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LOMA LINDA UNIVERSITY  
School of Behavioral Health  
in conjunction with the  
Faculty of Graduate Studies

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Linguistic Predictors of Peer Responsiveness in an Online Cancer  
Support Group

by

Andrea Lewallen

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A Thesis submitted in partial satisfaction of  
the requirements for the degree  
Doctor of Philosophy in Clinical Psychology

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March 2013

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Each person whose signature appears below certifies that this thesis in his/her opinion is adequate, in scope and quality, as a thesis for the degree Doctor of Philosophy.

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## ABBREVIATIONS

OSG	Online Support Group
LIWC	Linguistic Inquiry and Word Count
OR	Odds Ratio

## ABSTRACT OF THE THESIS

### Linguistic Predictors of Peer Responsiveness in an Online Cancer Support Group

by

Andrea Lewallen

Doctor of Philosophy, Graduate Program in Clinical Psychology  
Loma Linda University, March 2012  
Dr. Jason Owen, Chairperson

**Introduction:** Little is known about how group cohesion develops in online support group communities. Previous research suggests that message content, self-disclosure, and emotional expression may be central to this process. The purpose of this study was to identify linguistic and qualitative characteristics of participants' messages that predict how other participants respond in an asynchronous discussion board for cancer-related distress.

**Method:** 525 discussion board messages posted by 116 participants in the healthspace.net trial were collected. Linguistic Inquiry and Word Count (2001) was used to identify linguistic markers of emotional expression and pronoun use. Message topics were identified using qualitative analysis. Logistic regression and chi-square analyses were used to evaluate whether linguistic characteristics and message topics predicted receiving a response from other survivors in the online group.

**Results:** Messages were more likely to receive a reply if they had higher word count,  $OR=1.30, p=.001$ , or fewer second person pronouns,  $OR=.923, p=.040$ . Messages were less likely to receive a reply if they evidenced high levels of positive emotion,  $OR=.94, p=.03$ . The most common message topics related to self-disclosure (51%), the

group (38.5%), medical experiences (30.9%), and experiences related to the website (30.1%). Several types of message topics were associated with greater likelihood of a reply: self-disclosure ( $p<.001$ ), medical experiences ( $p=.01$ ), relationship issues ( $p=.05$ ), and introductory posts ( $p<.01$ ).

Implications: Informing participants how to introduce themselves to the group (i.e., detailed and self-focused messages discussing personal issues such as the effects of illness on life and relationships) could promote cohesion and enhance overall intervention engagement.

## **CHAPTER ONE**

### **INTRODUCTION**

According to the World Health Organization (2008), cancer is the third most common cause of death behind cardiovascular diseases and infectious and parasitic diseases. In high-income countries such as the United States, however, cancer is second only to heart disease (Kochanek et al., 2009). Further, the incidence of cancer is now increasingly exacerbated by lifestyle choices (e.g., sedentary lifestyle, smoking, poor diet) that are common in economically developed countries (Jemal et al., 2011). Fortunately, recent progress reports by the National Cancer Institute (2010) have illustrated increasing trends in survivorship. The American Cancer Society reports approximately 11 million cancer survivors (defined as those living from the time of a cancer diagnosis through the balance of their life) in the United States. As medical advances are continuing to improve survivorship for numerous forms of cancer, the proportion of individuals managing cancer and surviving past arduous treatments continues to increase.

In addition to dealing with the physical burdens of illness, research has repeatedly shown that cancer survivors often deal with long-term psychosocial effects of their diagnoses. The psychological impact of illness appears to be greater for those coping with cancer than other chronic health conditions (Kaiser et al, 2010). The burdens of coping with cancer increase the chances that survivors will struggle with clinically significant psychological problems. For example, Grassi and Rosti (1996) found that 13% of cancer survivors diagnosed within the past three months suffered from mood disorders including depression, dysthymia, and depressive disorders not otherwise specified. In addition, 15%

suffered anxiety disorders. Their results also indicated that 70% of survivors suffering from adjustment disorders prior to diagnosis developed chronic disturbances such as generalized anxiety disorder and dysthymia 6 years later (Grassi & Rosti, 1996). In a study analyzing the prevalence of psychiatric conditions in 250 cancer inpatients admitted to three different cancer centers, 47% of patients met criteria for a DSM-III diagnosis. Of these conditions, 85% were defined by symptoms of depression or anxiety (Derogatis, 1983). Overall, the actual level of anxiety and depression experienced often depends on variables such as age, gender, cancer type, and cancer stage (Vodermaier et al., 2011). However, for cancers such as metastatic breast cancer, neither age, site of cancer, or type of treatment received were shown to distinguish between depressed and non-depressed patients (Giese-Davis et al., 2006).

Depression and anxiety disorders can have a significant impact on an individual's physical and mental ability to cope with cancer. The Institute of Medicine (2008) reports findings that illustrate the effects of mental illness on coping, motivation, self-efficacy, and cognition. Diminished optimism and positive coping along with impaired cognition due to depression can seriously impair an individual's motivation to engage in a proper health regimen and health behaviors (Adler & Page, 2008). As a result, the psychosocial burdens of cancer can seriously hinder self-care and threaten survival.

Given the evidence for the psychosocial impact of cancer, researchers have begun to explore specific stressors that increase distress in survivors. While examining survey data from 180 adult cancer survivors, Deimling and Kahana (2002) found that cancer related illness symptoms were among the greatest predictors of depression and PTSD hyper-related arousal (Deimling & Kahana, 2002). Other correlates of distress include

unsupportive partner behavior (Manne et al., 2005), perceived risk of cancer (McGregor, 2004), younger age, lower education, lack of health insurance coverage, and having comorbid conditions (Kaiser et al., 2010).

Encouragingly, numerous protective factors have been studied as well. In particular, optimism and social support significantly reduce emotional distress in cancer survivors (Trunzo & Pinto, 2003). Bloom (1982) found that lower psychological distress in women with breast cancer was predicted by indicators of greater social support, and mediated by ability to cope.

### **Psychosocial Interventions and Adjustment to Cancer**

In a randomized trial of patients with malignant melanoma, the 35 treatment participants of a 6-week psychiatric group intervention demonstrated significant affective improvement and implementation of positive coping skills (Fawzy & Cousins et al., 1990). The intervention was designed to promote health education, stress management and problem solving techniques as well as providing social support. When compared to controls, the 38 treatment participants showed significant decreases in depression, fatigue, confusion and total mood disturbances at 6 months following the intervention.

Additionally, changes in affective states were correlated with improved immunity via the NK lymphoid cell system as well (Fawzy & Kemeny, 1990). Treatment participants demonstrated significant increases in large granular lymphocytes and natural killer cells 6 months following the intervention. When Fawzy et al., (1993) evaluated the results of this intervention 6 years later, treatment participants had a significantly lower death rate than controls (3/34 vs. 7/34). Interestingly, baseline affective distress and



baseline coping were significant predictors of recurrence and survival. Active behavioral coping, as was taught by the intervention, predicted decreased recurrence and death.

The studies described above, have elicited much interest in whether psychosocial factors and intervention can curv the physical impact of cancer. Studies in psychoneuroimmunology provide evidence that stress plays a critical role in how the neuro-endocrine and immune systems cope with disease (Adler & Page, 2008). A study by Giese-Davis and colleagues (2011) that provided weekly group therapy sessions for women with metastatic breast cancer suggested a link between depressive symptoms and survival time. Women with decreasing depression had nearly doubled median survival times than those with increased depressive symptoms. In a 2009 meta analysis, Pinquart and Duberstein analyzed 87 studies (104 samples) that explored perceived social support and cancer survival. Studies showed that participants with higher perceived social support and larger social networks had decreased mortality. This effect was such that an increase of one standard deviation in perceived social support was accompanied by a 25% decrease in the relative risk of mortality. As size of social network increased by one standard deviation, relative risk of mortality decreased by 20%.

