Self-Report and Linguistic Indicators of Emotional Expression in Narratives as Predictors of Adjustment to Cancer

Jason E. Owen,[1,6] Janine Giese-Davis,[2] Matt Cordova,[3] Carol Kronenwetter,[4] Mitch Golant,[5] and David Spiegel[2]

Emotional expression and cognitive efforts to adapt to cancer have been linked to better psychological adjustment. However, little is known about the relationship between linguistic indicators of emotional and cognitive coping efforts and corresponding self-report measures of related constructs. In this study, we sought to evaluate the interrelationships between self-reports of emotional suppression and linguistic indicators of emotional and cognitive coping efforts in those living with cancer. Seventy-one individuals attending a community cancer support group completed measures of emotional suppression and mood disturbance and provided a written narrative describing their cancer experience. Self-reports of emotional suppression were associated with more rather than less distress. Although linguistic indicators of both emotional expression and cognitive processing were generally uncorrelated with self-report measures of emotional suppression and mood disturbance, a significant interaction was observed between emotional suppression and use of cognitive words on mood disturbance. Among those using higher levels of emotional suppression, increasing use of cognitive words was associated with greater levels of mood disturbance. These findings have implications for a) the therapeutic use of emotion in psychosocial interventions and b) the use of computer-assisted technologies to conduct content analysis.

KEY WORDS: cancer; emotional expression; linguistic analysis; emotional suppression.

INTRODUCTION

The degree to which individuals use emotional expression or suppression to cope with their cancer experience appears to significantly influence trajectories of adjustment. Research reviews have suggested that emotional suppression may be linked with disease progression and outcomes (Gross, 1989; Temoshok, 1987; Giese-Davis and Spiegel, 2003), and studies have linked lower emotional suppression with lower levels of distress or mood disturbance (Classen, Koopman, Angell, and Spiegel, 1996; Cordova *et al.*, 2003). Stanton, Danoff-Burg, Cameron, Bishop, Collins, Kirk and colleagues (2000) have suggested that emotionally expressive forms of coping are associated with lower levels of distress and greater quality of life, particularly for those breast cancer survivors who have supportive others that are receptive to these expressions. Schmidt and Andrykowski (2004) also reported that the degree to which women with breast cancer are aware of and tend to their emotional states is associated with lower scores on a variety of measures of distress.

[1] Department of Psychology, Loma Linda University, 11130 Anderson Street, Loma Linda, CA 92350, USA.

[2] Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine.

[3] VA Palo Alto Health Care System, Pacific Graduate School of Psychology.

[4] Cancer Support Community, U.C.S.F. Mt. Zion Cancer Center.

[5] The Wellness Community–National, Santa Monica, CA.

[6] To whom correspondence should be addressed; e-mail: jowen@llu.edu.

A similar, though more complex, pattern of findings has emerged from the literatures on psychosocial and expressive writing interventions for those with cancer. Recent studies have shown that supportive-expressive group therapy reduces the suppression of primary negative affect among women with breast cancer (Giese-Davis, Koopman, Butler, Classen, Cordova, Fobair *et al.*, 2002), and emotional expressiveness among participants in these groups is associated with less severe mood disturbance (Classen, Koopman, Angell, and Spiegel, 1996) and indeed mediates the group therapy's observed effectiveness in reducing distress (Classen *et al.*, 2001). In expressive writing interventions, in which participants are asked to write about their deepest thoughts and feelings associated with their cancer, findings have generally suggested that emotionally expressive writing is beneficial for some but not all. Zakowski *et al.* (2004) reported that for prostate and gynecological patients with social support systems unresponsive to the expression of problems and emotions, those asked to engage in emotionally expressive writing exhibited improvements in distress levels. Stanton, Danoff-Burg, Sworowski, Collins, Branstetter, Rodriguez-Hanley *et al.* (2002) have shown that written emotional disclosure in women with breast cancer is associated with improvements in physical symptoms. Additionally, improvements in psychological well-being were evidenced for women who engaged in emotionally expressive writing and were low in avoidance of cancer-related stimuli.

