 60 women with ovarian cancer. Given widespread attention to PTG in the psycho-oncology literature (e.g., Jim & Jacobsen, 2008; Shand et al., 2015) and the marked paucity of such research dedicated to ovarian cancer, it is pertinent to examine this important positive psychological outcome among women with ovarian cancer.

Research suggests that social support can indeed help cancer patients navigate trauma-related issues and find meaning in their cancer experience (Schroevers et al., 2010). The ensuing cognitive processing (e.g., increased deliberate rumination) resulting from social support could, in turn, facilitate posttraumatic growth. Therefore, the purpose of the present study was to examine the potential indirect effect of social support on PTG through rumination among women with ovarian cancer. Related to previous psycho-oncology research (e.g., Morris & Shakespeare-Finch, 2011), we proposed that the relationship between social support and PTG would be explained by the mediation effect of rumination in the relationship. That is, with greater social support, women with ovarian cancer would be offered greater opportunity to cognitively process their cancer experience in a productive way (i.e., more deliberate rumination, less intrusive rumination), and in turn, would be more likely to experience PTG.

While PTG is an important emerging psychological outcome with clear clinical implications for cancer patients, examining the broader psychological state of individuals who have experienced such trauma was also important to consider. Ovarian cancer in particular can be chronic with a high risk of recurrence and various invasive treatments (Jayson et al., 2014; Roland et al., 2013). Therefore, in this research, two global mental health outcomes were also assessed—psychological distress and psychological well-being—in relation to the psychosocial predictors of interest: social support and rumination style. Determining the social and cognitive factors related to PTG, psychological distress, and psychological well-being among women with ovarian cancer has important implications for not only understanding their experience, but in supporting this population across their disease and survivorship trajectories as well.

Method

Participants and Procedure

Participants were recruited online by posting a link to a Qualtrics questionnaire in Facebook groups, on Twitter, on cancer-related websites, and through electronic newsletters. The study initially included cancer patients and their loved ones, but loved ones are excluded from this manuscript due to low sample size ($n = 17$). Many subjects were recruited from the National Ovarian Cancer Coalition's Facebook page, as the group posted a link to the questionnaire on the researchers' behalf. The recruitment posts stated that the study, titled *Psychosocial experiences of women with ovarian cancer and their loved ones*, involved completion of a 20 minute online questionnaire. In the post, participants were told that they must be 18 years or older to participate, and they had to be a woman with an ovarian cancer experience (currently or having experienced it), or a loved one currently supporting or having supported someone with ovarian cancer, such as a husband, partner, parent, or daughter/son.

All participants completed an online consent form prior to completing the study questionnaire. Sixty-seven women with ovarian cancer (self-reported diagnosis collected through the questionnaire) completed the study between March and July 2015. As an incentive, this study included the option for participants to give their name and email address to be entered for the chance to win a $50 Amazon gift card. The study protocol was approved by the authors' institutional review board.

Measures

Posttraumatic Growth

Participants were asked to complete the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). The PTGI is comprised of 21 items, which fall into five subscales: 1) relating to others (7 items), 2) new possibilities (5 items), 3) personal strength (4 items), 4) spiritual change (2 items), and 5) appreciation of life (3 items). Scale instructions were as follows: "Indicate for each of the statements below the degree to which this change occurred in your life as a result of your experience with cancer [referred to as the crisis in the questionnaire]." For each item, responses ranged from 0 = *I did not experience this change as a result of my crisis* to 5 = *I experienced this change to a very great degree as a result of my crisis*. Typical items for the subscales were: (1) for the Relating to Others subscale, possible scores ranged from 0 to 35, with items such as "Knowing that I can count on people in times of trouble" and "I learned a great deal of how wonderful people are;" (2) for the New Possibilities subscale, possible scores ranged from 0 to 25, with items such as "I'm able to do better things with my life" and "I developed new interests;" (3) for the Personal Strength subscale, possible scores ranged from 0 to 25, with items such as "A feeling of self-reliance" and "I discovered that I am stronger than I thought I was;" (4) for the Appreciation of Life subscale, possible scores ranged

from 0 to 15, with items such as "My priorities about what is important in life" and "Appreciating each day;" and (5) for the spirituality subscale, possible scores ranged from 0 to 10, with the two items being "A better understanding of spiritual matters" and "I have a stronger religious faith."

