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Moderating Effect of Posttraumatic Growth on the Relationship Between Social Support and Quality of Life in Colorectal Cancer Patients With Ostomies

KEY WORDS

Cancer
Colorectal cancer
Oncology
Ostomy
Posttraumatic growth
Quality of life
Social support

Background: Little research has examined the moderating influence of posttraumatic growth (PTG) on the relationship between social support and quality of life. **Objectives:** This study examined the relationship between social support and quality of life by the level of PTG in colorectal cancer patients with ostomies. **Methods:** Using a cross-sectional design, colorectal cancer patients with ostomies (n = 140) were recruited using convenience sampling. The City of Hope Quality of Life–Ostomy, the Multidimensional Scale of Social Support, and the Posttraumatic Growth Inventory measured quality of life, social support, and PTG, respectively. **Results:** Social support and PTG were positively related to psychological and social well-being. Higher social support was associated with better psychological and social well-being. Posttraumatic growth moderated the relationship between psychological and social well-being. At a low and moderate level of PTG, social support was more strongly associated with psychological and social well-being, whereas at high levels, this association was not significant. **Conclusions:** Findings highlight the significance of social support to improve the quality of life for colorectal cancer patients with an ostomy, particularly those with low levels of PTG. **Implications for Practice:** Screening for patients' positive cognitive adaptations while living with an ostomy could identify those who might need further social support to improve their quality of life. Further, intensive social support programs might promote the quality of life for colorectal patients with an ostomy, which was found to be effective for those with low levels of PTG.

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Colorectal cancer (CRC) is the third most common cancer worldwide and the second most common in South Korea.^{1,2} Ostomy, a surgical construction of a passage through the abdominal wall after removal of a part of an affected bowel, is an effective treatment option for CRC. However, ostomy formation is accompanied by challenges in physical, psychological, and social functions.³ Previous studies have shown that patients who underwent ostomy formation experienced a variety of physical impairments, including rectal discharge, inability to control gas, decreased sexual activity, and difficulties participating in travel and leisure activities.⁴ Further, they dealt with negative emotions and psychosocial distress, including anxiety, depression, embarrassment from stigma, and even suicidal ideation.⁵ Such physical and psychological distress is closely associated with reduced social relationships and activities, contributing to unemployment, social disconnectedness, and isolation.⁴⁻⁶ These wide-ranging and notable impairments can disrupt patients' daily lives and substantially affect their quality of life.³ Previous studies have found that quality of life was significantly lower in CRC patients with an ostomy compared with those without one.^{6,7} As the goal of cancer treatment is not only to increase survival time but also to improve quality of life, assessing patients' quality of life and its determinants is critical to understand the care needs of patients and improve their quality of life.³ Such assessments provide crucial information for the evaluation of health outcomes for therapeutic procedures along with the impact on patients' lives as well as for supporting the decision-making process for both patients and healthcare providers.⁸

Social support is the perceived availability of interpersonal resources from family members, friends, and significant others.⁹ It has been acknowledged to improve psychological adjustment and quality of life by buffering the negative impact of stressful life events and enhancing the recognition and benefits of positive emotions.^{10,11} Previous studies have found that high levels of perceived social support were associated with improved adaptation and health-related quality of life among CRC patients with an ostomy.¹²⁻¹⁴ However, little is known about the specific mechanisms linking the role of social support to quality of life in this population.

The double burden of cancer treatment and ostomy management represents a sizable challenge for CRC patients with an ostomy regarding the process of acceptance, adaptation, and adjustment, which might lead to positive or negative life trajectories.¹⁵ Individuals who cope effectively with such stressful events actively view their experience as a transition, and potential benefits include using cognitive, affective, and interpersonal processing strategies, which may lead to positive psychological changes in the context of diagnosis, treatment, and survivorship.¹⁶ Tedeschi and Calhoun¹⁷ defined such a positive psychological change that results from coping with life-threatening events as posttraumatic growth (PTG). Posttraumatic growth has received increased attention in empirical research as a potential or substantial predictor of quality of life in different populations of cancer survivors.¹⁸⁻²⁰ However, mixed results from previous studies create challenges in understanding the relationship between PTG and quality of life.²⁰ While a recent study has examined PTG as a psychological health outcome in CRC patients with an ostomy,²¹ few

have focused on the relationship between PTG and quality of life in this population.