Spiegel and colleagues (2006) also conducted a review of the mechanisms by which psychosocial treatment may improve cancer survival. While the authors recognized studies that found no relationship between interventions and longevity, they highlighted that interventions resulting in no psychological gains are unlikely to be associated with survival. Conversely, a study showing positive effects of psychosocial support demonstrated improved adherence to medical regimen, which was also predictive of greater survival (Richardson, 1990). Upon further review, Spiegel and colleagues

found evidence suggesting that improved survival may be mediated by stress reduction and heightened neuroendocrine and immune function. Evidence suggesting that immunosuppression affects the rate of cancer progression also indicates that heightened immunity (e.g. increases in NK cells) can lead to tumor cell destruction and reduced blood-borne metastases (Whiteside, 1995). As a result, interventions producing psychological gains shown to reduce cancer-related stress or mood disturbances and thereby improve immune function (Davis, 1986; Fawzy & Kemeny, 1990) may produce increased longevity.

### ***Benefits of Group Support***

The Institute of Medicine's 2008 Report examined findings regarding the impact of psychosocial stressors on cancer patients. Inadequate social support was found to weaken patients' ability to effectively cope with their illness and manage their symptoms. Additionally, socially isolated individuals are at greater risk for mental illness. Attaining adequate psychosocial support can be central to a cancer patient's physical and mental well-being. Not only can emotional support reduce distress through improved coping, but some social outlets also provide informational support that lead to improved health-care utilization (Adler & Page, 2008).

Given the psychosocial impact of cancer and the resulting challenges faced by survivors, supportive and therapeutic treatments for this population are of significant research and clinical interest. Peer support groups are an effective means of attaining psychosocial support (Davison, Pennebaker & Dickerson, 2000), which has been shown to result in educational, instrumental, and emotional benefits for cancer patients

(Campbell, Phaneuf, & Deane, 2004). This is understandable, given Grassi and Rosti's findings that patients who had little access to support from family and interpersonal relationships were at higher risk for psychological distress. Having access to psychosocial support provided by support groups, can reduce distress related to a cancer diagnosis and improve adjustment and psychosocial well-being (Meyer & Mark, 1995; Newell, Sanson-Fisher, & Savolanien, 2002).

Although findings are mixed (Edwards, Hubert-Williams, & Neal, 2008), there is substantial evidence documenting numerous benefits of psychosocial intervention (Rehse & Pukrop, 2003). Spiegel et al. (1981) found that women with metastatic breast cancer attending weekly support meetings for one year had significant psychosocial benefits. Participants showed significantly improved scores on POMS measure of mood disturbance including significant reductions in tension, fatigue, confusion and improved vigor when compared with controls (see Table 1). Although these improvements were still present at an eight-month follow up, they were no longer significant.

Based on evidence supporting the benefits of psychosocial interventions, the mechanisms by which support groups affect individuals has become an important area of study. The benefits received via group processes offered by this therapeutic medium are a particular area of interest. One common finding is that the opportunity to engage with a group of individuals experiencing similar disturbances encourages a sense of identification, empathy and belonging (Payne, Lundberg, Brennan, & Holland, 1997; Roberts, Piper, Denny, & Cuddeback, 1997). The ability to identify with a group and experience cohesion can instill a sense of universality and the realization that others are dealing with similar issues (Klemm, 2003). Through group identification, common

experiences and stories, which Rappaport (1993) refers to as the “group narrative,” are shared and constitute a social identity.

In addition to the benefits reaped through building a unique sense of community, members of cancer support groups have shown significant improvements related to the provision of cancer related information (Carlsson & Strang, 1998b; Ussher, 2006;). Namkoon (2010) found that women participating in a breast cancer support group not only had greater emotional well-being associated with information exchange, but that this effect was moderated by self-efficacy. In other words, exchange of illness or treatment related information likely endows support group participants with a sense of empowerment (Power, 2010). Ussher (2006) positioned empowerment and agency as the most significant consequences of group support. These benefits were further defined as increased confidence and sense of control in relation to living with cancer. Adamsen (2002) goes one step further by explaining that increases in confidence lead to a shift in position from victim to agent. Thus, the group dynamic created by those sharing similar experiences not only facilitates identification and reduced isolation, but enables participants to increase self-efficacy and empowerment such that they may experience less victimization at the hands of their illness.

### ***Online Cancer Support Groups***

Despite support for the benefits of cancer support groups, there remain some pitfalls associated with traditional methods of this treatment. Mainly, attending support groups in face-to-face format can be difficult for patients who have limited access due to traveling or scheduling requirements. In addition, patients who are currently experiencing

physical symptoms related to their cancer and medical treatments may not have the physical means and energy to attend a face-to-face support group each week. As a result, patients with patients with severe symptoms may forgo the benefits of psychosocial treatment and support.

The establishment of online-support groups for this population has addressed many of these issues. Given the exponential growth of web-based communications, it is not surprising that psychosocial treatment methods practiced in face-to-face groups have been adapted to an online format. Disseminating treatment online allows participants the convenience of accessing social support at their leisure and from their own homes. Employing the web as a treatment medium also allows clinicians and developers to create dynamic and individually tailored interventions. Participants can communicate with peers and facilitators through e-mail, online discussion boards, and live chat groups. Peer and facilitator support are often offered in parallel to preset treatment modules designed to arm survivors with coping skills specific to cancer suffering.

There is substantial evidence suggesting that web-based support groups for survivors are an efficacious means of reducing the negative impact of cancer. Support has been found for reduced reaction to pain and trends toward increased traumatic growth (Lieberman et al., 2003). Additionally, Owen et al., (2005) found that women who had poorer self-perceived health significantly improved their health perception when assigned to online treatment. While Salzer et al. (2010) did not see improvement in any outcome measures, women reported high levels of satisfaction with treatment suggesting self-perceived benefits as well. The Comprehensive Health Enhancement Support System (CHESS), developed by Gustafson and his colleagues has been shown to meet the

emotional and information needs of women coping with breast cancer (McTavish & Gustafson, 1995; Gustafson et al., 2001; Shaw, 2007; Shaw 2006). Significant benefits of this intervention have included increases in perceived social support and information competence (Gustafson et al., 2001). Bosom Buddies, another psychosocial intervention for breast cancer, found primary outcomes in mental health such as reduced depression (Winzelberg et al., 2003).

### **Disadvantages of Receiving Online Treatment**

While there is substantial evidence that online support groups (OSGs) are a viable alternative to face-to-face therapy, it is unlikely that they will completely replace more traditional forms of treatment. Questions regarding the limitations of the online therapeutic environment have been raised. Bantum and Owen, (2009) reported that participants from online groups demonstrated less commitment to the group than those participating in face-to-face treatment. They suggest this might be partially due to a decrease in the social pressures to maintain online participation than what is experienced in face-to-face groups. As a result, engagement is low (Eysenbach, 2005) and dropout is high (Wangberg, 2008).