Subscale scores are computed by summing the relevant items and a total PTGI score is also computed by summing the scores of all scale items (total PTGI possible scores range from 0 to 105). Higher scores for the subscales and the total score reflect greater PTG. The PTGI had excellent internal consistency in the present study ($\alpha = 0.96$), and each of the subscales had adequate internal consistency as well: relating to others ($\alpha = 0.82$), new possibilities ($\alpha = 0.88$), personal strength ($\alpha = 0.81$), spiritual change ($\alpha = 0.73$), and appreciation of life ($\alpha = 0.78$).

Rumination

The Event-Related Rumination Inventory (ERRI; Cann et al., 2011) was used to measure participants' rumination styles. The ERRI is a 20-item scale that was designed to measure cognitive processing (i.e., rumination) associated with PTG. Two styles of rumination are assessed with the ERRI: deliberate rumination (10 items) and intrusive rumination (10 items). Scale instructions were as follows: "After experiencing cancer, people sometimes, but not always, find themselves having thoughts about their cancer experience even though they don't try to think about it. Indicate for the following items how often, if at all, you thought about cancer in the past month." Typical deliberate rumination items include "I thought about whether changes in my life have come from dealing with my experience" and "I thought about what the experience might mean for my future." Typical intrusive rumination items include "I found myself automatically thinking about what had happened" and "I tried not to think about cancer, but could not keep the thoughts from my mind." Participants responded to each of the items on a scale that ranged from 0 = *not at all* to 3 = *often*. Scores for each scale can range from 0 to 30, with higher scores indicating a greater degree of rumination. Both the intrusive ($\alpha = 0.96$) and the deliberate ($\alpha = 0.89$) scales of the ERRI had excellent internal consistency in this study.

Social Support

To assess social support, participants completed the 8-item Duke-UNC Functional Social Support Questionnaire (Broadhead, Gehlbach, de Gruy, & Kaplan, 1988), a scale previously used in the ovarian cancer population (e.g., Price et al., 2010, 2013; Roland et al., 2013). Scale instructions for participants were as follows: "Here is a list of some things that other people do for us or give us that may be helpful or supportive. Please read each statement carefully and select the statement that is closest to your situation." For each item, participants respond on a five-point Likert scale ranging from 1 = *as much as I would like* to 5 = *much less than I would like*. Two examples of scale items are: "I have people who care about what happens to me" and "I get useful advice about important things in life." In computing an overall social support score, items are recoded such that higher scores reflect greater support and items are summed (possible scores range from 8 to 40). Higher total scores therefore indicate greater social support. Broadhead et al. (1988) determined that the instrument has adequate psychometric reliability and validity. In the present study, the scale had excellent internal consistency ($\alpha = 0.91$).

Psychological Well-being and Distress

To assess psychological well-being and psychological distress, participants completed the Mental Health Inventory (MHI; Veit & Ware, 1983), a 38-item questionnaire that assesses various facets of mental health. The MHI has been psychometrically tested and validated (Veit & Ware, 1983), and both short form and full-length scales have been used to assess mental health in the cancer population (e.g., Salsman et al., 2014; Inbar, Ety, Ayala, & Tamer, 2013). The two global mental health scales of the MHI assess psychological distress (24 items; possible scores range from 24 to 142) and psychological well-being (14 items; possible scores range from 14 to 84).

