Effects of Social Support Source and Effectiveness on Stress Buffering After Stem Cell Transplant

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Abstract

Background This study used the social support effectiveness framework to examine whether effective social support buffered the relationship between stressful life events and distress among hematopoietic stem cell transplant (HSCT) survivors and whether that buffering effect depended on the type of caregiver who provided it (partner versus non-partner caregivers).

Methods A total of 275 HSCT survivors completed measures of the effectiveness of their caregiver's support—*social support effectiveness* (SSE)—distress, and stressful life events. Hierarchical linear regression was used to analyze a three-way interaction between stressful life events, caregiver SSE, and caregiver type on distress.

Results After controlling for covariates, the three-way interaction of stressful life events, caregiver SSE, and caregiver type was significant ($b = -0.21$, SE $= 0.00$, $p < 0.001$). Among partnered survivors, more stressful life events were associated with greater distress ($B = 0.03$, SE $= 0.01$, $p = 0.045$) when caregiver SSE was low. There was no association between stressful life events and distress when caregiver SSE was average ($B = 0.01$, SE $= 0.01$, $p = 0.50$) or high ($B = -0.01$, SE $= 0.02$, $p = 0.61$). Among non-partnered survivors, there was a positive association between stressful life events and distress regardless of caregiver SSE.

Conclusions Average or highly effective caregiver support buffered effects of stressful life events on distress among partnered survivors. There was no evidence that support at any level of effectiveness buffered stressful life events among non-partnered survivors. Findings highlight the importance of measuring social support effectiveness and source of support among HSCT survivors.

Keywords Social support · Stem cell transplant · Stress buffering · Cancer survivor

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Introduction

For decades, the potential for social support to mitigate or "buffer" effects of acute or chronic psychosocial stressors has been a topic of research and clinical interest [1–3]. Stress buffering refers to the idea that when an individual appraises a situation as threatening and lacks appropriate coping mechanisms, social support can buffer adverse effects (e.g., negative affect, elevated physiological response) of that stress appraisal. Social support acts as a buffer by causing the individual to reappraise the situation as less threatening or by reducing or eliminating the reaction to that stress appraisal [1]. When stressful life events or stressors create practical and emotional demands that individuals cannot adequately address on their own (i.e., the stressors exceed their perceived ability to cope) [4], individuals are "buffered" by the coping resources and emotional sustenance provided by social support [3, 5]. In contrast, individuals who do not have these resources are at elevated risk for adverse effects of stressors such as psychiatric distress, anxiety, or depression.

Research on whether social support buffers stress (e.g., stressful life events, such as job loss or natural disaster) often examines either perceived support (i.e., perceptions that support is available if needed) or enacted support (social network members' attempts to provide emotional, informational, and instrumental support) [6–8]. The majority of these studies found that greater perceived support buffered negative psychological and physical outcomes among individuals experiencing greater stress [1, 9–12]. In contrast, the stress buffering effects of enacted support are varied. Although some show evidence that enacted support buffers stress [13], others found no evidence of stress buffering [14–17] and some studies even have shown a stronger association between stressful life events and negative psychological outcomes among people reporting more enacted support [18]. Moreover, interventions designed to increase enacted support often demonstrate little benefit [19].

In sum, research consistently demonstrates perceived support buffers against stress but fails to demonstrate consistent findings with regard to enacted support. The lack of consistent findings with regard to enacted support has been attributed to methodological issues, such as the use of cross-sectional designs that fail to account for the fact that stress may trigger mobilization of greater support [20], as well as issues in conceptualizing enacted support. Although enacted social support can be expected to reduce the adverse effects of a stressor by providing resources that promote better coping [5], it can also cause negative unintended effects such as a sense of dependency, guilt, or indebtedness, reducing its potential to buffer stress or even exacerbating adverse effects of stress [18, 21, 22]. This complexity has led to a pressing need for theoretically grounded research to determine whether, how, and under what circumstances enacted support acts as a stress buffer.

The social support effectiveness (SSE) framework [22] is one theoretical framework that may help explain these inconsistent findings on stress buffering effects of enacted support [23]. The SSE framework proposes that stress buffering is most likely when enacted support is effective—that is, when it provides recipients with the emotional, informational, and practical resources they need to address stressor-related demands. It defines effective support as emotional, informational, and instrumental support that approximates the amount and type of support a recipient needs and that is not difficult to obtain, is skillfully delivered, and has few or no negative effects on the recipient's self-concept [23]. Rather than expecting a specific stressor universally to elicit the need for a specific type of support [24], the framework recognizes that recipients' needs are highly individualized; the same stressor may elicit very different needs in different recipients (e.g., because of their dispositional characteristics, existing resources, or social context). As such, support recipients (rather than providers or observers such as researchers) are in the best position to judge whether the support they have received is effective, as defined by the SSE framework.