These findings suggest that coping efforts involving greater emotional expression and lower emotional suppression may play an important role in the process of adjusting to the ongoing stressors associated with surviving cancer. Several theories have been advanced to describe the potential mechanisms by which emotional expression/suppression impacts the adjustment process. Folkman and Greer (2000) have advanced a model of adjustment to chronic disease in which emotion-focused coping efforts serve to mitigate distress associated with generally uncontrollable situations. According to this stress and coping model, emotional distress can give rise to a search for meaning and an attendant reduction in distress. Manne *et al.* (2004) have shown that increasing levels of post-traumatic growth over time are predicted by baseline levels of emotional expression. It may only be through the awareness of the deeper feelings associated with the diagnosis of cancer and ongoing coping with treatment side effects, surgical disfigurement, sexual changes, and threat to life, that

people are able to sort out their priorities and begin to make plans to ensure that they make the best use of their remaining time. Additionally, through the expression of these deeper emotions, people with cancer can communicate to their loved ones how they are valued, can share their loved ones' fears, talk through the priorities they plan to implement in their lives, and communicate the meaningfulness of these experiences. Expression of fear, direct anger, and sadness related to the cancer can allow an intimate connection between cancer patients and their loved ones, especially when irritability and hostility are minimized. It is the resulting sense of deliberate life reordering, focus on meaningful relationships, new possibilities, and appreciation of life that links emotional awareness and expression to the reappraisal and growth that may reduce distress. While the literature is mixed with respect to the relationship between post-traumatic growth and distress, some studies have reported an inverse relationship between growth and distress (Ho, Chan, and Ho, 2004; Katz, Flasher, Cacciapaglia, and Nelson, 2001; Urcoyo, Boyers, Carver, and Antoni, 2005).

Cognitive coping efforts may also be important to the process of adjustment to cancer. Lazarus and Folkman (1984) theorized that cognition occurs in the context of emotion, and emotional expression may serve to reduce distress in part by stimulating cognitive coping efforts. Izard (2001) has suggested that in order for emotional expression to take place, some degree of cognitive activity must occur, specifically involving emotion perception and labeling. Schmidt and Andrykowski (2004) have suggested that, for cancer survivors, the ability to attend to and discriminate among various emotional states promotes emotion regulation and results in lower levels of emotional distress. Social-cognitive theories are also consistent with the idea that both emotional expression and cognitive engagement may facilitate adjustment to cancer. Both processes may enable cancer survivors, through assimilation and accommodation, to integrate the cancer experience into the views of themselves and the world (Creamer, Burgess, and Pattison, 1992; Horowitz, 1997). Emotional expression also allows a person to become aware of the cognitive schemas that they use to make sense of their experiences and allows these schemas to be available for restructuring (Greenberg, Rice, and Elliott, 1993). Thus, the extent to which individuals engage in active suppression of their emotional experiences may influence the degree to which

cognitive coping processes can alter cancer-related distress.

In evaluating the role of emotional expression in facilitating or hindering adjustment to cancer, previous studies have generally relied upon self-report measures of emotionally expressive forms of coping. While self-report measures are necessary to derive information about internal emotional states and perceptions of expressing these feeling states, common biases associated with self-report measures have lead other investigators to supplement self-report data with more objective measures such as peer reports (Kring, Smith, and Neale, 1994; Trierweiler, Eid, and Lischetzke, 2002) and behavioral coding of emotional expression (Giese-Davis, Piemme, Dillon, and Twirbutt, 2005). The development of computerized methods for coding the content of written text samples provides researchers with another, potentially more objective, method for quantifying emotional expression (Pennebaker and Francis, 1999).

Pennebaker and Francis (1999) developed a computerized content analysis program, Linguistic Inquiry and Word Count (LIWC), that uses a simple word counting approach to compare each word or word stem identified in a text sample to each of 2,290 words contained in 68 content-specific dictionaries (e.g., affective or emotional processes, cognitive processes, etc.). Some evidence for the concurrent validity of emotion-specific and cognitive processing word libraries used by LIWC has recently been reported for cancer-specific writing samples. Although positive correlations between LIWC-derived variables and those obtained using trained human raters (Alpers, Winzelberg, Classen, Roberts, Dev, Koopman *et al.*, 2005) were found, much variance in the human rater's data was left unexplained by the LIWC coding. Additionally, LIWC has been successfully used to replicate a manual content analysis of breast and prostate cancer online discussion groups (Klemm, Hurst, Dearholt, and Trone, 1999; Owen, Klapow, Roth, and Tucker, 2004). Results obtained from the use of LIWC to analyze emotionally expressive writing are consistent with the hypothesis that greater levels of emotional expression confer some health-related benefits. Improved health outcomes have been ascribed to three primary linguistic patterns: (1) high use of positive emotion words (e.g., happy, joyful), (2) moderate use of negative emotion words (e.g., sad, angry), and (3) increasing use of cognitive words that reflect causal reasoning (e.g., because, therefore; Esterling, L'Abate, Murray, and Pennebaker, 1999). More recently, Low, Stanton,

and Danoff-Burg (2006) have shown that for women with breast cancer, use of words associated with cognitive processing and negative emotions are associated with greater heart-rate habituation to expressive writing tasks and declines in physical symptoms over time.