Scale instructions were as follows: "Please read each question and choose the statement that best describes how things have been for you in the past month." One example of an item for the psychological distress scale is "How much of the time, during the past month, have you felt downhearted or blue?" Response options for this item ranged from 1 = *all of the time* to 6 = *none of the time*. A second example is "During the past month, how often did you get rattled, upset, or flustered?" with response options 1 = *always* to 6 = *never*. For the psychological well-being scale, two examples of items are "During the past month, how much of the time have you generally enjoyed the things you do?" and "How much of the time, during the past month, have you felt cheerful, lighthearted?" Response options for these two items ranged from 1 = *all of the time* to 6 = *none of the time*. For each scale, items are recoded such that higher scores on the Distress Scale indicate greater distress, and higher scores on the Well-being Scale indicate greater well-being. In the present study, the psychological distress scale ($\alpha = 0.97$) and the psychological well-being scale ($\alpha = 0.95$) had excellent internal consistency.

Sociodemographic and Medical Information

Information was collected regarding participants' sociodemographic characteristics, including their age, ethnicity, highest completed level of education, marital status, and family income. Medical information was also collected regarding the date of cancer diagnosis (time since diagnosis in months was calculated using this information), the stage of the disease at the time of diagnosis, any current or previous treatment, current medical status in regard to the presence of cancer, and the number of times the cancer has recurred.

Statistical Approach

In order to examine the potential indirect effect of social support on PTG through rumination (deliberate and intrusive), Preacher and Hayes' (2008) bootstrapping estimates of indirect effects were computed using SPSS. A total of 5000 samples were used in conducting the analysis. Following the mediation analysis, hierarchical linear regression analyses were conducted to examine the influence of social support and rumination style on the psychological outcomes of the present study: PTG, psychological distress, and psychological well-being. Social support was entered in block one, followed by deliberate and intrusive rumination in block two, which finalized the model.

Prior to conducting the analyses, data were screened and missing data were taken into account. For scales with ≤30% of the items missing, expectation maximization was used to estimate missing values (Schlomer, Bauman, & Card, 2010). For cases with more than 30% of the scale items missing, no total score was computed. Pairwise deletion was applied to the analyses to preserve power. No outliers were identified for the regression predictors. However, social support and intrusive rumination were negatively skewed. As such, the variables were transformed using a logarithmic transformation (Tabachnick & Fidell, 2013). Analyses were conducted using both the untransformed and transformed variables; because the regression models did not differ, the results are presented with the untransformed variables.

Results

Descriptive Statistics and Bivariate Correlations

Table 1 presents the sociodemographic and medical information of the sample. The participants in the study ranged in age from 28 to 74 ($M = 49.54$, $SD = 10.55$), and the majority identified as White American (80.6%), were married (52.2%), and had completed college or a post-graduate degree (62.7%). Most of the participants were currently in remission (71.6%) and had not experienced recurrence of cancer (61.2%). A total of 59 participants provided information about their date of diagnosis, and using this information, time since diagnosis was calculated in months. Time since diagnosis ranged from 3 to 229 months ($M = 58.90$, $SD = 56.95$). Descriptive statistics for the psychosocial variables are presented in Table 2.

Bivariate correlations for the study variables are presented in Table 3. Of note, social support had a significant positive correlation with the PTGI relationships subscale score ($r = .349$, $p < .01$) and psychological well-being ($r = .543$, $p < .01$), and a negative correlation with psychological distress ($r = -.458$, $p < .01$). Deliberate rumination was positively correlated with intrusive rumination ($r = .607$, $p < .01$), the PTGI total score ($r = .269$, $p < .05$), the PTGI personal strength score ($r = .269$, $p < .05$), the PTGI spirituality score ($r = .298$, $p < .05$), the PTGI appreciation subscale score ($r = .271$, $p < .05$), and psychological distress ($r = .283$, $p < .05$). Intrusive rumination was moderately negatively correlated with psychological well-being ($r = -.500$, $p < .01$), and positively correlated with psychological distress ($r = .532$, $p < .01$). In terms of the medical items included in the correlation analyses (time since diagnosis, cancer stage), time since diagnosis was negatively correlated with deliberate rumination ($rho = -0.296$, $p < .05$). No other significant correlations between the medical and psychological variables were found.