Research explicitly examining the effectiveness of support—which is not typically measured in studies—may help explain inconsistent findings on stress buffering effects of enacted support. This possibility is consistent with the observation that unidentified moderators account for the heterogenous findings on buffering effects of enacted social support [5]. The SSE framework would suggest that social support interventions should focus not on increasing the quantity of support individuals get during times of adversity, but rather on helping support recipients understand and communicate about support-related needs in a way that promotes effective support interactions. Interventions to enhance the effectiveness of support would also involve teaching support providers skills to deliver effective social support rather than increasing the amount of support they deliver.

The SSE framework has received empirical support in several populations. Two studies examined the effectiveness of partner support in pregnant women [25, 26]. First, a longitudinal study revealed that women who appraised support from their partner as being more effective demonstrated a decrease in prenatal anxiety from mid- to late pregnancy [25]. The second study examined the effectiveness of partner support in 82 pregnant women who, once in each trimester of pregnancy, reported distress over two consecutive days using ecological momentary assessment and provided saliva samples for diurnal salivary cortisol assessments [26]. Women who reported receiving more effective partner support showed a smaller association between distress and cortisol levels compared to women who reported receiving less effective partner support.

Two reports from the same sample examined the effectiveness of partner support in cancer survivors treated with hematopoietic stem cell transplant (HSCT) [27, 28]. One examined the effectiveness of partner support, quantity of support received from the partner, and survivor distress. Survivors who received less effective partner support (i.e., it was a relatively poor fit for their support needs) reported greater distress when they received a greater quantity of that support [27]. This finding may help explain why receiving support has sometimes been found to exacerbate adverse effects of a stressor. The second study examined associations between linguistic patterns found in narratives that HSCT survivors wrote to describe their transplant and the effectiveness of support they received from their main caregiver [28]. Findings indicated that HSCT survivors who received more effective emotional support from the caregiver used fewer negative emotion words in survivors' narratives describing their transplant experience.

Overview of the Present Study

The present study evaluated whether effective social support buffers adverse effects of stressful life events on psychiatric distress among HSCT survivors who were 9 months to 3 years

post-transplant. Stem cell transplant is a potentially lifesaving but often risky treatment for malignant and non-malignant conditions. A substantial number of patients experience serious, long-lasting medical complications [29, 30], and stressful life events such as financial strain and disruptions in work and other roles [31]. This high burden of stressful life events contributes to psychiatric distress found in many transplant survivors [32]. HSCT survivors sometimes report inadequate or unhelpful support from those in their intimate social network [31, 33]. We hypothesized that the effectiveness of social support would moderate the association between post-transplant stressful life events and survivors' psychiatric distress. Because HSCT survivors are highly dependent on caregivers during their treatment and recovery, we focused on support from a caregiver. In the case of married or partnered transplant survivors, the caregiver is usually the partner [34], and in the case of non-partnered survivors, the caregiver is usually a family member or friend. Consequently, we explored whether buffering would depend on whether the caregiver was a partner or not.

Methods

Participants and Procedures

The sample included 275 HSCT survivors participating in the baseline assessment for a trial evaluating a psychosocial intervention for survivors with at least some psychiatric distress and/or survivorship difficulties [28, 35]. Participants were identified through patient databases at Mount Sinai Medical Center in New York and Hackensack University Medical Center in New Jersey. They were mailed materials describing the study and called by a trained staff member for recruitment. Potential participants were also identified through advertisements in newsletters, and on the Internet, through mailings coordinated with advocacy organizations, and in newspapers. All potential trial participants completed a telephone screening interview to identify those who had undergone transplant 9 months to 3 years prior to assessment; were ≥ 18 years old; English speaking; alive with their disease or free of disease after successful transplant; not awaiting an additional transplant. To ensure they were not experiencing psychosis, suicidal ideation, current substance use, or cognitive impairment, participants were screened ineligible if they reported any of the following: endorsement of any item on the "Psychotic Symptoms" module of the Structured Clinical Interview for DSM-IV-TR [36], any endorsement of one item from the Brief Symptom Inventory assessing suicidal ideation ("Thoughts of Ending Your Life") [37], endorsement of one or more items on the four-item Rapid Alcohol Problems Screen [38] or the Two-Item Conjoint Screening [39]; or, two or more errors on the abbreviated 6-item Mini-Mental State [40]. They also had