Research has highlighted the relationship between social support and PTG, suggesting that PTG facilitates the benefits of social support,²² whereas social support contributes to developing PTG.^{16,23} The interaction between social support and PTG on quality of life has been investigated in breast cancer patients¹¹ and HIV/AIDS patients,²³ indicating a relationship between social support and PTG and their independent positive effects on quality of life. However, these studies have yielded mixed results with different patterns of relationships, suggesting that further empirical investigations are required to clarify the relationship between these psychological constructs.

Because CRC patients with an ostomy must cope simultaneously with cancer treatment and stoma adjustment, PTG may play a particularly crucial role in improving patients' quality of life across the disease trajectory. To the best of our knowledge, however, research has not yet examined the specific mechanisms linking social support, PTG, and quality of life in CRC patients with an ostomy. Further, little research has examined the moderating influence of PTG on the relationship between social support and quality of life. Thus, the purpose of this study was to examine whether and how PTG influenced the relationship between quality of life and social support in CRC patients with ostomies and, particularly, to determine the moderating role of PTG in this relationship.

Conceptual Model

Our conceptual model was based on the social-cognitive processing model proposed by Tedeschi and Calhoun¹⁷ that emphasizes the importance of the context of social support in the enhancement of cognitive processing leading to PTG. Much research has indicated that PTG has a complex relationship with other psychological variables.²⁴⁻²⁶ Despite the positive relationship between social support and PTG, the mechanism of the relationship has been found to be inconsistent across contexts.^{23,24} Given this theoretical framework and existing empirical evidence, the current study examined the moderating role of PTG in the relationship between social support and quality of life of CRC patients with ostomies. Considering that social support is an essential predictor of quality of life in this population,¹⁴ the main research question focused on the potential moderating role of PTG in the relationship between social support and quality of life (Figure 1).

■ Methods

Study Design and Sampling

Using convenience sampling, 141 CRC patients with ostomies were recruited for this cross-sectional survey from the Korea Stoma Association, a nonprofit organization providing educational and instrumental support for community-dwelling patients with an ostomy. Before data collection, the study protocol was approved by the institutional review board at Chung-Ang University, with

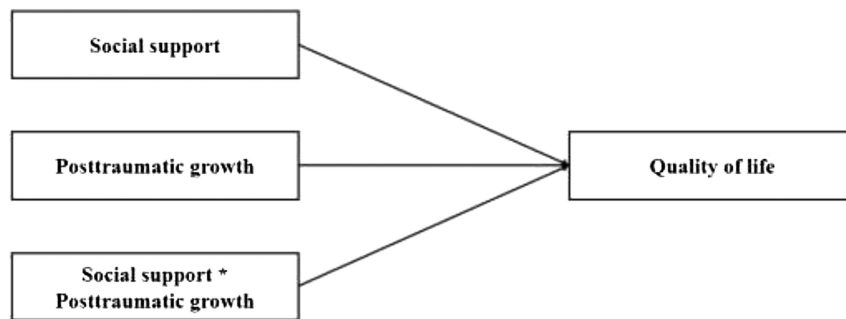


Figure 1 ■ Conceptual model of the influence of posttraumatic group and social support on the quality of life of patients with an ostomy.

which the principal investigator is affiliated (1041078-201707-HRSB-146-01). Approval was granted for online and offline advertisements to recruit participants from the Korea Stoma Association. Participants willing to participate provided their contact information to the association. After receiving a contact list with potential participants, survey packets were mailed, which included an informed consent form, questionnaires, and a postage-paid return envelope. Individuals who returned the packet received a gift card (value of US \$30) as a token of appreciation. A total of 180 survey packets were mailed in July 2017, and individuals had until December 2017 to return the survey. Of the 180 surveys, 141 participants returned the questionnaires (response rate of 77.8%). Of these, one individual was excluded because of incomplete responses, leaving 140 participants in the final analyses.