Multiple Mediation Analysis

A multiple mediation analysis was conducted to examine the indirect effect of social support on PTG through deliberate and intrusive rumination. In the estimation of path coefficients, 95% bias-corrected confidence intervals (95% BC CI) were computed. Bootstrapping estimates of indirect effects were conducted and results of the model are presented in Fig. 1. The overall model was significant, F (3, 58) = 4.78, $p = .005$, $Adj.\ R^2 = 0.157$. The total effect was not significant, $c = .69$, $p = .124$, nor was the direct effect (relationship between social support and PTG controlling for rumination), $c' = .48$, $p = .255$. Neither of the indirect effects through deliberate rumination, $a_1b_1 = .06$, 95% BC CI: (-.44, .32), nor intrusive rumination, $a_2b_2 = .26$, 95% BC CI: (-.02, .76), were significant.

Hierarchical Linear Regression Analyses

Following the null results of the multiple mediation model, a hierarchical regression analysis was conducted to examine the influence of social support and rumination in predicting PTG. Results for this model are presented in Table 4. The PTG model was significant, F (3, 58) = 4.78,

Table 1 Participant Sociodemographic and Medical Information

Variable	Category	*n*	(%)
Ethnicity	White American	54	(80.6)
	Native American/Alaska Native	1	(1.5)
	Hispanic/Latino American	4	(6.0)
	African American	1	(1.5)
	White British/Scottish/European	7	(10.4)
	Total	67	(100.0)
Education (completed)	Post-graduate degree	17	(25.4)
	College graduate	25	(37.3)
	High school graduate	6	(9.0)
	Trade school/some college	19	(28.4)
	Total	67	(100.0)
Family income	$20,000 or less	6	(9.0)
	$20,001-$30,000	7	(10.4)
	$30,001-$50,000	14	(20.9)
	$50,001-$70,000	12	(17.9)
	$70,001-$100,000	15	(22.4)
	$100,001 or more	13	(19.4)
	Total	67	(100.0)
Marital status	Married	35	(52.2)
	Widowed	4	(6.0)
	Living with a partner	2	(3.0)
	Single	11	(16.4)
	Divorced/separated	15	(22.4)
	Total	67	(100.0)
Disease stage at diagnosis	Stage I	25	(37.3)
	Stage II	5	(7.5)
	Stage III	19	(28.4)
	Stage IV	11	(16.4)
	Missing	7	(10.4)
	Total	67	(100.0)
Current medical status	Presence of disease, active treatment	10	(14.9)
	Presence of disease, no treatment	1	(1.5)
	Presence of disease, palliative treatment	1	(1.5)
	In remission	48	(71.6)
	Missing	7	(10.4)
	Total	67	(100.0)
Cancer recurrence	0 times	41	(61.2)
	1 time	13	(19.4)
	2 times	3	(4.5)
	3 times	2	(3.0)
	4 times	1	(1.5)
	Missing	7	(10.4)
	Total	67	(100.0)

$p = .005$, *Adj.* $R^2 = 0.157$ with model predictors explaining 15.7% of the variance in PTG. Notably, social support was not significant in the regression model ($\beta = 0.139$, $p > .05$). Deliberate rumination ($\beta = 0.483$, $p < .01$) and intrusive rumination ($\beta = -0.363$, $p < .05$) were significant predictors of PTG.

It is noteworthy that although intrusive rumination did not have a significant zero-order correlation with PTG ($r = .112$, $p > .05$), it emerged as a significant predictor of PTG in the model. A possible interpretation is that when the shared variance of intrusive and deliberate rumination is taken into account, intrusive rumination is