to have at least some distress or survivorship difficulties (determined in reference to published cutoffs for at least mild symptoms or findings in relevant populations) according to in one or more of the following domains: cancer-specific distress [41]; generalized distress, depressive symptoms, or anxiety [37]; health-related quality of life [42, 43]; and sense of purpose in life [44]. Eligible and consenting participants completed a baseline assessment that included a mailed questionnaire and telephone interview. Data for the present report were obtained in this baseline assessment, prior to beginning the psychosocial intervention. Participants received a $20 gift card or a pair of movie tickets for screening and a $20 gift card for the baseline assessment. Informed consent was obtained from all individual participants included in the study. All study procedures were approved by the institutional review boards at both study sites and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Survivors who were eligible for the trial and who had completed at least half of the trial's baseline assessment ($n = 302$) were included in the present sample. To avoid confounding stressful life events and caregiver SSE, partnered survivors were excluded from this sample if they reported a life event that indicated problems in their relationship with their partner ($n = 17$) or a partner's death or serious illness ($n = 10$), leaving a total of 275 survivors in the final sample. We compared survivors in the final sample to those excluded on the following demographic variables: age, education, income, and race. Compared to survivors in the final sample, those excluded ($n = 27$) were more likely to have lower income (Ms in the range of $50,000–65,000 vs. $65,000–80,000; $p = 0.00$). Survivors in the final sample did not differ on age ($p = 0.81$), education ($p = 0.43$), or race ($p = 0.53$).

Measures

Caregiver SSE was assessed with the 25-item Social Support Effectiveness–Questionnaire [23], which assesses recipients' appraisals of the effectiveness of support received from a specified support provider. The first 15 items assessed the effectiveness of three functional types of support: emotional, informational, and instrumental. For each type of support, participants read a brief description of the type of support being considered, then responded to questions that assess: (1) how well the quantity of the support matched the amount they needed (0 = *very poor* to 4 = *excellent*); (2) the extent to which the participant wished the support had been different somehow (0 = *not at all* to 4 = *extremely*); (3) the extent to which the support was perceived to have been provided skillfully (0 = *not at all* to 4 = *extremely*); (4) how difficult it was to get (0 = *never* to 4 = *always*); and (5) whether the caregiver ever offered the support without being asked (0 = *never* to 4 = *always*). The final 10 items assessed unintended negative

byproducts of receiving support (e.g., feelings of guilt or indebtedness; $0 = no$ $1 = yes$, *occasionally* and $2 = yes$, *more than occasionally*). Instructions asked participants to respond based on support provided in the prior 3 months in order to assess the effectiveness of support as a relatively stable characteristic of support in a given relationship. Additionally, participants who were cohabiting with a spouse or partner (in a married or in a marriage-like relationship) rated support from their spouse or partner. Otherwise, they were asked to rate support for the person they turned to the most for support for their transplant. The measure has been shown to have good validity and internal reliability in past research (Cronbach's alpha = 0.95) [27]. Its subscales have been found to be highly intercorrelated, and thus, responses are usually scored to create a single total score for the scale [28]. Accordingly, in this study, responses were reverse-coded, as appropriate, and summed to obtain a caregiver SSE score that ranged from 0 to 80, with higher scores indicating more effective support (Cronbach's alpha = 0.92).

Stressful life events were assessed with the life experiences survey [45]. This self-report measure lists 47 potentially stressful life events. Survivors reported which events they experienced in the prior 6 months. Consistent with prior research [46], a stressful life event score was created by summing the number of events rated by each survivor as having had a negative impact.

Psychiatric distress was assessed with the 53-item Brief Symptom Inventory (BSI) [37], which includes symptoms of depression, anxiety, somatization, hostility, paranoid ideation, interpersonal sensitivity, obsession-compulsion, psychoticism, and phobic anxiety. Participants rated the extent to which each symptom caused discomfort in the prior month on a scale from $0 = not$ at all to $5 = extremely$. Psychiatric distress was indexed by the BSI Global Severity Index (GSI), which is the mean of all 53 items (Cronbach's $\alpha = 0.94$).