Across studies of written emotional disclosure, a pattern of results linking use of affective and cognitive processing words to better adjustment is emerging. As noted previously, there is also evidence that self-reported emotional expression/processing may be associated with better adjustment to cancer. However, little is known about the relationship between linguistic indicators of emotional and cognitive coping efforts and corresponding self-report measures of related constructs. Further, little is known about interactions between cognitive and emotional coping processes in determining adjustment to cancer. In this study, we sought to evaluate the construct validity of linguistic indicators of emotional and cognitive coping efforts in those living with cancer. We further sought to identify whether suppression of emotion as an emotion-regulation strategy was associated with linguistic indicators of cognitive and affective processing and psychological adjustment to cancer.

We first hypothesized that individuals who self-report lower levels of emotional suppression, greater emotional self-efficacy, and lower use of denial and fatalistic coping strategies would be more likely to evidence emotional expression, particularly of negative emotions, in written cancer narratives. While we anticipate that greater emotional expression will be associated with better psychological adjustment, it seems likely that the relationship between emotional expression and adjustment will vary with the type of coping strategies used by the individual. Stanton *et al.* (2002) have shown that cancer survivors who use avoidant coping strategies are less likely than those who are more approach-focused to derive psychological benefits from emotionally-expressive writing. Thus, we hypothesize that for those who use suppression as a means of coping with emotion, the degree of association between emotional expression and adjustment will be attenuated. We also hoped to extend previous studies by examining the relationship between use of cognitive words and psychological adjustment. We hypothesized that higher counts of words indicating cognitive processing (e.g, efforts to cognitively process the cancer experience; word counts associated with a previously identified cognitive factor, causal and insight words; Pennebaker and

King, 1999) will be associated with better overall adjustment only in those who exhibit lower levels of self-reported emotional suppression, for whom cognition is not employed as a substitute for emotion.

METHOD

Participants

Participants were recruited from a non-profit organization (The Wellness Community, TWC) that provides community-based support groups for those living with cancer. Participants were recruited from 6 separate TWC facilities across the state of California. To be eligible to participate in the study, potential participants were required to be a) currently participating in an ongoing patient support group at one of the participating community organizations, b) over the age of 18, and c) able to read, comprehend, and write in English. As reported elsewhere, 245 individuals who met the eligibility criteria were recruited for participation in the present study (Cordova *et al.*, 2003). Of these, 208 (85%) completed the questionnaire packet, 73 (30%) provided a written cancer narrative, and 71 (29%) completed both the questionnaire packet and the written cancer narrative. Those who completed the questionnaire packet and those who refused any form of participation in the study did not differ with respect to sociodemographic characteristics, disease status, medical treatments undergone, or recruitment site. Among those who completed the questionnaire packet, there were no differences between those who chose to provide a written cancer narrative and those who did not provide a narrative with respect to demographic characteristics (i.e., age, gender, educational attainment, annual household income, employment status, marital status, race, and time spent using the support group), medical aspects of their cancer (i.e., primary vs. metastatic disease, time since diagnosis, and chemotherapy, radiation, or hormone treatment), or primary study variables (i.e., emotional suppression, mood disturbance, or emotional self-efficacy).

Procedure

After receiving approval from the Stanford University human subjects review board, participants in ongoing support groups at each of the six participat-ing TWC facilities were recruited for participation in the present study. Over a one-week period, facilitators of support groups at each of the participating TWC facilities stopped each support group meeting 20 minutes early and invited willing cancer survivors to stay and learn more about the study. Participants were invited to participate in the study at the end of their scheduled group meeting, and many support group members were unable to stay after the group to fully complete the study procedures. Those support group members who chose to learn about the study were provided informed consent by the group facilitators, and facilitators distributed a questionnaire packet that contained the self-report measures and instructions for the written narrative. Instructions for the narrative were provided in written format on the last page of the questionnaire packet. The presentation order of questionnaires and narrative instructions was the same for all participants, and only 35% of those who completed the self-report questionnaires elected to stay long enough to complete the written cancer narrative.