Table 2 Descriptive statistics of study variables

	Mean (*SD*)	Range	Possible range
Social support	32.37 (7.27)	12.00–40.00	8.00–40.00
Rumination: deliberate	18.99 (7.26)	3.00–30.00	0–30.00
Rumination: intrusive	18.22 (9.13)	2.00–30.00	0–30.00
PTGI total	55.27 (25.02)	0–99.00	0–105.00
PTGI relationships	19.71 (7.95)	0–35.00	0–35.00
PTGI new possibilities	10.85 (7.14)	0–24.00	0–25.00
PTGI personal strength	10.56 (5.99)	0–20.00	0–20.00
PTGI spirituality	4.58 (3.57)	0–10.00	0–10.00
PTGI appreciation	9.56 (4.28)	0–15.00	0–15.00
Psychological well-being	50.73 (14.69)	14.00–78.00	14.00–84.00
Psychological distress	62.15(25.30)	26.00–134.00	24.00–142.00

negatively predictive of PTG. However, it is also possible that intrusive rumination is operating as a suppressor variable in the model. Further analyses to probe this possibility were conducted; a hierarchical regression (social support in block one, deliberate rumination in block two, intrusive rumination in block three) indicated that the regression weight of deliberate rumination was enhanced upon the inclusion of intrusive rumination in the models. The regression results for this secondary analysis are also presented in Table 4. While suppression can be an issue related to collinearity, in our model, the variance inflation factor for intrusive rumination (VIF = 1.59) was low enough to alleviate this concern (Akinwande, Dikko, & Samson, 2015).

Hierarchical linear regressions were also conducted to assess the role of social support and rumination in psychological distress and psychological well-being. Results for the models are presented in Table 5. The final model with psychological distress as an outcome variable was significant, $F\ (3,\ 60) = 13.18$, $p < .001$, *Adj.* $R^2 = 0.367$. In the model, both social support ($\beta = -0.348$, $p < .01$) and intrusive rumination ($\beta = 0.449$, $p < .01$) were predictive of psychological distress. The final model with psychological well-being as the outcome variable was also significant, $F\ (3,\ 60) = 16.40$, $p < .001$, *Adj.* $R^2 = 0.423$. Both social support ($\beta = 0.435$, $p < .01$) and intrusive rumination ($\beta = -0.476$, $p < .01$) were significant predictors in the final model. Deliberate rumination was not significant in predicting psychological distress ($\beta = -0.001$, $p > .05$) or psychological well-being ($\beta = 0.140$, $p > .05$).

Table 3 Bivariate zero-order correlations among study variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1.Social Support	–	–	–	–	–	–	–	–	–	–	–	–
2. Deliberate Rumination	−0.042	–	–	–	–	–	–	–	–	–	–	–
3. Intrusive Rumination	−0.191	0.607**	–	–	–	–	–	–	–	–	–	–
4. PTGI Total	0.198	0.269*	−0.112	–	–	–	–	–	–	–	–	–
5. PTGI Relationships	0.349**	0.238	−0.048	0.861**	–	–	–	–	–	–	–	–
6. PTGI New Possibilities	0.079	0.141	−0.224	0.904**	0.692**	–	–	–	–	–	–	–
7. PTGI Personal Strength	0.163	0.269*	−0.104	0.905**	0.696**	0.766**	–	–	–	–	–	–
8. PTGI Spirituality	0.079	0.298*	0.056	0.696**	0.464**	0.530**	0.592**	–	–	–	–	–
9. PTGI Appreciation	0.082	0.271*	−0.095	0.898**	0.660**	0.804**	0.810**	0.659**	–	–	–	–
10. Psychological well-being	0.543**	−0.168	−0.500**	0.303*	0.232	0.325*	0.307*	0.166	0.235	–	–	–
11. Psychological distress	−0.458**	0.282*	0.532**	−0.176	−0.195	−0.195	−0.161	0.002	−0.125	−0.840**	–	–
12. Time Since Diagnosis	−0.188	−0.296*	−0.233	0.084	0.013	0.087	0.172	−0.102	0.119	−0.026	0.126	
13. Stage at Diagnosis	0.130	0.032	0.096	0.005	0.100	0.004	−0.010	−0.146	0.001	−0.096	0.000	−0.191