Sociodemographic characteristics were self-reported and included participant age, sex, partner status (coded $1 = married$ or in a $marriage$-$like$ $partnered$ $relationship$, $0 = other$), annual household income ($1 = less$ $than$ $\$20,000$; $2 = \$20,000$-$\$34,999$; $3 = \$35,000$-$\$50,000$; $4 = \$50,000$-$\$65,000$; $5 = \$65,00$-$\$80,000$; $6 = \$80,000$-$\$95,000$; $7 = \$80,000$-$\$95,000$; $8 = over$ $\$110,000$), education ($1 = high$ $school$ or $less$; $2 = some$ $college$ or $trade$ $school$; $3 = 4$-$year$ $college$ $degree$, $4 = graduate$ $degree$), and race/ethnicity ($1 = non$-$Hispanic$ $White$, $0 = other$).

Medical characteristics were abstracted from medical records (information about the diagnosis, transplant, and complications) or self-reported (comorbidity data) and included diagnosis, type of transplant ($1 = allogeneic$, $0 = autologous$), number of serious transplant-related complications (not counting GvHD; e.g., infections, mucositis), number of medical comorbidities (e.g., high blood pressure, heart disease), and type of cancer.

Statistical Analyses

First, descriptive statistics were computed. Missing cases ranged from 2 to 7% on age, income, stressful life events, and social support effectiveness variables. Little's MCAR test was nonsignificant (Chi-square = 21.99, $df = 26$, $p = 0.69$), indicating that data was missing at random. Therefore, we used expectation maximization technique to impute missing values. Expectation maximization generates estimated values of missing items from available data using an iterative process [47]. We then examined variables for potential outliers. Univariate analyses were used to examine the distributional properties of study measures. Our outcome variable, psychiatric distress, was approximately normally distributed with a skewness of 1.65 and a kurtosis of 3.60. Any sociodemographic or medical variables significantly associated with psychiatric distress in bivariate analysis were entered as covariates in the primary analysis. Hierarchical multiple regression was conducted in which psychiatric distress was regressed on covariates (including partner status, which determined whether participants reported the effectiveness of support from a partner or non-partner caregiver) (step 1); stressful life events and caregiver SSE (step 2); all two-way interactions involving partner status, stressful life events, and caregiver SSE (step 3); and the three-way interaction (step 4). To maximize power, covariates were retained in the model only if they were associated with psychiatric distress at $p < 0.25$. Continuous variables were mean-centered, and interaction terms involving continuous variables were calculated with mean-centered variables to reduce multicollinearity and enhance interpretability of findings.

Results

Participant Characteristics

Descriptive statistics for the sample are shown in Table 1. Most participants were non-Hispanic White, had completed a 4-year college education, were partnered, and their median annual household income fell in the range of $80,000 to $95,000. Survivors without a partner most frequently reported their main source of support as friends ($n = 14$), siblings ($n = 11$), or children ($n = 9$). Slightly more than half the participants had an autologous transplant (using their own stem cells rather than a donor's stem cell, as used for allogeneic transplants).

As shown in Table 2, the average psychiatric distress score was relatively low and did not differ for partnered survivors and non-partnered survivors. Participants reported an average of just over two stressful life events in the past 6 months. The most commonly reported stressful life events were change in employment ($n = 73$), financial changes ($n = 94$), and personal illness (other than cancer) or injury ($n = 69$). Non-partnered survivors reported more stressful life events than partnered

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Table 1 Sample descriptive statistics (n = 275)