Instruments

Quality of life was assessed using the City of Hope Quality of Life–Ostomy that has been widely used in clinical studies with high reliability and validity.^{27,28} This instrument consists of three sections. The first part contains 13 questions used to assess demographic, disease, and ostomy-specific characteristics. The second section included 33 questions regarding work, health insurance, sexuality, psychological support, clothing, diet, and daily ostomy care. The third section measured ostomy-specific quality of life using 43 questions on 4 subscales: physical (11 items), psychological (13 items), social (12 items), and spiritual (7 items) well-being. All items were rated on a 10-point Likert scale from 0 (“worst quality of life”) to 10 (“best quality of life time”). Scores were calculated by dividing the sum of the item by the number of items in each subscale. The Cronbach’s α ’s for the 4 subscales ranged from .72 to .85 in the original study²⁷ and .73 to .88 in this study.

Perceived social support was assessed using the Multidimensional Scale of Perceived Social Support, which measures a participants’ perceived support from family (4 items), friends (4 items), and significant others (4 items).²⁹ Each item was rated on a 7-point Likert-type scale from 1 (“not at all”) to 7 (“always”). Scores for each subscale were calculated as the average of the scores on each scale, and the subscale averages were summed to obtain the total mean score. Possible scores ranged between 1 and 7 points for the total score and each subscale. Higher mean scores of the items on the total score and subscales indicated higher levels of social support. Cronbach’s α for the whole scale was .83 in the original study. In the current study, the Cronbach’s α

coefficients were .95 for the whole scale and ranged from .88 to .92 for the subscales.

Posttraumatic growth was measured using the Posttraumatic Growth Inventory.¹⁷ It includes 21 items on 5 subscales, including 7 items for Relating to Others, 5 items for New Possibilities, 4 items for Personal Strength, 2 items for Spiritual Change, and 3 items for Appreciation of Life on a 6-point Likert-type scale from 0 (“I did not experience this change”) to 5 (“I experienced this change to a very great degree”). The mean scores of the total scale and the subscales were calculated by dividing the sum of the items by the number of items on the total scale or the respective subscale. Higher mean scores of the items indicate higher levels of PTG. In the original study, the Cronbach’s α ’s for the total scale were .90, and for the 5 subscales, they ranged from .72 to .85.¹⁷ In this study, Cronbach’s α ’s were .96 for the whole scale and ranged from .75 to .90 for the subscales.

Statistical Analyses

Descriptive statistics were assessed for the participants’ demographic and clinical characteristics. Pearson correlation coefficients were used to examine the bivariate association between the variables. Regression-based simple moderation analysis (model 1) using PROCESS version 3.3 for SPSS³⁰ examined the moderating effect of PTG on the relationship between social support and quality of life. In moderation analysis, the mean centered products and heteroscedasticity-consistent SEs were constrained to center the predictor and moderator and to ensure homoscedasticity in the model, respectively. Unstandardized regression coefficients (B) and bias-corrected 95% confidence intervals for B were calculated using the bootstrap procedure (5000 samples). R^2 changes were also measured to determine if the interaction significantly improved the regression model. The cutoff scores of the moderator for predicting the conditional effects were -1 SD from mean, mean, and $+1$ SD from mean. The significance of simple regression lines for the conditional effects of the predictor at the cutoff values of the moderator was also determined. The simple regression lines were visually represented using simple slope analysis to interpret the moderation effect. All statistical analyses were performed using IBM SPSS Statistics version 25.0 (IBM Corp., New York, NY), with two-tailed statistical significance set at $P < .05$.