Written Narrative

Those who agreed to write about their cancer experience were given the following instructions:

> Most people have certain ways they are used to thinking about what has happened to them and the feelings they have had since their cancer diagnosis. We would like you to tell us the story of your cancer experience in a few paragraphs. This might involve how you initially found out, important people you told and their reactions, what you have done to cope with life since the diagnosis, your philosophy or attitude, your feelings, what's been helpful, what has been difficult, what has changed, and what has stayed the same. You need not include all these in your story. The only important thing is that you convey the story about your cancer experience.

No time limit was given for the writing task. Written narratives were then transcribed into electronic files, spell-checked, and analyzed using Linguistic Inquiry and Word Count (LIWC, Pennebaker and Francis, 1999). LIWC performed text-based content analysis by comparing each word of a text file with a dictionary of 2300 commonly-used words sorted into 74 categories. For the purpose of this study, only the word categories associated with emotion and cognitive processing were utilized. To control for variations in the lengths of written narratives, LIWC calculated the percentage of all words used

that were associated with cognitive processing (i.e., use of words that represent causation, insight, tentativeness, certainty, discrepancies, and inhibition) and emotional expression (i.e., positive feelings, optimism, sadness, anger, and anxiety).

Measures

Participants were asked to complete a questionnaire packet that included self-report measures of medical/demographic characteristics, emotional suppression, and mood disturbance. A study-specific questionnaire was used to assess medical and sociodemographic characteristics, including basic demographics (e.g., age, gender, household income, etc.), site of primary cancer, time since diagnosis, medical treatments received, degree of cancer progression, and duration of participation in cancer support groups.

Emotional suppression was measured using the Courtauld Emotional Control Scale (CECS; Watson and Greer, 1983). This instrument was designed to assess the degree to which individuals with cancer suppress anger, anxiety, and depression. The CECS consists of 21 items, each rated on a 4-point Likert type scale anchored by 1 ("almost never") and 4 ("almost always"), used to evaluate the extent to which individuals attempt to suppress the expression of anger, anxiety, and unhappiness. Example items include "when I feel angry, I refuse to say anything" and "when I feel anxious, I smother my feelings." The scale has demonstrated good reliability and validity in similar samples of individuals with cancer (Giese-Davis, Koopman, Butler *et al.*, *in press*). In this sample of 71 individuals, internal consistency of the 21 CECS items was excellent (Cronbach's α = 0.94).

Mood disturbance was assessed using the Profile of Mood States (POMS; McNair, Lorr, and Droppleman, 1992). The POMS asks individuals to rate how they've been feeling over the past week using 65 emotional descriptors (e.g., angry, worn-out, annoyed, terrified). Each item employs a 5-point Likert scale with the following labels: "not at all," "a little," "moderately," "quite a bit," and "extremely." The instrument provides 6 subscale scores associated with tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment. A total mood disturbance score was calculated by summing the subscale scores for tension, depression, anger, fatigue, and confu-

sion and subtracting from this total the vigor subscale score. This scoring procedure resulted in negative total mood disturbance scores for those participants who reported very low levels of negative mood states and high levels of vigor. In the current sample, internal consistencies were high for all 6 of the POMS subscales: tension/anxiety (Cronbach's $\alpha = 0.89$), depression (Cronbach's $\alpha = 0.93$), anger (Cronbach's $\alpha = 0.93$), vigor (Cronbach's $\alpha = 0.91$), fatigue (Cronbach's $\alpha = 0.95$), and confusion (Cronbach's $\alpha = 0.84$). The POMS has been validated and widely used to measure mood disturbance among individuals with cancer (Cassileth, Lusk, Brown, and Cross, 1985; Cella, Tross, and Orav, 1989; Stanton, Danoff-Burg, Sworowski, Collins, Branstetter, Rodriguez-Hanley *et al.*, 2002).

Emotional self-efficacy was measured using the Stanford Emotional Self-Efficacy Scale-Cancer (SESES-C; Giese-Davis *et al.*, 2004). This instrument consists of 15 items rated using a 10-point Likert scale and assesses the degree to which individuals have confidence in their abilities to manage emotions specific to facing a life-threatening illness such as cancer. Although the SESES-C provides three subscale scores associated with communicating emotion in relationships, focusing on the present moment, and confronting death and dying, only the total emotional self-efficacy score was utilized in the present study. Internal consistency for the present sample was very good (Cronbach's $\alpha = 0.87$). Additionally, the instrument has been shown to have good test-retest reliability (Giese-Davis *et al.*, 2004) and responsiveness to intervention effects (Fobair *et al.*, 2002; Giese-Davis *et al.*, 2002).