Additionally, Alleman (2002) highlights common concerns regarding less intimacy in the online environment due to a lack of non-verbal cues that would otherwise provide essential context in face-to-face communication. However, Alleman argues that limiting communication to text does not eliminate opportunities for expressiveness, but creates different avenues for it. Not only can choice of diction and syntax alone convey the affect and intention of the writer's message, but additional online strategies (changes

in font style, size, capitalization of letters, addition of emoticon images, change in spelling etc.) can provide contextual richness to the messages conveyed. While these strategies do not replace the advantages of non-verbal communication, participants use tools such as emoticons in a way that mimics face-to-face interactions (Derks et al., 2008).

### **Advantages of Receiving Online Treatment**

Despite its challenges, providing treatment online is also shown to have unique advantages in communication as well. Suler (2004) points out that the online environment allows for more freedom to be comfortable expressing positive or negative ideas and emotions that they are less likely to express face-to-face. He labels this phenomenon “The Disinhibition Effect” and further describes it as a tendency to increase self-disclosure and intensity of expressions when communicating online rather than in person. Lieberman and Golant (2003) illustrate this point by including the following statement written by a participant in reaction to an internet support group for cancer “I felt the ESG (Electronic Support Group) worked well because I felt I shared more in this group than I would face-to-face.” As a result, providing therapy online may facilitate emotional expression by helping individuals verbalize (and thus address) difficult feelings faster.

A second advantage to online treatment is the unique opportunity available for researchers to track and analyze group dynamics and expression during participation. The majority of communication among members of web-based groups occurs through the sharing of written text. Participants engage in numerous forms of written expression such

as discussion posts, e-mails, blog posts, and journal posts. As a result, various forms of text analysis allow investigators to collect unique data that may be less accessible to those who study group communications occurring face-to-face.

### ***Text Analysis of Online Communication***

In order to better understand communicative preferences of cancer patients, Klemm (1998) performed a content analysis on 300 discussion board messages written by participants. Messages were isolated into eight categories including: 1) information giving/seeking, 2) personal opinions, 3) encouragement/support, 4) personal experience, 5) thanks, 6) humor, 7) prayer, 8) miscellaneous. Similarly, Grimsbo (2010) isolated common themes emerging from the written messages of cancer survivors. The most commonly found themes included living with symptoms and side effects, living with a fear of relapse, concerns for everyday life, and unmet information needs from health care providers.

Another common form of text analysis allows researchers to track specific words belonging to deeper categories of expression. Words are captured and categorized at basic linguistic levels such as pronouns, articles, and prepositions, as well as more complex psychological expressions such as positive or negative emotion and cognition (Pennebaker, 2003). Programs providing specific content analysis, such as the Linguistic Inquiry Word Count (LIWC), can collect data on numerous aspects of written language allowing researchers to conduct simple, reliable, and fast analyses of communication (Pennebaker, 2003). LIWC was developed to identify possible features of writing about negative experiences that could predict subsequent improvement in health (Pennebaker et



al. 1997). It was later expanded to analyzing language use in multiple text sources including literature, personal narratives, and conversational transcripts (Pennebaker & Graybeal 2001).

Bantum and Owen (2009) used LIWC to identify emotion words from messages written by women with stage one or two breast cancer. In addition, investigators developed coding rules for identifying levels of emotion. Rules were compiled from a literature review on verbal and nonverbal behavioral indicators of emotional expression. Emotional expression data collected by LIWC was compared with data collected by human raters as well as an additional text analysis program called Psychiatric Content Analysis and Diagnosis (PCAD). This study found that while sensitivity for LIWC varied across categories of emotional expression, (see Table 1) sensitivity for detecting overall expression was good (0.88). In addition, LIWC had exceptional specificity for all types of emotional expression (0.97-0.999).

### ***Pronoun Analysis***

A growing number of studies have demonstrated the usefulness of text analysis for understanding the dynamics of online support group communication. In one example, LIWC was used to identify the frequency of various pronoun use among breast cancer survivors (Shaw et al., 2008). Use of first person singular pronouns such as “I” and “me”, were seen as an identifiers of self-focus. Third person pronouns such as “she” and “they” were viewed as identifiers of focus on others. Lastly, relational non-I pronouns such as “we” were identified as an expression of collective focus (focus on a group with the self included). When each of these categories of pronoun usage was

analyzed as a predictor of outcomes, usage of first person pronouns was associated with higher levels of negative emotions.

### ***Keyword Analysis***

In addition to capturing pronouns, LIWC has been used to identify keywords that allow the context of written messages to be categorized. Seale et al., (2006) used keyword analysis to place text written by cancer survivors into categories such as support, symptoms, treatment, and body image. Analyzing keywords allowed the investigators to identify gender differences in communication. Women mainly used keywords related to interpersonal communication whereas men use keywords related to awareness, information, and choice.

### ***Analysis of Emotional Expression***

LIWC also uses unique methods for understanding the expression of a variety of emotions in text. By capturing 261 words that are indicative of positive emotional expression, and 345 words that are indicative of negative emotional expression, LIWC provides researchers with an overall percentage of positive and negative emotion words used by a participant. A notable number of studies have used this feature to explore the roles of emotional expression in relation to various psychological variables (Petrie et al., 1998; Owen et al., 2003, 2005; Shaw et al., 2006; Lieberman & Goldstein, 2006; Low et al., 2006; Liess et al., 2008; Han et al., 2008; Lieberman, 2007; Lieberman & Winzelberg, 2009). For example, Petrie and colleagues (1998) used LIWC to analyze the relationship between written emotional expression and the immunological impact of

suppressing thoughts after writing emotional content. Suppression was found to have a measurable negative impact on immune function regardless of whether previously written content was emotional. In another example, Lieberman and Winzelberg (2009) re-examined a previous hypothesis that religious expression was associated with positive outcome in survivors of breast cancer. After using LIWC to calculate the percentage of religious words used in an online support group, this hypothesis was not supported.

The studies above illustrate how text analysis can be used to identify unique variables that are otherwise very difficult to quantify. To test the common hypothesis that emotional expression plays an important role in coping with illness, Smyth (1998), compared 199 studies investigating the effects of emotional expression on numerous health variables associated with various chronic diseases such as cancer. The results of this analysis showed that significant improvements were found in reported health, psychological well-being, physiological functioning, and general functioning across studies. Effect sizes were significant before outliers were removed ( $n = 119$ ,  $d = .41$ ,  $r = .20$ ,  $p < .0001$ ) and after as well ( $N = 117$ ,  $d = .47$ ,  $r = .23$ ,  $p < .0001$ ). In other words, the experimental groups demonstrated a 23% improvement over controls after outliers were removed. (Smyth, 1998). Effect sizes varied by outcome type.

### **The Role of Emotional Expression in Coping with Cancer**

Stanton, Low and colleagues (Stanton et al., 2000; Low et al., 2006; Low et al., 2010) have placed great emphasis on the function of emotional expression in coping with breast cancer. In one study (Low, Stanton, Danoff-Burg, 2006,) LIWC was used to examine the relationship between emotional expression during writing exercises and heart rate at four time points: before, during, and at the end of expression, in addition to

four minutes post expression. Women were assigned to write about their “deepest thoughts and feelings” (EMO group) or “positive thoughts and feelings” (POS group) regarding their experience with cancer. Those assigned to the control group were asked to write facts regarding their cancer treatment.

The result of the study above demonstrated that expression of negative emotion was significantly greater among EMO group participants than those in the POS or control groups. While there was no significant baseline difference in heart rate between these groups, women in the EMO group had significantly greater heart rate recovery than control participants (See Figure 1). In other words, women in the EMO group had significantly lower heart rate 4 minutes post writing sessions than heart rate recorded at baseline. POS participants did not differ significantly from either group (Low et al., 2006).