■ Results

Table 1 reports the demographic and clinical characteristics of the participants. Approximately half of the participants ($n = 64$, 45.7%) were women. Most participants had a high school education or higher ($n = 100$, 71.4%), were married ($n = 113$, 80.7%), and had undergone colostomy ($n = 107$, 76.4%). The majority ($n = 132$, 94.3%) had a permanent ostomy. The period since stoma formation varied, with a mean length of 14.7 years (SD, 10.12) and ranging from 1 to 39 years. Rated out of 10 points, the quality-of-life subscales of social (mean, 4.31; SD, 1.61) and psychological well-being (mean, 4.69; SD, 1.24) had relatively lower mean ratings, and those of physical (mean, 5.02; SD, 1.81) and spiritual well-being (mean, 5.20; SD, 1.80) had relatively higher scores. The total mean scores for social support and PTG were 4.77 (SD, 1.32) out of 7 points and 3.04 (SD, 1.02) out of 5 points, respectively (Table 2).

Furthermore, Pearson correlation coefficients between the psychosocial measures were calculated (Table 2). Social support was positively correlated to PTG ($r = 0.394$, $P < .001$), psychological ($r = 0.262$, $P = .001$), and social well-being ($r = 0.194$, $P = .026$), but not physical and spiritual well-being. Posttraumatic growth was positively correlated with psychological ($r = 0.367$, $P < .001$), Social ($r = 0.198$, $P = .039$), and spiritual well-being ($r = 0.348$, $P < .001$), but not with physical well-being.

In the regression model that was adjusted to control for sociodemographic (ie, age, gender) and clinical characteristics (ie, years since an ostomy and ostomy type), the interaction between social support and PTG was significant for psychological ($P = .006$) and social well-being ($P = .019$), whereas it was not significant for physiological and spiritual well-being (Table 3).

Simple slope analysis was used to visually represent the relationship between social support and psychological or social well-being at different levels of PTG (ie, +1 SD, -1 SD; Figure 2). The relationships between social support and both psychological and social well-being were greater at the low (ie, -1 SD) and mean level of PTG and weaker at the high (ie, +1 SD) level, suggesting that

increased PTG attenuated the effect of social support on both psychological and social well-being. Figure 2A presents the simple slopes of the relationship between social support and psychological well-being for low and mean levels of PTG, which were significant (low PTG: $P = .002$; mean PTG: $P = .002$), whereas the slope for the high level of PTG was not significant ($P = .344$). Similarly, the simple slopes of the relationship between social support and psychological well-being at low and mean levels of PTG were significant (low PTG: $P = .002$; mean PTG: $P = .013$), whereas the slope at the high level of PTG was not ($P = .382$).

■ Discussion

Colorectal cancer patients with ostomies experience the double burden of simultaneously coping with cancer treatments and stoma adjustment, and both social support and PTG may play a role in improving quality of life over the disease trajectory.^{15,31} However, little research has been conducted to examine the nature of the relationship between social support, PTG, and quality of life in CRC patients with ostomies. Thus, in this study, we examined the moderating role of PTG in the relationship between social support and quality of life. We found that social support was significantly related to psychological and social well-being, the aspects of quality of life that were identified as problematic for the study participants. The association between social support and quality of life was moderated by PTG, demonstrating that the significant positive relationship between social support and quality of life was attenuated for individuals who had greater PTG.