Data Analysis

Square root transformations were applied to independent variables demonstrating significant positive skew (i.e., affect words, positive emotion words, negative emotion words, and helplessness/hopelessness, see Tabachnik and Fidell, 1996). Variables exhibiting significant negative skew (i.e., self-efficacy for confronting death/dying, fighting spirit, and fatalism) were reflected and transformed using the square root. Because the pattern of obtained results did not differ when variable transformations were not employed, results are presented for raw (untransformed) variable distributions. For all regression models, independent variables were centered to facilitate interpretation of regression

coefficients (Cohen, Cohen, West, and Aiken, 2003; Kraemer and Blasey, 2004).

Participant Characteristics

The majority of participants in the current study were married (60.6%), female (71.8%), and Caucasian (81.7%). Additional demographic characteristics of the sample are presented in Table I. Participants were diverse with respect to cancer type and disease severity. Participants' primary cancer sites included breast (30.1%), colon/rectum (9.6%), prostate (8.2%), ovary (8.2%), head/neck (5.5%), brain (4.1%), lymphoma (4.1%), leukemia (4.1%), abdomen (4.1%), arm/leg (4.1%), lung (2.7%), uterus (1.4%), skin (1.4%), groin (1.4%), cervix (1.4%), and pancreas (1.4%). 8.3% of participants did not respond or did not know the site of their primary tumor. Most participants reported having non-metastatic disease (58.8%) and had undergone some form of chemotherapy (67.7%). Only 42.7% of participants had undergone radiation treatment for their cancer.

RESULTS

Cancer Narratives

Participants used an average of 242 (SD = 163) words to describe their experience with cancer. Consistent with previous studies of expressive writing in cancer and other populations (Low *et al.*, 2006; Pennebaker and Francis, 1999), 5.0% of the total number of words in each cancer narrative were identified by LIWC as emotion words (positive emotion = 2.6%, negative emotion = 2.4%), and 5.3% of all words were categorized as words related to cognitive processing. Linguistic indicators of emotional expression and cognitive processing were not significantly associated with any of the measured demographic or medical variables.

Association between Participant Characteristics and Primary Study Variables

Descriptive statistics for the primary study variables are shown in Table II. Levels of emotional suppression and emotional self-efficacy were not associated with gender, stage of disease, or time since diagnosis. Similarly, mood disturbance was unassociated with stage of disease or gender.

Table I. Demographic, Medical, Self-Report and Word-Count Variables for Cancer Patients ($n = 71$)

Characteristic	$\bar{x}$	SD	Range
Age	56.3	10.7	30–80
Months since diagnosis	34.0	44.7	2–222
Months in support group	14.8	18.3	1–84
	N	%	
Gender			
Male	20	28.2	
Female	51	71.8	
Race/ethnicity			
White	58	81.7	
Hispanic	5	7.1	
Black	3	4.2	
Asian	2	2.8	
Native American	1	1.4	
Other	2	2.8	
Martial status			
Married or living as married	43	60.6	
Single	11	15.5	
Divorced	9	12.7	
Widowed	5	7.0	
Separated	3	4.2	
Education			
High-school graduate	1	1.4	
Some college	24	33.8	
College graduate	14	19.7	
Some graduate school	11	15.5	
Master's degree	12	16.9	
Doctoral degree	9	12.7	
Employment			
Unemployed or retired	43	60.6	
Employed part-time	9	12.7	
Employed full-time	19	26.8	
Annual household income			
Less than $20,000	10	14.1	
$20,000–$39,999	10	14.1	
$40,000–$59,999	16	22.5	
$60,000–$79,999	8	11.3	
$80,000–$99,999	12	16.9	
$100,000 or more	7	9.9	
Don't know/ Refused	9	11.2	

However, longer intervals between time of initial diagnosis and entry into the study were significantly correlated with higher mood disturbance, $r = 0.28$, $p = 0.028$. Gender, stage of disease, and time since diagnosis were not significantly associated with any of the linguistic indicators of emotional expression or cognitive processing.