More recently, the effects of different types of emotional expression have been analyzed in greater depth. Investigators have shown an increasing interest in whether these effects vary when positive or negative emotions are analyzed separately. For example, Han et al. (2008) used LIWC to analyze emotional expression within 96 messages written by breast cancer survivors. This study found that expression of positive emotion was associated with psychological benefits such as a reduction in breast cancer related concerns. However, this effect was shown to be significantly stronger for participants who wrote a higher percentage of negative emotion words overall.

Lieberman and Goldstein (2006) went on to identify how the expression of specific subtypes of negative emotions (i.e. anger, anxiety, and fear) influenced cancer related concerns and quality of life in breast cancer survivors. This study found that the

type of specific negative emotion expressed accounted for different effects on these variables. High expression of emotional words related to anger was associated with decreased cancer related concerns and increased quality of life, while expression of fear and anxiety were not.

### ***Mechanisms of Emotional Expression***

#### **Reduced Cognitive Avoidance**

Stanton and Snider (1993), examined coping variables that influenced mood and affect in breast cancer survivors. Not surprisingly, women who received a cancer diagnosis based on biopsy results were significantly more tense, depressed, angry, fatigued, confused, and less vigorous than women whose biopsies were benign (Stanton & Snider, 1993). Furthermore, personal attributes, cognitive appraisals, and coping processes were all associated with patient moods pre-biopsy. However, when controlling for these variables, results revealed that coping through cognitive avoidance pre-biopsy was the sole unique predictor of negative affect after diagnosis (partial  $r = .55$ ,  $p < .01$ ). Additionally, cognitive avoidance was also the only unique predictor of post surgery negative affect ( $r = .47$ ,  $p < .05$ ).

The results above provide support for the common theory that suppression of distressing thoughts is psychologically detrimental. Petrie, Booth, and Pennebaker (1998) found that thought suppression might be physiologically detrimental as well. Participants randomly assigned to thought suppression groups demonstrated significantly decreased circulating T lymphocytes (CD3) as well as a marginal decrease in CD8 (T-suppressor) cells. However, those who participated in emotionally expressive writing had

significantly increased levels of CD4 (T helper) cells as well as an increase in overall lymphocytes. Further, linguistic analysis showed that participants who expressed themselves emotionally used more words related to cognitive processing and insight. As a result, it is likely that coping through emotional expression facilitates the cognitive processes that ameliorate distressing or traumatic situations.

### **Increased Social Support**

Stanton and colleagues (2000) have suggested that the benefits of emotional expression may depend on the social receptivity of the context in which they are expressed. Women who coped through emotional expression had fewer medical appointments for cancer-related morbidities. Women also showed enhanced physical health and vigor, when other coping strategies and demographic variables were controlled. However, emotionally expressive coping only predicted improved quality of life in women who perceived their social context to be receptive to this expression (Stanton, 2000).

Low, Stanton, and Bower (2010) hypothesized that perceived emotional support acts as a moderator for the benefits of emotional expression. This hypothesis was based on social constraints theory, which suggests that lack of a social outlet is detrimental for adjustment to stressful situations. Additionally Low and colleagues found an interesting interaction in which women with low perceived emotional support benefited most from expressing cancer related emotions during the intervention. In other words, the benefits of emotional expression varied with a woman's experience of being socially constrained in

her expression. Those who perceived themselves to be constrained benefited significantly greater from having a new outlet in which to express their emotions.

As stated earlier, Stanton and Snider found that cognitive avoidance was also the only unique predictor of post diagnosis and post surgery negative affect. However, seeking social support was predictive of improved vigor ( $r = .63, p < .001$ ). This effect was stronger than the partial correlation found for engaging in less cognitive avoidance ( $r = -.47, p < .05$ ). Based on this and results described above, there is enough evidence to encourage further investigation into variables related to social support and emotional expression.

### **Current Study**

The literature has demonstrated wide support for the psychosocial, emotional, and sometimes physical benefits associated with online cancer support groups. As a result, it is not surprising that researchers are beginning to focus on the mechanisms underlying these therapeutic benefits. The growing area of content and linguistic analysis can be particularly beneficial in understanding specific differences in how participants utilize group support and how communication styles shape their unique experiences. Greater understanding of these areas can facilitate the development of more effective intervention designs and facilitation techniques. For example, based on evidence by Han and colleagues (2008), the benefits associated with expression of positive emotion are greater among women whose expressions were previously primarily negative. These results may guide facilitators to take note of intervention participants whose written content is mainly comprised of negative emotions, and find appropriate ways to encourage positive

expression. Similarly, improving our understanding of communication dynamics can inform facilitation techniques that promote greater connectedness in the online social network. Knowledge regarding variables that increase social engagement can inform the content of psycho-education in new modules. For example, if self-disclosure is evidenced to promote online social support, modules can highlight education regarding the benefits of self-disclosure in supportive settings. Additionally, if facilitators are aware of the types of expressions that achieve greater peer support, they can increase reinforcement for these messages, or post public discussion prompts that promote this type of expression.

Despite accepted evidence regarding the benefits of social support and the advantages of seeking support through online interventions, the literature has yet to focus directly on variables that affect engagement with social aspects of an intervention or variation in peer-peer communication. While group processes are shown to be therapeutically critical, it is not understood what variables contribute to the frequency or type of communication that occurs between peers in a web-based support group. Klemm (1998) and Grimsbo (2010) have analyzed the categories and themes most commonly discussed by cancer patients in a support group. However, there is no evidence as to whether any of these categories predicted changes in communication among participants. Similarly, Pennebaker (2003) used pronoun analysis to predict positive or negative emotional expression, but no studies have analyzed how variation in emotional expression affects communication patterns among cancer survivors.



## *Aims and Hypotheses*

### **Aim One**

The present study aims to better understanding the relationship between self-focus and emotional expression in cancer survivors. In particular, exploring whether written emotional expression varies with a participant's focus on themselves verses others. Based on the results found by Shaw et al. (2008), it is hypothesized that written messages exhibiting greater self-focus will also exhibit greater negative emotional expression. In addition, it is expected that focus on others as well as collective focus (the self as part of a group) will be associated with greater positive emotional expression.

### **Aim Two**

The second aim of this study is to better understand the relationship between emotional expression and peer communication. Of interest is peer communication as it pertains to messaging on a discussion board designed for contact between cancer survivors. It is hypothesized that peers will provide greater social support by reaching out to communicate with messages that exhibit higher negative emotional expression. This hypothesis is based on Truong et al., (2011) and Shaw et al., (2000), who state that altruism is among the most commonly reported reasons for enrollment in a cancer support group.

### **Aim Three**

The final aim of this study was exploratory. Common themes of expression were identified across all written messages, and the author explored how message themes

related to social support and emotional expression. While other studies have successfully categorized topics commonly discussed by cancer survivors (Klemm,1998; Grimsbo, 2010), investigators have not yet analyzed how common forms of emotional expression vary across themes nor which themes predict the reception of social support from peers and facilitators.