**$p < .01$; *$p < .05$

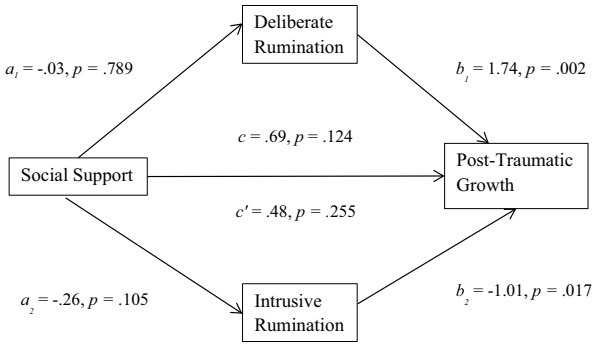

Fig. 1 Examining the indirect effect of social support on posttraumatic growth through rumination. *Note* Unstandardized coefficients are presented for the pathways between the independent variable, mediator, and dependent variable. *a* pathway = relationship between IV and mediator, *b* pathway = relationship between mediator and DV, *c* pathway = relationship between IV and DV [total effect], *c′* pathway = relationship between IV and DV after controlling for mediator [direct effect]

Discussion

The aim of the present study was to examine the role of type of rumination and social support in PTG, psychological distress and psychological well-being. Results of the study indicated that social support was not a predictor of PTG. However, rumination was predictive of PTG, and social support and intrusive rumination were both predictive of psychological distress and psychological well-being. Overall, the results of the study provide evidence for the importance of cognitive processing, i.e., type of rumination, in PTG, and indicate that both social support and rumination remain important considerations in other psychological outcomes among women with ovarian cancer.

In this study, we hypothesized that social support would be predictive of PTG, and that this relationship would be explained by the mediation effect of rumination. However, our results did not support the hypothesis; we did not find evidence for a positive relationship between social support and PTG, nor an indirect effect through rumination in the regression of social support on PTG. McDonough et al. (2014), in their research on women with breast cancer, posited that in order to facilitate growth, the support received by the cancer patient needs to be specific to the cancer experience or directly from a partner. Previous research on general social support and PTG reported no significant relationship (Cordova et al., 2001); however, McDonough et al. (2014) found that breast cancer-specific social support was associated with PTG during the post-treatment period of three months. Therefore, it is possible that the null findings of the present study are related to the assessment of social support. A general social support measure was used, and it is possible that using an assessment of ovarian cancer-specific social support (i.e., support grounded in knowledge of challenges associated with the ovarian cancer experience) might have yielded a significant relationship with PTG. Thus, examining additional forms of social support, including support that is specific to ovarian cancer, would be a valuable area for future study.

It is noteworthy that although social support was not predictive of overall PTG in the present study, it was positively correlated with the relating to others domain of the PTGI. It is possible that when women with ovarian cancer perceive a greater degree of social support from others, they

Table 4 Hierarchical linear regression models of social support and rumination on posttraumatic growth

Outcome variable	Predictor variable	β	R	R^2	Adjusted R^2	F	df	p
Posttraumatic growth	Block One	–	0.198	0.039	0.023	2.44	1, 60	.124
	Social support	0.198	–	–	–	–	–	–
	Final model	–	0.445	0.198	0.157	4.78	3, 58	.005
	Social support	0.139	–	–	–	–	–	–
	Deliberate rumination	0.483**	–	–	–	–	–	–
	Intrusive rumination	−0.363*	–	–	–	–	–	–
Posttraumatic growth[a](*secondary analysis*)	Block One	–	0.198	0.039	0.023	2.44	1, 60	.124
	Social support	0.198	–	–	–	–	–	–
	Block Two		0.339	0.115	0.085	3.84	2, 59	.027
	Social support	0.207	–	–	–	–	–	–
	Deliberate Rumination	0.276*	–	–	–	–	–	–
	Final *model*		0.445	0.198	0.157	4.78	3, 58	.005
	Social support	0.139	–	–	–	–	–	–
	Deliberate rumination	0.483**	–	–	–	–	–	–
	Intrusive rumination	−0.363*	–	–	–	–	–	–

[a]Investigation of a possible suppressor effect was conducted, denoted as *secondary analysis* in this figure

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

Table 5 Hierarchical linear regression models of social support and rumination on psychological distress and psychological well-being