Variable	Partnered (n = 204)		Unpartnered (n = 71)		p value	Total (n = 275)	
	n	%	n	%		n	%
Sex							
Female	102	(50%)	52	(73%)	p = 0.01	154	(56%)
Male	102	(50%)	19	(27%)		121	(44%)
Age[a] *mean (sd)*	54.87	(11.30)	51.86	(14.16)	p = 0.12	54.11	(12.13)
Education[b]							
High school or less	20	(10%)	11	(15%)	p = 0.29	31	(11%)
Some college or trade school	40	(20%)	18	(25%)		58	(21%)
4-year college	70	(35%)	25	(35%)		95	(35%)
Graduate degree	73	(36%)	17	(24%)		90	(33%)
Race/ethnicity							
Non-Hispanic White	176	(86%)	56	(79%)	p = 0.14	232	(84%)
Other race/ethnicity	28	(14%)	15	(21%)		43	(16%)
Annual income[c]							
Less than $20,000	7	(3%)	16	(23%)	p = 0.00	23	(8%)
$20,00–$50,000	21	(10%)	23	(32%)		44	(16%)
$50,000–$80,000	41	(20%)	11	(15%)		52	(19%)
$80,000–$110,000	43	(21%)	8	(11%)		51	(19%)
Over $110,000	79	(39%)	6	(8%)		85	(31%)
Type of transplant							
Autologous	111	(54%)	38	(54%)	p = 0.90	149	(54%)
Allogeneic	93	(46%)	33	(46%)		126	(46%)
Number of transplant complications *mean (sd)*	2.48	(1.66)	2.82	(1.73)	p = 0.15	2.57	(1.68)
Number of medical comorbidities *mean (sd)*	1.20	(1.18)	1.45	(1.32)	p = 0.13	1.26	(1.22)
SSE *mean (sd)*	58.61	(13.34)	59.72	(13.54)	p = 0.55	58.90	(13.37)
Psychiatric distress *mean (sd)*	0.54	(0.41)	0.67	(0.55)	p = 0.08	0.58	(0.45)
Stressful life events *mean (sd)*	2.08	(2.37)	3.32	(3.29)	p = 0.00	2.40	(2.68)

[a] Five observations missing

[b] One observation missing

[c] Twenty observations missing

Table 2 Correlations among study variables (n = 275)

Variables	1	2	3	4	5	6	7	8	9	Mean	SD
1. Distress	–	0.37**	− 0.24**	− 0.15**	0.24*	0.32**	0.12*	− 0.12*	− 0.19**	0.58	(0.45)
2. Stressful life events	–	–	− 0.22**	− 0.13*	0.14*	0.17*	0.13*	− 0.20*	− 0.20**	2.40	(2.68)
3. Social support effectiveness	–	–	–	0.05	− 0.09	− 0.09	0.00	− 0.04	0.08	58.90	(13.37)
4. Age	–	–	–	–	− 0.11	0.27**	− 0.17**	0.11	0.09	54.04	(12.03)
5. No. of complications	–	–	–	–	–	0.17**	0.21**	− 0.09	− 0.14*	2.57	(1.68)
6. No of comorbidities	–	–	–	–	–	–	− 0.02	− 0.09	− 0.20**	1.26	(1.22)
7. Allogenic vs. autologous transplant	–	–	–	–	–	–	–	− 0.01	0.02	–	–
8. Partnered	–	–	–	–	–	–	–	–	0.48**	–	–
9. Income	–	–	–	–	–	–	–	–	–	–	–

*p < 0.05, **p < 0.01

survivors. Average caregiver SSE was moderately high and did not differ for partnered and non-partnered survivors.

Predictors of Psychiatric Distress

As shown in Table 2, the following variables were associated with psychiatric distress in bivariate analyses: age ($r = -0.15$, $p < 0.01$), number of transplant-related complications ($r = 0.24$, $p < 0.05$), number of medical comorbidities ($r = 0.32$, $p < 0.01$), and allogeneic (vs. autologous) transplant (point biserial $r = 0.12$, $p < 0.05$), and income ($r = -0.19$, $p = <0.01$).

After controlling for covariates and partner status in step 1, step 2 estimates showed main effects of both stressful life events ($b = 0.24$, SE: 0.01, $p < 0.01$) and caregiver SSE ($b = -0.14$, SE: 0.00, $p < 0.01$) (see Table 3). Step 3 yielded a significant two-way interaction between stressful life events and partner status ($b = -0.28$, SE: 0.02, $p < 0.01$), but no other significant two-way interactions. Step 4 revealed a significant three-way interaction of stressful life events, caregiver SSE, and partner status ($b = -0.21$, SE: 0.00, $p < 0.05$).

We used the Process macro [48] to probe the three-way interaction, evaluating whether the interaction between caregiver SSE and stressful life events differed as a function of partner status. For participants with and without partners, we examined the conditional effects of stressful life events on psychiatric distress when caregiver SSE was one standard deviation below the mean (low), at the mean (average), and one standard

deviation above the mean (high). As shown in Fig. 1, among partnered survivors who reported low SSE, greater stressful life events in the prior 6 months were positively associated with psychiatric distress ($B = 0.03$, SE = 0.01, $p = 0.045$). Partnered survivors had no association between stressful life events and psychiatric distress when partner support was of average effectiveness ($B = 0.01$, SE = 0.01, $p = 0.50$) or high effectiveness ($B = -0.01$, SE = 0.02, $p = 0.61$).