## CHAPTER TWO

### METHODS

#### Sample

Messages were written by a total of 116 participants of an online support group for cancer survivors. Cancer survivors were identified from the Loma Linda University Medical Center (LLUMC) comprehensive cancer registry, which lists all patients with a cancer diagnosis who visited LLUMC for initial diagnosis, second opinions, or treatment. Potential participants were mailed letters explaining the details of the study as well as information for self-enrollment on the intervention site. Individuals were also contacted for additional screening over the phone. To be eligible for participation, patients were required to be English speaking adults with consistent access to the Internet, in addition to having a minimum distress rating of 4 or higher using the Distress Thermometer (Hawkes, 2010). Additionally, a variety of web-recruitment strategies were used such as sending information to relevant Facebook groups, list serves, and online periodicals for cancer patients and survivors. These messages included instructions for those who were interested in self-screening online. If eligible, they were then able to enroll themselves in the study by creating a profile for the intervention. Once a profile was created, participants were randomized to a treatment group or a waitlist control. They were then asked to complete baseline surveys on the study website. Participants who were waitlisted were required to wait 12 weeks before completing a follow-up survey and receiving access to the treatment intervention.

## **Intervention**

After enrolling in the treatment group and completing the baseline survey, participants were directed to begin the 12-week intervention. When accessing the intervention, the first visible page included an asynchronous discussion board for communication with peers and facilitators. Facilitators sent each new participant a welcome message encouraging them to complete their profiles and use the discussion board to become familiar with the group. To facilitate communication, participants were able to select a personalized avatar, as well as an emoticon to represent their current mood state. Current distress was also indicated through a numerical rating that accompanies each post. Further communication was made available through weekly sessions facilitated in a live chatroom. Participants were also encouraged to complete weekly guidance modules (12 total) that included coping skills training exercises.

## **Procedure**

Only messages posted by participants to the discussion board were selected for analysis. Although written text submitted in the chatroom would provide rich information on direct communication between peers, the live, synchronous nature of the chatroom results in excessive ambiguity regarding the direction of each message. Multiple chatroom conversations may occur in parallel with many individuals participating in one or more conversations simultaneously. Messages sent may be vague with no clear intended recipient. Given that a specific aim of this study is to identify predictors of receiving peer responses, the discussion board alone can provide concrete information as to what constitutes a direct response to a specific message. Additionally, chatroom

communication is limited to individuals who were available for participation during each facilitated weekly session. Conversely, the discussion board is available at all times, making it the central forum for the intervention and primary mode of communication among peers.

All posts made on the discussion board were stored in a MySQL database that included information such as the content of the post, the identity of the author, and the time the post was made. Additionally, participants were able to select an emoticon representing their current mood state as well as a numerical distress rating at the time the post was made. The MySQL database also stores information regarding the type of post that was made (e.g. if the post was an original post or a response to a previous post). Responses to each message are logged in this database as well, and linked to the original message.

## **Variables**

### ***LIWC***

A total of 525 messages were collected from an online discussion board for cancer survivors. These messages were analyzed using LIWC 2001 developed by Pennebaker and colleagues. Similar to the procedure used by Liess and colleagues (2008), Shaw and colleagues (2008), and Lieberman and Goldstein (2006), LIWC was used to scan each message for various linguistic variables such as emotional expression and pronoun use. LIWC contains a dictionary of greater than 4,000 words and wordstems that are each defined in one or more verbal categories. Categories are organized hierarchically, for example, all words categorized as “anger words” will also belong to

the greater category of “negative emotion words” and the overall category “emotion words.” This feature allows investigators to analyze expression on a spectrum in which analysis can belong to broad or specific categories. While analyzing a target text, LIWC identifies words and wordstems pertaining to all available categories, and increments them accordingly. The output provided includes variables such as word count, words per sentence, and percent of words from category.

### **Emotional Expression**

Variables of emotional expression were extracted from written messages on the discussion board using LIWC2001. LIWC identifies numerous dictionary words that pertain to psychological processes such as social, affective, and cognitive processes. The current study specifically analyzed words related to affective expression. Within words that are classified as affective processes, LIWC subdivides emotion into words that qualify as positive and negative expression. Examples of positive emotion words include love, nice, and sweet, while negative emotion is identified by words such as hurt, ugly, and nasty. Furthermore, negative emotion words are subdivided into three categories: anxiety (e.g. worried, fearful), anger (e.g. hate, annoyed), and sadness (e.g. cry, grief).

### **Pronouns**

LIWC2001 was also used to extract variables reflecting pronoun use. In addition to providing a number reflective of total pronoun use, pronouns tracked by LIWC are divided into four categories including first person, second person, third person, and impersonal. First person pronouns are further divided into first person singular (e.g. I, me,

my) and first person plural (e.g. we, us, our). Similarly, third person pronouns are divided into third person singular (e.g. he, she, him) and third person plural (e.g. they their, they'd). Second person pronouns are encompassed by a single category that includes words such as: you, your, and thou. Lastly, impersonal pronouns refer to things rather than people and include words such as: it, it's, and those.

### ***Social Support***

Social support was measured as the number of replies a message received from the original author's online support group peers. This information is stored on the MySQL database, which identifies all original posts as well as their responses. Additionally, responses were identified as written by a facilitator or peer. Messages receiving no replies from peers were deemed as receiving zero social support.

### ***Exploration of Themes***

Lastly, the investigator read each post in order to identify themes of expression across participants. A modified version of the Giese-Davis et al., (2005) theme groups were used to code the presence of 13 overarching themes including family, group, gratitude, death, work, friends, medical, self, website, outside activities, sharing information, seeking information, and introducing the self to the group. Each message was identified as containing all applicable themes. Messages were also coded for subthemes within most overall themes. For example, the overall theme of gratitude contained the sub-themes, gratitude to group and gratitude to other. Therefore messages

coded as containing the theme of gratitude were necessarily coded into one of these two subthemes.

## **Data Analysis**

### ***Aim One***

The first aim of this study was to evaluate whether written emotional expression varies with a participant's focus on themselves or others. Firstly, correlational analyses were run to identify associations between self-focus and emotional expression. To test the hypothesis that greater self-focus would be associated with greater negative emotional expression, beyond its association with positive expression, a two-step hierarchical regression was conducted. The dependent variable for this analysis was the use of first person singular pronouns, and the independent variables included positive expression in the first step, with negative expression added in the second. This regression model was run twice. The first regression used the word count for each LIWC variable while controlling for message length, and the second used the proportion of each LIWC variable used within a message. Variables that examined word count while not controlling for message length were not used because they varied naturally with the word count of any other LIWC variable depending on the message length.

To explore whether emotional expression predicts self-focus independently of predicting focus on others, additional hierarchical regressions were run. Negative emotional expression was treated as a dependent variable. The first step of this regression included the use of first person plural, second person, and third person pronouns, while the second step added the use of first person singular pronouns. This regression was also



conducted while using the word count for these LIWC variables, and conducted once more while using the proportion of LIWC variables used.

### *Aim Two*

The second aim of this study was to better understand the relationship between emotional expression and peer communication. In order to test the hypothesis that peer responses would be greater for messages containing higher levels of negative emotional expression, binary logistic regressions were conducted. In these regressions, positive and negative emotional expression were analyzed as possible predictors for membership into one of two groups: 1) participant messages receiving at least one reply from a non-facilitator, 2) participant messages receiving no replies from non-facilitators. This regression analysis was conducted three times. First using word count for LIWC variables, second using word count while controlling for message length, and third using the proportion of LIWC variables used within a message.