Outcome variable	Predictor variable	β	R	R^2	Adjusted R^2	F	df	p
Psychological distress	Block One	–	0.458	0.210	0.197	16.50	1, 62	<.001
	Social support	−0.458**	–	–	–	–	–	–
	Final *model*	–	0.630	0.397	0.367	13.18	3, 60	<.001
	Social support	−0.348**						
	Deliberate rumination	−0.005						
	Intrusive rumination	0.449**						
Psychological well-being	Block One		0.543	0.295	0.284	25.97	1, 62	<.001
	Social support	0.543**	–	–	–	–	–	–
	Final *model*	–	0.671	0.451	0.423	16.40	3, 60	<.001
	Social support	0.435**	–	–	–	–	–	–
	Deliberate rumination	0.140	–	–	–	–	–	–
	Intrusive rumination	−0.476**	–	–	–	–	–	–

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

are more likely to deepen such relationships and become more emotionally expressive—key components of growth within this domain (Tedeschi & Calhoun, 1996). Although the directionality of the relationship cannot be confirmed with this cross-sectional study, this result does emphasize that when examining PTG among cancer patients, it is important to look at the individual domains—as growth may not be uniform across all PTG dimensions.

In assessing how cognitive processing predicts PTG, the results indicated that deliberate rumination was positively predictive of PTG and intrusive rumination was negatively predictive of PTG. The positive association between deliberate rumination and PTG is consistent with previous literature focused on other forms of trauma (Taku, Cann, Tedeschi, & Calhoun, 2009) as well as cancer patients (Danhauer et al., 2013; Morris & Shakespeare-Finch, 2011). However, in contrast to the findings of the present study, previous psycho-oncology research reported no significant correlation between intrusive rumination and PTG (Cordova et al., 2001; Morris & Shakespeare-Finch, 2011). The results of the regression suggest that intrusive rumination is negatively predictive of PTG after controlling for deliberate rumination. However, as previously discussed, given the non-significant zero-order correlation between PTG and intrusive rumination, it is possible that intrusive rumination was a suppressor variable in the regression. That is, not only did the regression alter the relationship between intrusive rumination and PTG, but the inclusion of intrusive rumination in the model could have also inflated the predictive capacity of deliberate rumination (MacKinnon, Krull, & Lockwood, 2000). The results of the present study should be interpreted with this information in mind.

With regard to the relationship between rumination and PTG, Triplett et al. (2012) discussed that processing the way in which the trauma challenges one's core beliefs and helps to redefine one's assumptive world is a key aspect of experiencing growth. Intrusive and deliberate rumination could then be perceived as complementary processes that can result not only from coping with the cancer experience, but also in re-establishing one's core beliefs and assumptive world. Intrusive rumination, however, without deliberate rumination, is a non-productive way of re-experiencing the trauma (Cann et al., 2011). Accentuating the importance of productive cognitive processing, psycho-oncology research has found that deliberate rumination (Morris & Shakespeare-Finch, 2011), and related constructs such as greater use of positive reinterpretation coping (Shand et al., 2015; Widows, Jacobsen, Booth-Jones, & Fields, 2005) and greater challenge to core beliefs (Danhauer et al., 2013), are positively related to PTG.

In examining the other psychological outcomes, although social support did not emerge as a significant predictor of PTG in the present study, it was positively predictive of psychological well-being and negatively predictive of psychological distress. This finding is consistent with previous research in this area of study; ovarian cancer patients with higher levels of social support are more likely to report more positive well-being and fewer negative mental health symptoms (e.g., Champion et al., 2007; Hipkins, Whitworth, Tarrier, & Jayson, 2004). Social support can facilitate the emotional processing of a cancer experience, and can also be helpful in alleviating the stressors associated with treatment and cancer aftereffects (Helgeson & Cohen, 1996).

Additionally, greater intrusive rumination was predictive of greater psychological distress and lower levels of psychological well-being. Previous psycho-oncology studies have also shown a relationship between intrusive rumination and psychological distress (Morris & Shakespeare-Finch, 2011) as well as depressive symptoms (Steiner, Wagner, Bigatti,

& Storniolo, 2014). Therefore, while deliberate rumination may be helpful in facilitating growth, intrusive rumination may be particularly problematic in that it not only is linked with distress, but might also decrease psychological well-being among women with ovarian cancer.