Among non-partnered survivors, stressful life events were positively associated with psychiatric distress when support was of low effectiveness ($B = 0.06$, SE = 0.02, $p = 0.01$), average effectiveness ($B = 0.08$, SE = 0.01, $p = 0.00$), or high effectiveness ($B = 0.10$, SE = 0.02, $p = 0.00$).

Discussion

This study examined whether the effectiveness of caregiver enacted support influenced whether that support buffered adverse effects of recent stressful life events on psychiatric distress among HSCT survivors. We also explored whether those stress buffering effects depended on whether the support was provided by a partner or non-partner. In our study, we found that support that was of average or high effectiveness buffered the effects of stressful life events on psychiatric distress in partnered survivors. There was no evidence that support at any level of effectiveness buffered against stressful life events in non-partnered survivors.

Table 3 Multiple regression analysis predicting survivor distress ($n = 275$)

	Step 1 b	(SE)	Step 2 b	(SE)	Step 3 b	(SE)	Step 4 b	(SE)
Intercept	–	–	–	–	–	–	–	–
Participant age	− 0.20*	(0.00)	− 0.16*	(0.00)	− 0.17*	(0.00)	− 0.17*	(0.00)
Income	− 0.07	(0.01)	− 0.04	(0.01)	− 0.05	(0.01)	− 0.05	(0.01)
Complications	0.13*	(0.02)	0.11*	(0.02)	0.10	(0.02)	0.10	(0.02)
Comorbidities	0.33**	(0.02)	0.28**	(0.02)	0.26**	(0.02)	0.26**	(0.02)
Allogeneic transplant	0.07	(0.05)	0.05	(0.05)	0.05	(0.05)	0.05	(0.05)
Partnered	− 0.03	(0.06)	− 0.01	(0.06)	0.02	(0.06)	− 0.00	(0.06)
Life event stress	–	–	0.24**	(0.01)	0.45**	(0.02)	0.47**	(0.02)
Social support effectiveness	–	–	− 0.14**	(0.00)	− 0.01	(0.00)	− 0.08	(0.00)
LES*SSE	–	–	–	–	− 0.01	(0.00)	− 0.15	(0.00)
LES*partnered	–	–	–	–	− 0.28*	(0.02)	− 0.32*	(0.02)
Partnered*SSE	–	–	–	–	− 0.17	(0.00)	− 0.11	(0.00)
LES*SSE*partnered	–	–	–	–	–	–	− 0.21*	(0.00)
F for step	10.46**		15.31**		3.69*		5.94*	
R^2 for step	0.19		0.08		0.03		0.02	
F for full model							10.19**	
R^2 for full model							0.28	

*$p < 0.05$, ** $p < 0.01$

b standardized regression coefficient, *LES* life event stress,
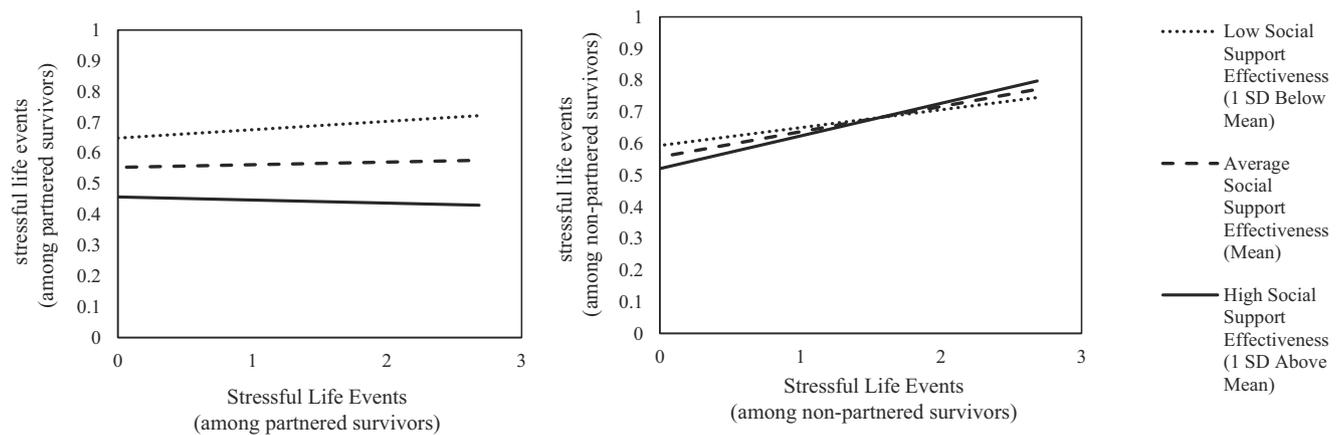
SSE social support effectiveness