### *Aim Three*

The third aim of this study was to explore how common themes of expression across participant's written messages relate to social support and emotional expression. This aim was approached by qualitatively categorizing written messages into overall themes and sub-themes based on their content. Means and standard deviations were obtained to describe message themes that tended to receive a greater number of replies as well as themes that had a greater number of emotion words. Additionally, message categories were analyzed as potential predictors of whether a message did or did not

receive a participant response, as well as whether they did or did not receive a facilitator response. In order to explore this relationship, chi-square analyses were conducted for all themes of communication (overall themes and sub-themes) as predictors of peer and facilitator responses.

## CHAPTER THREE

### RESULTS

#### Sample

A total of 525 messages written by 116 participants were analyzed. The majority of participants were female 78.6%, middle aged, ( $M = 53.56$ ,  $SD = 10.50$ ), married, (78.6%) and White, (83.8 %). In terms of ethnicity, the remainder of participants identified themselves as Black (6.8%), Hispanic (4.3%), Multi-ethnic (3.4%) or Other (1.7%). On average, participants had 16.56 years of education ( $SD = 8.3$ ). Less than half of participants had previously participated in a support group (41%). Nearly as many participants (37.6%) stated that they had participated in a support group online. A total of 109 participants (94%) reported a single cancer diagnosis, and 7 participants (6%) reported being diagnosed with more than one cancer type. Of those who reported a single diagnosis, over 20 distinct cancers were represented, including breast (37.9%,  $n = 44$ ), prostate (12.9%,  $n = 15$ ), gynecologic (9.5%,  $n = 11$ ), thyroid (5.3%,  $n = 6$ ), sarcomas (5.2%,  $n = 6$ ), colon (3.4%,  $n = 4$ ), skin (3.4%,  $n = 4$ ), lymphomas (3.4%,  $n = 4$ ), thymus (1.7%,  $n = 2$ ), papillary carcinoma (1.7%,  $n = 2$ ), tracheal (.9%,  $n = 1$ ), lung (.9%,  $n = 1$ ), meningioma (.9%,  $n = 1$ ), neuroendocrine (.9%,  $n = 1$ ), pancreas (.9%,  $n = 1$ ), primary peritoneal (.9%,  $n = 1$ ), appendix (.9%,  $n = 1$ ), adenoid cystic carcinoma (.9%,  $n = 1$ ), leukemia (.9%,  $n = 1$ ), and testicular (.9%,  $n = 1$ ).

#### Messages

Original written messages (non-replies) averaged a word count of 124.94 words,  $SD = 143.201$ . These messages tended to have a greater number of positive emotion

words ( $M = 3.86$ ,  $SD = 4.29$ ), than number of negative emotions words,  $M = 1.97$ ,  $SD = 2.98$ . Similarly, messages had a higher proportion of positive emotion words ( $M = .038$ ,  $SD = .054$ ) than negative emotion words ( $M = .016$ ,  $SD = .025$ ). Additionally, messages tended to use a greater number of first person singular pronouns ( $M = 10.05$ ,  $SD = 11.82$ ), followed by the number of third person pronouns ( $M = 1.66$ ,  $SD = 4.02$ ), and the number of second person pronouns,  $M = 1.17$ ,  $SD = 3.07$ . Least of all was the number of first person plural pronouns used ( $M = .89$ ,  $SD = 1.86$ ). This order changed slightly when the proportion of pronoun words was taken into account. The proportion of first person singular pronouns used remained the highest ( $M = .081$ ,  $SD = .041$ ), followed by the proportion of second person pronouns ( $M = .019$ ,  $SD = .032$ ). The proportion of third person pronouns was third highest ( $M = .009$ ,  $SD = .015$ ), and first person plural pronouns remained the lowest proportion used,  $M = .008$ ,  $SD = .016$ . See Table 1 for summary of these statistics. On average messages received .84 replies,  $SD = 1.015$ . Of the 525 messages, 277 (52.8%) received at least one reply. There were 161 (30.7%) messages receiving at least one reply from a participant, and 184 (35%) receiving at least one reply from a facilitator. A total of 68 messages (13%), received replies from both participants and facilitators.

Table 1

*Descriptives of the original 525 messages.*

Variable	Proportion of words used			Word count used		
	Mean	SD	Range	Mean	SD	Range
Number of replies	.84	1.255	0-5			
Participant replies	.46	1.007	0-9			
Facilitator replies	.39	.630	0-4			
Positive emotion	.039	.053	0-1	3.900	4.210	0-40
Negative emotion	.017	.023	0-.33	1.960	2.860	0-31
First person singular	.086	.044	0-.22	10.360	11.815	0-96
First person plural	.007	.015	0-.14	.810	1.790	0-17
Second person	.018	.031	0-.25	1.560	2.960	0-37
Third person	.010	.016	0-.08	1.720	3.390	0-56

### **Aim One**

#### ***Associations between Emotional Expression and Self-Focus***

The first aim of this study was to identify existing relationships between emotional expression and self-focus (as indicated by use of first person pronouns).

Numerous significant correlations were found between the type of pronouns used and the type emotion expressed. When word use was analyzed by proportion, positive emotional expression was significantly negatively correlated with the use of first person singular pronouns,  $r = -.150$ ,  $p < .001$ , but not with the use of first person plural pronouns.

Negative emotional expression was significantly positively correlated with the use of first person singular pronouns  $r = .116$ ,  $p < .008$ , but not with first person plural pronouns.

Both positive and negative emotional expression were significantly correlated with use of second person pronouns, positive emotion,  $r = .281, p < .001$ ; negative emotion,  $r = -.111, p < .001$ . However, neither positive nor negative emotional expression was correlated with the proportion of third person pronouns used.

When word count was used, bivariate correlations for total number of emotion words and pronoun types used varied somewhat from the proportion results above. Both positive and negative emotional expression were correlated with the use of first person singular pronouns, (positive emotion,  $r = .660, p < .001$ ; negative emotion,  $r = .706, p < .001$ ) as well as with first person plural pronouns, positive emotion,  $r = .415, p < .001$ ; negative emotion,  $r = .706, p < .245$ . Positive and negative emotion were also both correlated with use of second person pronouns (positive emotion,  $r = .473, p < .001$ ; negative emotion,  $r = .371, p < .001$ ) as well as the use of third person pronouns, positive emotion,  $r = .619, p < .001$ ; negative emotion,  $r = .588, p < .001$ .

Lastly, each LIWC variable (i.e. positive emotion, negative emotion, first, second, and third person pronouns) was regressed on total word count, and the standardized residuals of these regressions were kept. This was done as an additional means of controlling for the total number of words used in a message. Using these residual variables, bivariate correlations were obtained across the number of words used for each variable, independent of message length. These results were similar to the correlations obtained with the proportion of words used. Positive emotion was significantly negatively correlated with use of first person singular pronouns,  $r = -.263, p < .001$ , and positively correlated with first person plural pronouns,  $r = .246, p < .001$ . Use of positive emotion words was also positively correlated with use of second person pronouns,  $r = .331, p <$

.001. Negative emotional expression was significantly positively correlated with use of first person singular pronouns,  $r = .133, p = .003$ , and negatively correlated with use of second person pronouns,  $r = -.120, p < .001$ , but not correlated with first person plural nor third person. See Table 2 for summary of bivariate correlations. Based on these results, word count was no longer used for analyses containing LIWC variables as both independent and dependent variables. This is because these variables appear to vary together naturally, given that the use of all word types will vary together with the length of a message.