Ostomy formation can lead to profound impairments in patients' physical, psychological, and social functioning and ultimately contribute to poor overall quality of life.⁴ Numerous studies have reported that all domains of quality of life were significantly influenced by ostomy-related problems, with social well-being being the most strongly affected domain.^{28,32,33} Our finding indicating that social well-being was the most problematic area of quality of life is consistent with previous studies conducted in Iranian,³² Chinese,³³ Croatian,²⁸ and even Korean³⁴ CRC patients with ostomies. Similar to a 2020 study by Konjevoda and colleagues,²⁸ our results highlighted poorer outcomes for patients' psychological and social well-being compared with their physical and spiritual well-being. Similarly, Verweij and colleagues³⁵ measured quality of life in patients with ostomies using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30 (version 3.0). In their study, of six subscales of quality of life, social functioning was found to be a vulnerable quality-of-life domain, and its score was significantly compromised compared with patients without ostomies or healthy population. Unlike results reported among CRC patients with ostomies, social functioning scores have not been found to be lower than those on other subscales on the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire in breast cancer patients.³⁶ Poor psychosocial well-being in CRC patients with ostomies might be associated with ostomy-related problems, such as decreased abilities in controlling bowel functions and poor body image

 **Table 1 • Participants' Demographic and Clinical Characteristics (n = 140)**

Characteristics	Mean ± SD, Range
Age, y	68.18 ± 9.95, 41–87
Years having ostomy	14.66 (10.12), 1–39
	n (%)
Gender	
Male	76 (54.3)
Female	64 (45.7)
Education	
Less than high school	40 (28.6)
High school or higher	100 (71.4)
Marital status	
Married	113 (80.7)
Not married	27 (19.3)
Type of ostomy	
Ileostomy	33 (23.6)
Colostomy	107 (76.4)
Having permanent ostomy	132 (94.3)

Table 2 • Correlations Between Psychosocial Variables

	Correlations					Mean ± SD, Range
	1	2	3	4	5	
1. Social support	—					4.77 ± 1.32, 1–7
2. Posttraumatic growth	.394 ^a	—				3.04 ± 1.02, 0–5
3. Physical well-being	.111	.098	—			5.02 ± 1.81, 0–10
4. Psychological well-being	.262 ^a	.367 ^a	.480 ^a	—		4.69 ± 1.24, 0–10
5. Social well-being	.194 ^b	.198 ^b	.615 ^a	.683 ^a	—	4.31 ± 1.61, 0–10
6. Spiritual well-being	.122	.348 ^a	.003	.421 ^a	.178 ^b	5.20 ± 1.80, 0–10

^a*P* < .01.

^b*P* < .05.

perception, which might, in turn, disrupt psychosocial adaptation and social engagement and lead to social withdrawal and isolation.^{4,5}

Social support is a fundamental component of psychosocial adaptation for patients with ostomies and greatly influences quality of life.^{10,13,14} Social support has been identified as a critical factor for enhancing psychological adjustment, relieving the burden of living with an ostomy, and enhancing one's sense of self-efficacy for ostomy management.¹⁴ Indeed, CRC patients with poor social support experience increased difficulty adapting and adjusting to life with an ostomy and poor quality of life.^{10,13} Similar to existing research on multiple types of cancer,^{35,36} our study also found a strong association between social support and quality of life, especially in psychological and social well-being, in CRC patients with ostomies. The underlying mechanisms of

the relationship between social support and quality of life have been investigated in multiple studies with different types of cancer survivors.^{10,37–39} Malekzadeh and colleagues³⁷ found in a sample of patients with gastrointestinal cancer that social support had a buffering effect on the association between negative emotions or psychological symptoms (eg, stress, anxiety, and depression) and quality of life. Other studies have suggested the moderating or mediating role of social support in the relationship between positive psychological impact (eg, coping, adjustment, and resilience) and quality of life in patients with prostate cancer³⁸ and breast cancer.³⁹ Uchino⁴⁰ identified the factors that influence the beneficial effects of social support on patients' quality of life, suggesting that patients' psychosocial profiles might influence the acceptability of social support. Specifically, positive affect (eg, self-esteem, feelings of self-control, self-confidence, and resilience) might contribute

Table 3 • The Moderating Effects of Posttraumatic Growth on the Association Between Social Support and Quality of Life