Association between Self-Report and Linguistic Indicators of Emotional Expression

To examine our first hypothesis that the self-report emotional expressivity and mood disturbance

Table II. Mean, Standard Deviation, and Range for Each Primary Study Variable

	n	$\bar{x}$	SD	Range
Emotional suppression	70	46.5	12.1	25–80
Emotional self-efficacy	71	66.2	17.2	15–95
Total mood disturbance	71	35.6	36.0	−26–130
Overall affective expression (% of all words used)	71	5.0	3.2	0–23.3
Positive emotional expression (% of all words used)	71	2.6	2.3	0–15.6
Negative emotional expression (% of all words used)	71	2.4	1.8	0–10.0
Overall cognitive processing (% of all words used)	71	5.3	2.4	0–13.3

variables would be correlated with LIWC indicators of emotional and cognitive processing, we performed Pearson product-moment correlations between the linguistic indicators of emotional expression and self-report measures of emotional control and self-efficacy for emotional expression. As shown in Table III, there were moderate to strong correlations among the self-report measures. Greater levels of emotional suppression were negatively correlated with self-efficacy for managing emotions ($r = -0.54$, $p < 0.001$) and positively correlated with mood disturbance ($r = 0.33$, $p = 0.005$). However, the anticipated correlations between self-report measures and linguistic indicators were not observed. None of the linguistic indicators of emotional expression or cognitive processing were significantly correlated with self-reported emotional suppression, emotional self-efficacy, or mood disturbance, and effect sizes were quite small (r's $= -0.18$ to -0.01). Moderate to strong intercorrelations among the linguistic indicators were observed. Specifically, overall linguistic indicators of emotional expression were positively correlated with positive emotional expression ($r = 0.83$, $p < 0.001$), negative emotional expression ($r = 0.68$, $p < 0.001$), and cognitive processing ($r = 0.32$, $p = 0.006$). Positive emotional expression was positively correlated with cognitive processing ($r = 0.32$, $p = 0.006$) but not negative emotional expression ($r = 0.14$, $p = 0.19$).

Effects of Emotional Suppression on Adjustment

We then sought to test our second hypothesis that the effect of affective word count on mood disturbance would change across levels of emotional suppression. Using multiple linear regression with all-in entry, we examined whether total mood disturbance as the dependent variable was associated with emotional suppression (CECS), affective word counts (LIWC), and their interaction. The model was significant, $F(3,66) = 2.89$, $p = 0.04$, $R^2 = 0.12$, but no interaction between affective word count and emotional suppression was observed. Greater emotional suppression was associated with greater mood disturbance, $\beta = 0.31$, $p = 0.010$. Affective word count was not predictive of total mood disturbance (see Table IV).

A second regression model was used to evaluate hypothesis 3 that the effect of cognitive word count on mood disturbance would change across levels of emotional suppression. Multiple regression was again employed to examine whether total mood disturbance as the dependent variable was associated with emotional suppression (CECS), cognitive word counts (LIWC), and their interaction (see Table IV). The complete model was significantly predictive of mood disturbance, $F(3, 66) = 4.97$, $p = 0.004$, $R^2 = 0.184$. As in the previous model, greater emotional suppression was associated with

Table III. Pearson Correlations Between Linguistic Indicators of Emotional Expression and Self-Report Measures of Emotional Control, Self-Efficacy, and Total Mood Disturbance

	1	2	3	4	5	6	7
Self-report measures							
1. Emotional suppression	—						
2. Emotional self-efficacy	−.54***	—					
3. Total mood disturbance	.33**	−.24*	—				
Linguistic indicators							
4. Overall emotional expression	−.14	.06	−.08	—			
5. Positive emotional expression	−.18	.12	−.11	.83***	—		
6. Negative emotional expression	−.01	−.05	−.01	.68***	.15	—	
7. Overall cognitive processing	−.01	.12	.13	.32**	.32**	.14	—

Note. Significance is indicated by *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table IV. Summary of Regression Analysis for Variables Predicting Total Mood Disturbance ($n = 71$)

Model, predictors	B	95% CI for B	β	p-value
Model 1				
Emotional suppression: CECS total score	0.929	0.23–1.63	0.313	0.010
LIWC affective words	−0.966	−3.95–2.01	−0.086	0.520
Suppression × affective words interaction	−0.057	−0.28–0.17	−0.066	0.619
Model 2				
Emotional suppression: CECS total score	0.855	0.19–1.52	0.289	0.013
LIWC cognitive words	1.994	−1.30–5.29	0.135	0.232
Suppression × cognitive words interaction	0.331	0.04–0.63	0.256	0.028