Table 2

*Summary of bivariate correlations of emotional expression and pronoun use*

	Proportion of words		Total word count		Word count (message length controlled)	
	Positive emotion	Negative emotion	Positive emotion	Negative emotion	Positive emotion	Negative emotion
1 <sup>st</sup> person singular	- .150***	.116***	.660***	.706***	-.263***	.133***
1 <sup>st</sup> person plural	.055	-.024	.415***	.245***	.246***	-.081
2 <sup>nd</sup> person	.281***	-.111***	.473***	.371***	.331***	.120**
3 <sup>rd</sup> person	-.030	-.016	.619***	.588***	-.019	.011

Note: \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

### *Emotional Expression as a Predictor of Self-Focus*

A hierarchical linear regression model was conducted to analyze whether negative emotional expression accounted for unique variance in first person pronoun usage. The first step regressed the proportion of first person singular pronouns used onto the

proportion of positive emotion words used. This overall step was significant,  $F(1, 523) = 21.11, p < .001, R^2 = .039$ . The second step of this regression, which added the proportion of negative emotion words used, was not significant. When the same hierarchical linear regression was conducted using variables that controlled for message length, different results were obtained. Similar to the previous regression, the first step of this model, which regressed use of first person pronouns onto positive emotional expression was significant,  $F(1, 523) = 38.944, p < .001, R^2 = .069$ . Unlike the previous regression, the second step, which added negative emotional expression, was also significant overall,  $\Delta F(1, 522) = 10.083, p = .002$ . Within this step, the proportion of negative emotion words accounted for 1.8% of variance of the proportion of first person pronouns used beyond what was accounted for by positive emotion,  $\Delta R^2 = .018$ . See Table 3 for a summary of regressions using the proportion of words used compared to using variables for which message length is controlled separately.

Table 3

*Hierarchical regression results for use of first person pronouns regressed onto type of emotional expression*

Model	Predictor	Proportion of words used				Word count (message length controlled)			
		$\beta$	$p$	$R^2$	$\Delta R^2$	$\beta$	$p$	$R^2$	$\Delta R^2$
1			< .001	.039	.039***		< .001	.069	.069***
	Positive emotion	-.197***	< .001			-.263***	< .001		
2			.231	.041	.003		< .001	.087	.018**
	Positive emotion	-.192***	< .001			-.263***	< .001		
	Negative emotion	.052	.231			.133**	.002		

Note. \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$



### *Self-Focus as a Predictor of Negative Emotion*

A hierarchical regression was run to analyze whether use of first person pronouns accounted for unique variance of emotional expression beyond what was accounted for by use of first person plural, second person and third person pronouns. In the first step, the number of negative emotion words used while controlling for message length was regressed onto the number of first person plural, second person and third person pronouns used with message length controlled. This overall step was significant,  $F(3, 521) = 3.777$ ,  $p < .001$ ,  $R^2 = .021$ . Within this step, only the use of second person pronouns individually predicted negative emotional expression,  $F(3, 521) = 7.639$ ,  $p < .001$ . The second step of this model, which added the number of first person singular pronouns used was also significant,  $\Delta F(1, 520) = 15.267$ ,  $p < .001$ ,  $\Delta R^2 = .028$ . In this step, the use of second person pronouns remained significant,  $F(1, 520) = 16.31$ ,  $p = .006$ . However, the use of first person pronouns was also individually significant  $F(1, 520) = 15.26$ ,  $p < .001$ .

When this same hierarchical regression was run using the proportion of negative emotional expression words along with the proportion of each type of pronoun used, the results were as follows. The first step of the model, including the proportion of negative emotional expression words regressed onto the proportion of first person plural pronouns, second person pronouns and third person pronouns used, was not significant. In this model, only the proportion of second person pronoun used significantly predicted negative emotional expression,  $F(3, 521) = 3.964$ ,  $p = .047$ . The second step, which added the proportion of first person singular words used, was also non-significance. Additionally, no variables within this model remained individually significant. See Table 4 for summary of these regressions.

Table 4

*Hierarchical regression results for negative emotional expression regressed onto type of pronoun used*

Model	Predictor	Proportion of words used				Word count (message length controlled)			
		$\beta$	<i>P</i>	R <sup>2</sup>	$\Delta R^2$	$\beta$	<i>P</i>	R <sup>2</sup>	$\Delta R^2$
1			.266	.008	.008		.011	.021	.021*
	First person plural	.003	.945			-.083	.056		
	Second Person	-.088	.047			.121**	.006		
	Third person	-.015	.738			.000	.992		
2			.299	.010	.002		< .001	.049	.028***
	First person plural	.015	.737			-.017	.711		
	Second person	-.072	.123			.188***	< .001		
	Third person	-.009	.832			.057	.213		
	First person singular	.050	.299			.196***	< .001		

Note. \*\*\**p* < .001, \*\**p* < .01, \**p* < .05

## Aim Two

### *Associations of Emotional Expression and Social Support*

Three logistic regression analyses were conducted to analyze the predictive value of positive and negative emotional expression on receiving social support (as measured by receiving at least one reply from a participant to an original message). The first of these analyses regressed social support onto the proportion of positive and negative emotion words used in the original message. This overall model was not significant, Omnibus  $\chi^2(2) = 5.686, p = .058$ . Of the variables within this model, the proportion of positive emotion words used was predictive of a participant being *less* likely to receive a reply, OR = .937 (CI 95% = .882, .959), *p* = .034). In other words, for every one percent

increase in the proportion of positive emotion words used, the odds of receiving a reply decreased by .065. In the second logistic regression, social support was regressed onto the number of positive and negative emotion words used within the original message. This overall model was significant, Omnibus  $\chi^2(2) = 7.998, p = .018$ . Within this model, the number of negative emotion words used significantly predicted receiving social support, OR=1.089 (CI 95% = 1.007, 1.178),  $p = .034$ . For every one word increase in the number of negative emotion words used, the odds of receiving a reply increased by .085. The last logistic regression conducted regressed social support onto the number of positive and negative emotion words used, while controlling for the total word count of the message. This overall model was not significant Omnibus  $\chi^2(2) = 4.413, p = .110$ . Similar to the results using the proportion of emotional expression, only expression of positive emotion words predicted social support, OR=.816 (CI 95% = .671, .992),  $p = .041$ . As before, higher expression of positive emotion was associated with lower odds of receiving a reply ( $B = -.204$ ). See Table 5 for summary of these results.

Table 5

*Odds of Receiving a Reply Based on Emotional Expression*

Predictors	Proportion of words used				Word count used				Word count (message length controlled)			
	OR	95% CI	Wald test	<i>p</i>	OR	95% CI	Wald test	<i>p</i>	OR	95% CI	Wald test	<i>p</i>
Positive emotion	.94*	.88-.99	4.473	.034	1.0	.95-1.1	.012	.913	.82*	.67-.99	4.180	.041
Negative emotion	1.0	.93-1.1	.005	.944	1.1*	1.0-1.2	4.502	.034	.99	.82-1.2	.020	.887

Note. \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$ .

Logistic regression predicted membership into groups receiving social support (at least one reply to original message) or receiving no support (no replies to original messages)

## **Aim Three**

### ***Commonly Expressed Themes in Online Messages***

A total of 525 messages were read by the investigator and coded according to 13 overarching themes. The most common theme across messages included sharing information about the author's Self (51%), followed by discussion regarding the Group (38.5%), Medical issues (30.5%), and issues regarding the Website (30.5%). Within messages discussing the message author's self, the most common subtheme was the author's emotional state (n = 113). For example, one participant wrote "I am having irrational feelings of anxiety this week." The second most common subtheme within the overall theme of Self, was the author's physical health (n = 88). Messages containing this theme commonly included details regarding the author's illness related symptoms or side effects to medication. One message within this theme expressed the author's frustration, "...some days its nausea, others it's diarrhea or showering a second time because my hot flashes flare up." Authors often disclosed their personal stories regarding their experiences of being diagnosed with cancer and receiving treatment (n = 58). The self sub-theme that occurred with the least frequency was the author's religious commentary on his/her current experience. For example, one author mentioned "[coincidences] seem to be happening more and more often as I continue to open myself to the spiritual realm and I find this event significant and comforting."