	<i>B</i>	<i>SE</i>	<i>t</i>	<i>P</i>	95% CI (Lower–Upper)	ΔR^2	<i>P</i>
Physical well-being							
Social support	0.109	0.142	0.767	.445	–0.173, 0.390		
PTG	0.027	0.109	0.244	.808	–0.189, 0.242		
Social support × PTG	–0.005	0.006	–0.860	.392	–0.016, 0.006	.007	.392
Psychological well-being							
Social support	0.346	0.106	3.263	.015	0.136, 0.556		
PTG	0.172	0.081	2.111	.037	0.010, 0.333		
Social support × PTG	–0.009	0.004	–2.258	.026	–0.017, –0.001	.038	.026
Low PTG	0.510	0.141	3.629	<	.001		
0.232, 0.789							
Moderate PTG	0.339	0.105	3.213	.002	0.130, 0.548		
High PTG	0.186	0.115	1.625	.107	–0.041, 0.413		
Social well-being							
Social support	0.317	0.025	2.527	.013	0.068, 0.565		
PTG	0.026	0.100	0.259	.796	–0.172, 0.224		
Social support × PTG	–0.012	0.004	–2.825	.006	–0.021, –0.004	.063	.006
Low PTG	0.541	0.163	3.311	.001	0.217, 0.865		
Moderate PTG	0.308	0.125	2.470	.015	0.061, 0.555		
High PTG	0.093	0.132	0.705	.483	–0.168, 0.353		
Spiritual well-being							
Social support	0.030	0.077	0.392	.696	–0.123, 0.184		
PTG	0.173	0.060	2.902	.005	0.055, 0.290		
Social support × PTG	–0.005	0.003	–1.682	.095	–0.010, 0.001	.022	.095

Abbreviations: *B*, unstandardized regression coefficient; CI, confidence interval; PTG, posttraumatic growth.