Note. Model 1: $R^2 = 0.116$, Adjusted $R^2 = 0.076$. Model 2: $R^2 = 0.184$, Adjusted $R^2 = 0.147$. All B and β coefficients represent the regression coefficients for the centered predictors.

greater mood disturbance, $\beta = 0.29$, $p = 0.013$. In addition, the interaction between cognitive word use and emotional suppression was significant, $\beta = 0.26$, $p = 0.03$. To facilitate interpretation of the interaction, separate regression lines for the effect of cognitive word count on mood disturbance were derived for different levels of emotional suppression. As shown in Fig. 1, mood disturbance increases with increasing use of cognitive words. However, increasing cognitive word count results in greater increases in mood disturbance for individuals with high emotional suppression relative to those with low emotional suppression (see Fig. 1). To further interpret the interaction, a median split on emotional suppression was performed to divide subjects into either a high or low emotional suppression group. Among those with low levels of emotional suppression, use

of words indicative of cognitive processing was not significantly correlated with total mood disturbance, $r = -0.17$, $p = 0.36$. However, for those with high levels of emotional suppression, greater use of cognitive processing words was associated with higher levels of mood disturbance, $r = 0.37$, $p = 0.024$.

Discussion

Results of this study provide additional evidence that efforts by those with cancer to suppress emotion are associated with more, not less, distress. While in general self-report measures of affect management and word counts were uncorrelated, the interaction of self-report of emotional suppression on the CECS and cognitive word count was related to higher
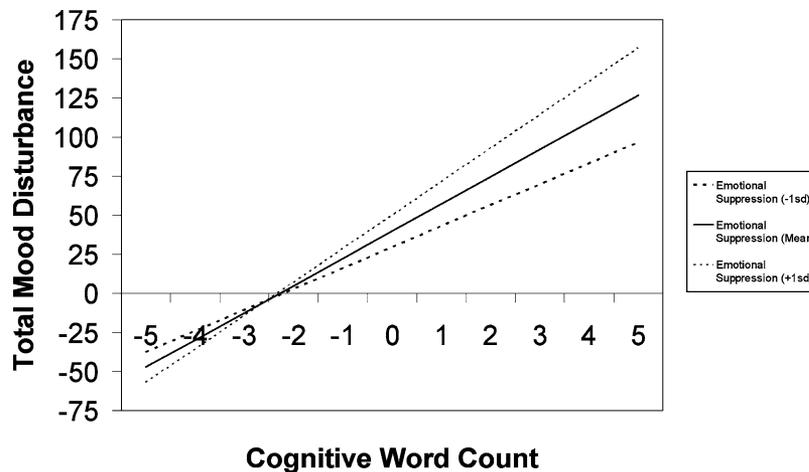

Fig. 1. Interaction Between Use of Cognitive Processing Words and Emotional Suppression on Total Mood Disturbance. *Note.* Cognitive word count and emotional suppression are centered; total mood disturbance is shown in original raw score units. As levels of emotional suppression increase, the slope of the relationship between cognitive word count and total mood disturbance also increases.

distress, notably among those high in emotional suppression. In the context of serious disease-related stress, a self-defined strategy involving suppression of emotion does not seem to provide comfort, and evidence of mobilization of cognitive descriptors enhances rather than mitigates the association between suppression and distress. The hypothesis that emotional suppression and the interaction of suppression and cognitive processing words would be associated with psychological adjustment was supported. Among those who use suppression as an emotion regulation strategy, increasing levels of cognitive processing are associated with greater levels of mood disturbance. Our results suggest that cognitively-based coping efforts may be insufficient for resolution of distress when individuals are less inclined to engage in emotional expression. High cognitive processing in the context of attempts to restrict emotional expression may reflect efforts to intellectualize the cancer experience in order to cope with underlying anxiety. Weihs, Enright, Simmens, and Reiss (2000) have reported that among women with recurrent breast cancer who exhibit chronic low-grade anxiety, high emotional constraint is associated with a greater risk of mortality. Thus, future efforts to further clarify the relationship between emotional constraint/suppression and cognitive coping strategies could advance theoretical models necessary understanding adjustment to cancer.

However, these findings also suggest either that self-report measures of one's tendency to suppress emotion are not necessarily associated with the extent to which one actually engages in emotional expression in a written disclosure task or that text analysis of written affect using LIWC does not have the precision necessary to find such correlations. Similarly, self-efficacy for emotional expression was not associated with greater levels of written emotional expression.