Fig. 1 A plot of the conditional effects of stressful life events on distress when caregiver SSE was low (one standard deviation below the mean), average (at the mean), and high (one standard deviation above the mean) for partners (left) and non-partners (right). For partnered survivors who rated the support they received as low, the association between stressful life events and distress was significant ($B = 0.03$, SE $= 0.01$, $p = 0.045$). For partnered survivors who rated the support they received as average, the association between stressful life events and distress was no longer significant ($B = 0.01$, SE $= 0.01$, $p = 0.50$). For partnered survivors who rated the support they received as high, the association between stressful life events and distress was not significant ($B = -0.01$, SE $= 0.02$, $p = 0.61$). For those without a partner, the association between stressful life events and distress remained significant when they rated their caregiver's social support effectiveness as low ($B = 0.06$, SE $= 0.02$, $p = 0.01$), average ($B = 0.08$, SE $= 0.01$, $p = 0.00$), or high ($B = 0.10$, SE $= 0.02$, $p = 0.00$). $B =$ unstandardized regression coefficient

Thus, our hypothesis was supported for partnered survivors but not for non-partnered survivors, for whom caregivers are usually family members or friends.

Findings in the present study extend our prior work by showing that effective social support as advanced by the SSE framework [23] is capable of acting as a stress buffer against stressful life events in the partnered sample of HSCT survivors. As a measure of enacted support, social support effectiveness could provide a potential new understanding of why enacted support has not consistently been found to buffer adverse effects of stress. Studies that found null stress buffering effects or that enacted support exacerbated adverse effects of stress [9, 13, 15, 49–51] used measures that implicitly assume that receiving a greater quantity of support is better than receiving a lower quantity of support. This exploratory study has shown that the effectiveness of support is an important contributor of its potential to buffer psychiatric distress among partnered survivors in our sample [27]. These findings are consistent with relationship science research on perceived partner responsiveness, which asserts that people's health and well-being are enhanced when they perceive that their partner responds to their needs in a way that allows them to feel understood, validated, and cared for [52]. Receiving effective social support from a partner may elicit these perceptions. Our approach may also be consistent with social support research guided by optimal matching theory [24, 53], although we believe that assessing recipients' appraisals of support effectiveness is more precise than estimating the extent to which received support matches the needs likely to be elicited by characteristics of a stressor, as determined by researchers (e.g., extent of cancer-related physical disability in cancer patients versus survivors [54]). This is because individual

recipients' support needs can be expected to differ even when they are facing the same or a similar stressor [23].

We found no evidence that effective social support buffered against stressful life events among non-partnered survivors—that is, among transplant survivors without a spouse or partner who relied on caregiving from a family member or friend. One potential explanation for this finding is that relationship characteristics such as mutual influence, interdependence, and responsiveness are generally higher in romantic relationships compared to family and friend relationships [52, 55]. In addition, Thoits discusses how the effectiveness of support transactions can depend on their source [5]. She distinguishes between primary group members, characterized by high emotional connectedness and commitment, and other support providers, arguing that the level of intimacy, commitment, and normative expectations in relationships with these different types of providers can affect how the support they provide successfully buffers against psychiatric distress. Likewise, a partner's intimate relationship with the transplant survivor, compared to non-partner caregivers, may give them a better understanding of the survivors' needs and thus a better ability to provide support responsive to those needs. Recipients may experience support differently when received by a partner (e.g., as an indicator of continuing commitment and intimacy) versus a non-partner caregiver, enriching the meaning of the support and its potential to reduce psychiatric distress. Conversely, a more intimate relationship may also offer the survivor a better assessment of the caregiver's emotional resources and abilities to provide the needed support. Survivors may refrain from asking for support to avoid straining the non-partner caregiver. Research is needed to evaluate whether these and/or other processes can explain why effective partner

support buffered against stressful life events in this study, whereas effective support from family and friends did not.