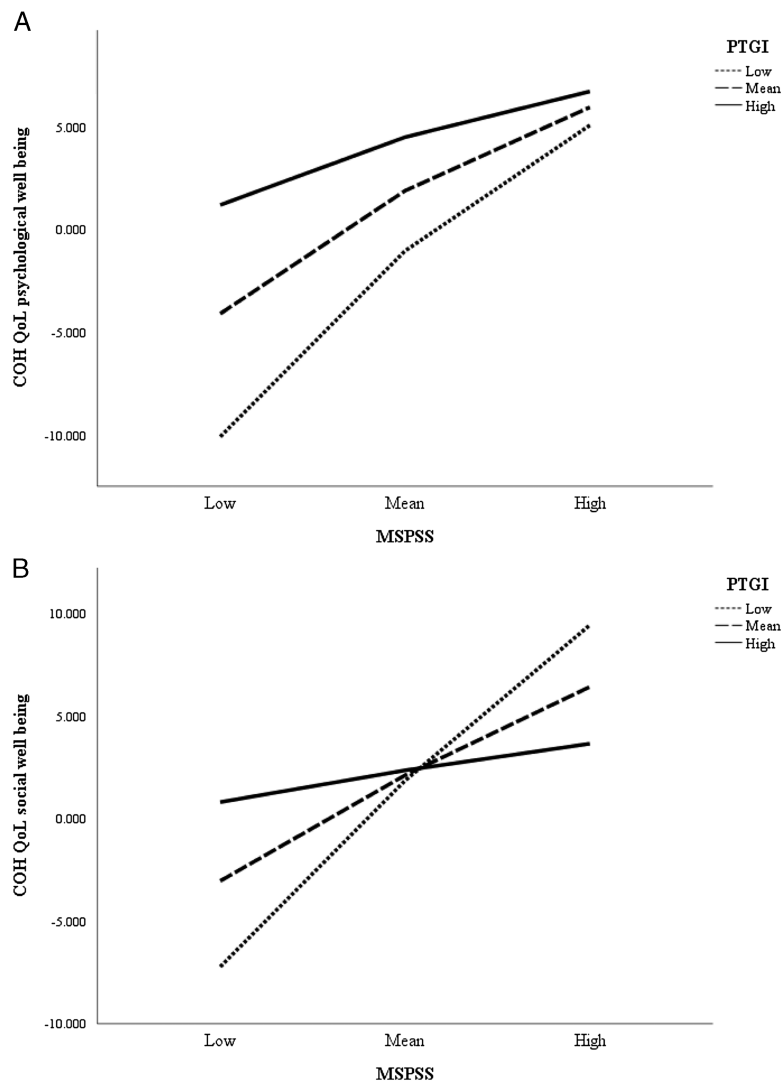


Figure 2 ■ Moderating effect of posttraumatic growth on the relationship between perceived social support and quality of life in colorectal cancer patients with an ostomy. Abbreviations: COH QoL, City of Hope Quality of Life; MSPSS, Multidimensional Scale of Perceived Social Support; PTGI, Posttraumatic Growth Index. A, Moderating effect of PTG on the relationship between perceived social support and psychological well-being (low PTG: $P = .002$; mean PTG: $P = .002$; high PTG: $P = .344$). B, Moderating effect of PTG on the relationship between perceived social support and psychological well-being (low PTG: $P = .002$; mean PTG: $P = .013$; high PTG: $P = .382$); MSPSS and PTGI levels were determined at -1 SD from the mean (low), mean, and $+1$ SD from the mean (high).

to facilitating the attitude and ability to receive social support, whereas negative affect (eg, neuroticism) might impede receiving social support.⁴⁰

We hypothesized that PTG would moderate the relationship between social support and quality of life. Our results demonstrated that PTG did significantly moderate the relationship between social support and 2 domains of quality of life (ie, psychological and social well-being) in our sample of CRC patients with ostomies. Specifically, the strength of the relationship between social support and quality of life was stronger at low and mean levels of PTG, whereas the relationship became nonsignificant for those with high levels of PTG. Few studies have examined the relationship between these three variables; however, the moderating role of PTG in the relationships between psychosocial variables has been previously reported. Siqveland and colleagues⁴¹ examined

the moderating role of PTG in the relationship between negative psychological factors, such as posttraumatic stress and depression, and quality of life in disaster survivors. In that study, PTG was not directly related to quality of life but moderated the influence of both posttraumatic stress and depression on quality of life. The study revealed that PTG attenuated the relationship between posttraumatic stress and quality of life, suggesting PTG functions as an adaptive coping response after a disaster. Similarly, research has explored the moderating role of PTG in the relationship between posttraumatic stress symptoms and adjustment and affective reactions in digestive system cancer survivors and found that PTG strengthened the constructive process by buffering the effects of posttraumatic stress symptoms on adjustment and affective reactions.⁴² Rzesutek⁴³ examined the relationship between social support, PTG, and psychological well-being in a sample

of individuals with HIV. Social support moderated the positive relationship between PTG and psychological well-being in this sample.⁴³ Different from that study, we reported that PTG moderated the relationship between social support and quality of life, particularly for psychological and social well-being.

Our study contributes new findings to the literature regarding the dynamics of psychological factors, demonstrating that social support is more strongly related to psychological and social well-being when PTG is lower. Ostomy formation represents a traumatic experience and is associated with changes in the availability of resources that help with adjustment to stressful life events⁴⁴ and requires mobilization of social support (ie, individual and social resources) and coping mechanisms to overcome threats to one's sense of well-being and quality of life.⁴⁵ Previous research has demonstrated that social support may help CRC patients with ostomies cope with ostomy-related psychological stress and promote their adaptation to and reestablishment of daily living patterns.²⁷ Considering the role of social support in promoting PTG and enhancing quality of life,⁴³ this study's findings highlighted that social support is particularly critical for improving quality of life among CRC patients with ostomies who report low levels of PTG.