The pattern of observed results may be accounted for by two competing explanations. The first is that perceptions of one's ability to regulate emotion through emotional expression are not consistent with actual emotion-regulation behavior under the specific circumstances created in this study. Self-reports of ability to regulate emotion via emotional suppression/expression may be made in consideration of those circumstances most likely to involve emotional suppression or expression- namely social situations involving friends or family members with whom one might disclose the presence of such emotions. Because written disclosure is a more theoretical than immediate form of social disclosure of emotion that does not take place in the presence of a valued other, evaluation of written narratives may not adequately assess the degree to which one is able to suppress or express emotions in this context.

A second, competing explanation is that the linguistic indicators of emotional expression as measured by word counting programs (Alpers *et al.*, 2005; Pennebaker and Francis, 1999) is not sufficiently sensitive or germane to detecting emotion management in this population. The finding of no association between current levels of mood disturbance and linguistic indicators of emotional expression supports this interpretation, given that we would expect those experiencing greater levels of emotional disturbance to express these feeling states in their cancer narratives. Additionally, the significant positive association between self-reported emotional suppression and total mood disturbance did not vary with linguistic indicators of emotion, although it did with cognition. These results were contrary to our hypothesis, given that we anticipated that higher levels of written emotional expression in the context of emotion regulation through suppression would result in synergistic effects on mood disturbance.

There are several notable limitations of the current study. First and foremost, all measures were collected at a single point in time, which necessarily prevents causal interpretations of the relationships among our study variables. Additionally, although our study is comparable in size to similar studies with clinical populations in support settings, the relatively small number of writing samples limited the power available to test our hypotheses. Generalizability of these results may be limited by the fact that participants in the study were active members of cancer support groups and not a random sample of cancer survivors. It is possible that the variability of key study variables (e.g., emotional suppression) was less than could be expected in a more diverse group of survivors, which if true might have attenuated some of the observed relationships among variables. However, the sample was quite diverse with respect to other participant characteristics such as disease type and severity of disease.

With respect to the writing samples themselves, it is important to note that the writing instructions that were provided to participants differed somewhat from those that have been used in studies of expressive writing (e.g., Stanton *et al.*, 2002). Rather than being asked to write about their deepest thoughts and feelings associated with their cancer, participants

were simply asked to tell the story of their experience with cancer. It should be noted that LIWC was designed specifically for expressive writing studies, although more recent studies have used writing samples obtained from a variety of naturalistic sources (e.g., Cohn, Mehl, and Pennebaker, 2004). However, the general nature of the instructions used in the present study may have limited the degree of overall emotional expression, and our estimates of emotional expression may under-represent the degree to which participants actually engage in behavioral expression of emotions related to cancer.

A final limitation directly involves the process used by LIWC to categorize words into the various content categories. It has been suggested that word counts are inherently incapable of distinguishing the context in which the word was used (Krippendorf, 2004). For example, use of the word "happy" has very different meanings in different contexts: "I am so happy with the results of my surgery" vs. "I can't remember the last time I felt happy." While computer assisted text analysis (CATA) may be useful for rapid screening of large volumes of text, it may be necessary to supplement the word counting approach used by LIWC with disambiguation procedures. Once such procedure, recommended by Stemler (2001) and others, is the use of key word in context (KWIC) analysis, whereby words identified in word counting procedures are presented to a human rater in the context in which the word was used. Although KWIC analysis is substantially more time intensive than CATA alone, such procedures may substantially increase the content validity of the LIWC program.

In summary, cognitive coping efforts designed to make meaning of the cancer experience may actually increase distress in those that regulate emotion using emotional suppression. This finding has implications for treatment, suggesting that intervention strategies for reducing emotional suppression may serve to reduce psychological distress and could enhance the effectiveness of interventions that rely primarily on cognitive coping and problem-solving strategies. The present study also raises questions about whether word counts of emotional expression can serve as distinct indicators of the degree to which individuals engage in emotional expression. Because self-report measures of emotion regulation strategies were uncorrelated with objective word counts of emotional expressivity, we know at the very least that word counts of emotional expression seem to be measuring something different than what participants themselves tell us. Given that most research on LIWC has been undertaken with studies of healthy undergraduates and other non-cancer populations, additional research on the construct validity of LIWC, particularly among individuals writing about the experience of cancer, may be warranted.

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