This research has important clinical implications for facilitating overall quality of life and well-being of women with ovarian cancer. The promotion of growth from trauma is largely discouraged in clinical settings, as it may lead to unhelpful and unnecessary pressure on patients to adjust to their trauma in a prescribed fashion (McDonough et al., 2014). However, rather than focusing on growth directly, providing or facilitating opportunities for deliberate rumination (e.g., with a health care professional, loved ones, or other ovarian cancer patients/survivors) may be beneficial in this population.

Our study also demonstrates that intrusive rumination may be a key cognitive variable that impedes psychological well-being and fuels psychological distress. Notably, intrusive rumination was not correlated with disease severity (cancer stage) or time since diagnosis in the present study. While previous research suggests that intrusive rumination may facilitate deliberate rumination (Cann et al., 2011), it is important for health care professionals working with ovarian cancer patients—both acutely and in terms of long-term care—to recognize that problematic cognitive processing in the form of intrusive rumination may have negative implications for mental health across the cancer experience trajectory.

There are limitations of the present study that must be considered in interpreting the findings. The participants in this study were recruited primarily through social media and cancer-related websites, which limits the generalizability of the results. Additionally, the recruitment strategies contributed to a heterogeneous sample in terms of medical status (e.g., time since of diagnosis, remission status), which should be kept in mind in interpreting the findings. However, the results of the present study are nonetheless important to consider; women with ovarian cancer can experience residual effects of the disease long after treatment ends and while in remission (Jayson et al., 2014; Roland et al., 2013). Further, the experience of PTG may not occur immediately after treatment. For many individuals, it may take time to cognitively process their situation and experience growth (Tedeschi & Calhoun, 2004). In turn, capturing the psychological processes (e.g., rumination, coping) at the beginning of the cancer experience as well as post-treatment remains an important consideration in understanding PTG in this population.

The relatively limited response to the study, and in turn, small sample size ($n = 67$) must also be noted. Although it is possible low power may be influencing some of the findings, the sample size is similar to other psycho-oncology studies (e.g., Cordova et al., 2007; Ponto et al., 2010; Weiss, 2004; Widows et al., 2005) and there was a good range of data. Further, many of the correlations and observed means for the psychological variables in the present study are comparable to previous psycho-oncology research (e.g., Cordova et al., 2001; Morris & Shakespeare-Finch, 2011; Price et al., 2013; Triplett et al., 2012).

Finally, it is important that the cross-sectional design of the study be emphasized. While the models are structured such that social support and rumination are positioned as predictors of the psychological outcomes, the direction of the associations cannot be confirmed. It is possible, for example, that the relationship between deliberate rumination and PTG is reciprocal. Therefore, in addition to examining other important variables (e.g., challenge to core beliefs, coping strategies, and specific forms of social support), in future longitudinal studies, it would be useful to further examine the roles of intrusive and deliberate rumination, and their temporal relationship, in relation to PTG.

Overall, this study significantly adds to the literature dedicated to better understanding the ovarian cancer experience. Specifically, this research illustrates that deliberate rumination may be a key cognitive variable in facilitating PTG among women with ovarian cancer. Additionally, although social support was not predictive of overall growth, it may be beneficial within the growth domain of relating to others. The results also identify intrusive rumination as a problematic cognitive processing style that may be detrimental to well-being and may contribute to psychological distress in women with ovarian cancer. Importantly, time since diagnosis and stage of disease were not associated with the psychological outcomes, which highlights that examining both positive and negative psychological outcomes across the disease and survivorship trajectories remains an important research endeavor with significant clinical implications for this population.

Compliance with Ethical Standards

Conflict of interest Erin M. Hill and Kaitlin Watkins declare that they have no conflict of interest related to this study

Informed Consent All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed Consent was obtained from all patients that were included in the study.

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