It is interesting to note that our findings showed higher psychiatric distress among unpartnered survivors compared to partnered survivors, raising the question of whether the processes revealed in this investigation may help explain why unmarried (i.e., unpartnered) cancer survivors report poorer psychosocial outcomes than their married counterparts. Compared to partnered cancer survivors, unpartnered survivors are more likely to experience depression and mood disturbances [56], as well as overall greater distress [57]. It may be that their need to rely on support from a non-partner caregiver is a disadvantage when it comes to getting the resources they need to cope effectively with stressful life events.

This study identifies several directions for future research. First, a study with a longitudinal design that assesses the temporal effects of social support effectiveness on psychiatric distress is needed to confirm the causal nature of these variables. The cross-sectional nature of this current study raises the possibility that reverse causation may have accounted for significant findings. Specifically, psychiatric distress could reduce survivors' appraisal of the effectiveness of support they received, leading those with greater psychiatric distress to report more ineffective social support and to be less likely to benefit from social support provided in response to stressful life events. A longitudinal study would confirm whether an increase in partnered caregiver social support buffers psychiatric distress of stressful life events.

Second, although our study suggests that the source of caregiver support (partner versus non-partner) is associated with social support's ability to buffer against stressful life events, additional research is needed to understand why source of support (partner versus non-partner) matters. Potentially, partners may differ in certain objective and subjective aspects of social support, such as their proximity, availability, and amount of time spent with the survivor, the relational implications of support, or perceived caregiving burden. These and other aspects of support could help explain why social support effectiveness acted as a buffer in partnered survivors but not non-partnered survivors. Cohabitation may also be a key variable that accounts for stress buffering in partnered survivors but not non-partnered survivors. Thus, additional, theoretically grounded research (e.g., relationship science) is needed to shed light on the mechanisms underlying our results. If these findings were to be replicated, the SSE framework could guide future social support interventions to help support providers and recipients understand and articulate their support needs in order to engage in effective support interactions.

Our procedures for avoiding confounding stressful life events and caregiver SSE may have excluded a small number of partnered survivors in distressed relationships (i.e., 17 survivors were excluded for reporting a life event that indicated problems in their relationship). Future research examining the effectiveness of partner support and its potential for stress buffering in distressed relationships could provide valuable insight. Likewise, additional research is needed to more fully understand the support needs of non-partnered HSCT survivors. One potential explanation for the lack of significant findings could be that we included many different types of caregivers (e.g., siblings, friends, parents) in the non-partnered sample. Comparing the buffering potential of effectiveness support from various sources of non-partner providers (e.g., children versus friend) would be a valuable contribution to the field.

This study has several limitations. First, the cross-sectional design and retrospective reporting (e.g., of stressful life events and comorbidities) raise the possibility of reverse causation or confounding variables accounting for these findings. Second, self-reported medical comorbidities may have been prone to bias (e.g., due to poor recall). Third, our sample of non-partnered survivors is small ($n = 71$, 26%) and includes a large proportion of female respondents (73%), which may have impacted our ability to detect a significant interaction with social support effectiveness. The low average psychiatric distress score in our sample may have contributed to this small difference. Repeating this study in a sample with higher psychiatric distress scores could clarify the extent to which effective social support can buffer stressful life events to clinically reduce psychiatric distress. Our study also assumes that partnered cancer survivors view their spouse or partner as their main source of support. Although married cancer survivors frequently report their spouse as their main source of support [58], the possibility exists that some partnered survivors may view another person (friend, family member) as their main source of social support. Although our study removed partnered survivors who reported death or serious injury of their partner, we were not able to do the same with non-partnered survivors. Thus, there is the potential for confounding events in non-partnered caregivers (e.g., illness of a close friend who was reported as a survivor's main source of support) that may impact both the effectiveness of caregiver support and the level of psychiatric distress of the survivor. Finally, our sample was mostly White, educated, and of higher income status. Hence, these findings may not generalize to other populations. Understanding the potential for effective social support to act as a buffer in individuals who are resource-constrained is an area for future research.

This study also has strengths, including its novel focus on social support effectiveness as an important contributor of stress buffering effects of enacted support, its consideration of both partner and non-partner caregivers, and its focus on a population that may be vulnerable to adverse effects of stressful life events because of their cancer treatment and, for many, continuing health concerns. Finally, by differentiating the components of support that make it more likely to be effective, the SSE framework identifies potential mechanisms through which social support can buffer psychiatric distress.

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These mechanisms provide insight into how to design interventions to improve the effectiveness of social support to enhance coping and psychological adjustment in stem cell transplant survivors.

Compliance with Ethical Standards

Conflict of Interest   The authors declare that they have no conflicts of interest.

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

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