In practice, the need for social support for a better quality of life appears to be greater for those with low levels of PTG compared with those with high levels of PTG. Posttraumatic growth has been found to facilitate the development of social relationships by improving attitudes toward others when receiving social support as well as patients' social support-seeking efforts.³ Thus, social support interventions might provide a synergistic effect in the provision of social support and development of PTG, which reciprocally facilitates psychological and social well-being in patients with low PTG. Further, social support interventions might be efficient and effective in those with lower PTG who have an increased need for social support and who may be struggling with ostomy-related burdens and coping challenges. Supportive intervention programs could be effective in providing opportunities for patients to express negative emotions and thoughts and to recognize positive feelings and benefits, which could enhance psychological growth and quality of life. These benefits may be especially critical for those with low levels of PTG because PTG is strongly associated with negative emotions, which may lead to rejecting social support and withdrawing from social networks and support systems.⁴⁴

Limitations

This study has some limitations that may influence the generalizability of the findings. In particular, this cross-sectional study with a small sample size and limited variables does not enable inferences about causality and generalizability. The first limitation is its use of convenience sampling: the study participants were recruited from a stoma support group, which provides patients various forms of social support such as informational and instrumental support and social networks. Factors related to the qualitative aspect of support group engagement might have influenced the psychosocial outcomes. Participants' level of active engagement in the group, the extent to which they actually received social

support, what kind of support they received, and their level of satisfaction with support from the group represent some qualitative aspects of social support. A second limitation was a lack of information regarding social support. Because we did not include questions on the amount and types of perceived social support being received by the participants and their satisfaction with this social support, we could not identify sample-specific characteristics that could influence the participants' social support, PTG, and quality of life. The inclusion of extensive information regarding the aforementioned aspects of social support would be beneficial in determining the specific social support needs in relation to PTG and quality of life and other psychosocial outcomes. Such data might contribute to the development of acceptable and personalized approaches for effective social support utilization to improve the quality of life of patients with ostomies. Considering the close relationship between psychosocial outcomes and the clinical and sociocultural contexts, additional research that includes a diverse sample of CRC patients at different stages of illness and from varied sociocultural backgrounds is necessary to establish the strength of the association among social support, PTG, and quality of life.

Third, the amount of time needed for the development of PTG following traumatic experiences varies across studies.¹⁶ As PTG within a disease trajectory typically increases over time, we included the number of years since an ostomy as a covariate when estimating the effect of PTG on quality of life. In this study, the participants had a wide range of years since an ostomy (from 1 to 39 years), but this covariate was not found to influence the results. This finding might be due to the large variation among the participants' number of years since an ostomy. The association between PTG and length of time since an ostomy is inconclusive in previous studies.¹⁶ Thus, further empirical studies using large samples and longitudinal, prospective designs are necessary to provide information on the developmental progression of PTG over the disease course for CRC patients with ostomies.

Despite these limitations, this study is significant in that it provides evidence of the predictive influence of PTG on changes in psychological and social well-being and confirms the role of PTG in buffering the effects of social support. Posttraumatic growth could be considered a useful indicator for identifying those needing social support provisions to improve their quality of life. Based on our study results, randomized controlled trials that test for the effects of social support interventions are needed to determine the causality of the association between social support, PTG, and quality of life in CRC patients with an ostomy. We would like to consider specific indicators for social support in terms of both perceived and received social support, the subtypes of social support, and social networks, which would expand our understanding of the conditional effect of social support on quality of life in different contexts.

Conclusions

The study is the first to provide evidence on the moderating role of PTG in the relationship between social support and quality of life in CRC patients with an ostomy. The findings have practical

relevance for healthcare providers working with CRC patients having ostomies and indicate that changes in psychological and social well-being in response to social support vary by PTG level. Social support could represent a method of improving psychological and social well-being, particularly for individuals with low levels of PTG. Thus, increasing the availability of social support services could serve as a quality-of-life intervention for CRC patients with an ostomy.

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