Messages categorized as containing the Group theme most frequently included a supportive note to an individual group member (n = 110), followed by a note demonstrating general support for the group, such as "I truly wish all of you the best outcome whether it is cure, comfort, support or whatever you want most" (n = 53).

Messages within the Group theme also included notes addressing an individual facilitator (n = 26), and less frequently, seeking support from the group (n = 13). An example of a message seeking support from the group includes one author's note, "keep me in your mind and continue to keep me in your thoughts."

The medical issues most commonly discussed included information regarding medical exams and treatment (n = 139). Participants frequently posted messages sharing the results of their treatment with others such as, "Apparently a urine test, called FISH came back with cancer cells and we ran it again, still positive. So, another set of biopsies and further check into the kidneys." Less commonly, participants discussed issues related to their doctors or medical staff (n = 13), such as one participant who expressed frustration with a peer's doctor by stating, "Just because they deal with this on a daily basis, doesn't mean they have to lose their kindness with their patients." Least common among the Medical theme were messages related to cost and insurance, such as, "...I did have to declare bankruptcy last year, as medical costs, plus not being able to keep up my part-time consulting business did me in."

Website use was the fourth most commonly discussed theme among messages. The most frequent sub-theme within Website use, was identified as participants making announcements regarding their use of the site. For example, participants frequently posted messages expressing regret that they could not attend a chat sessions, such as "I am sorry I missed the chat and the lessons. Will try to catch up soon." Participants also expressed frustration regarding technical difficulties (n = 43), for example, "I had trouble logging in and just stopped trying and then on a whim signed in tonight." Lastly, participants posted messages seeking information regarding use of the website (n = 28).

One participant who had trouble identifying which module was assigned for the current week posted the message, “Can someone please tell me what week we are on?” See

Figure 1 for a summary of themes identified within posts by percentage.

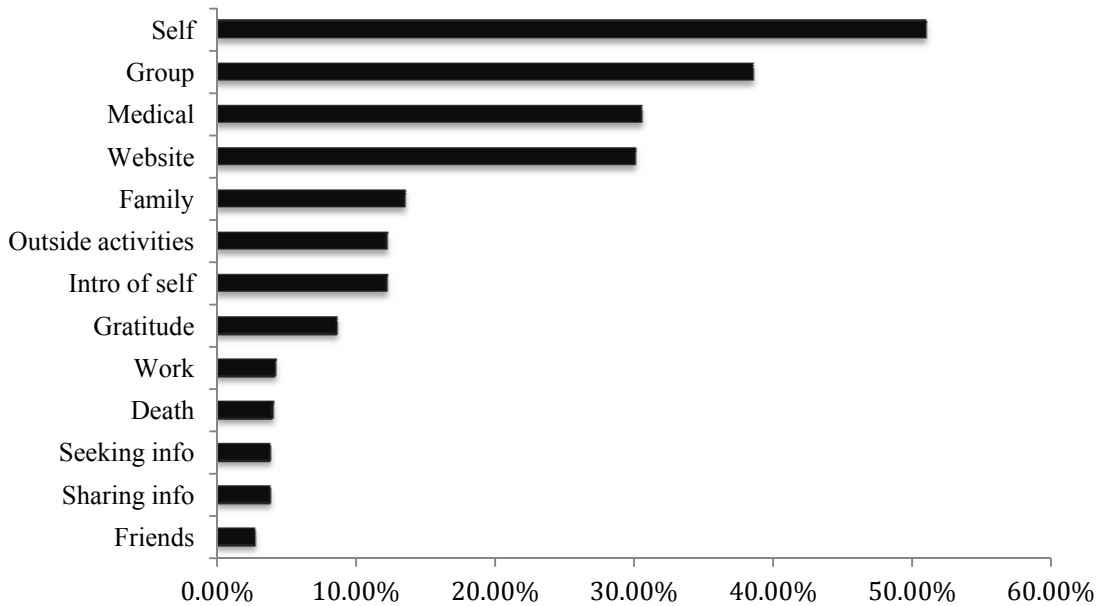


Figure 1. Percentage of messages containing identified themes (n = 525)

### *Message Themes that Predict Social Support*

Messages that Introduced the author to the group received the greatest numbers of replies overall (M = 1.75, SD = 1.93), followed by messages that discussed Death (M = 1.33, SD = 1.93), and messages discussing Work related issues M = 1.32, SD = 1.21. Messages receiving the least number of replies on average included those regarding the Group (M = .65, SD = 1.03), Site issues (M = .81, SD = 1.26), and Family issues M = .92, SD = .56. See Table 6 for a summary of the average number of replies each theme received from facilitators and participants.

Table 6

*Mean number of replies received by messages containing specific themes*

Theme	Total replies (SD)	Participant replies (SD)	Facilitator replies (SD)
Intro of self	1.75 (1.93)	.98 (1.68)	.77 (.87)
Death	1.33 (1.93)	.71 (1.38)	.62 (.92)
Work	1.32 (1.21)	.73 (1.16)	.59 (.59)
Self	1.20 (1.41)	.65 (1.22)	.54 (.70)
Medical	1.15 (1.26)	.64 (1.02)	.51 (.72)
Gratitude	1.07 (1.93)	.53 (.92)	.53 (.73)
Seeking info	1.05 (1.23)	.55 (.99)	.50 (.61)
Outside activities	1.03 (1.34)	.56 (1.21)	.47 (.64)
Friends	1.0 (1.04)	.50 (.94)	.50 (.52)
Sharing info	.95 (1.90)	.80 (1.85)	.15 (.37)
Family	.92 (.56)	.59 (.87)	.32 (1.06)
Site	.81 (1.26)	.41 (.93)	.54 (.70)
Group	.65 (1.03)	.36 (.73)	.30 (.57)

Note. N = 525

Numerous chi-square analyses were run in order to see if message themes were associated with receiving a reply from either participants or facilitators. Messages discussing Family were more likely to receive a reply from a participant ( $\chi^2(1, N = 525) = 5.18, p = .023$ ), but not from a facilitator. Messages that discussed the Group in some way varied with receiving a reply from facilitators, ( $\chi^2(1, N = 525) = 15.28, p < .001$ ), but not from participants. However, within the Group theme, messages that addressed an individual group member varied with receiving replies from both participants, ( $\chi^2(1, N = 525) = 8.77, p = .003$ ), and facilitators, ( $\chi^2(1, N = 525) = 35.62, p < .001$ ). Interestingly, messages within the Group theme that addressed an individual facilitator, varied

significantly with participant replies, ( $\chi^2(1, N = 525) = 6.72, p = .009$ ), but did not vary significantly with facilitator replies.

Although the overall Work theme did not vary with any replies, the sub-theme of work concerns varied significantly with replies from facilitators,  $\chi^2(1, N = 525) = 4.13, p = .042$ . Similarly, the overall Website use theme did not vary with replies, while its sub-theme announcing own site use varied significantly with receiving a reply from a facilitator,  $\chi^2(1, N = 525) = 4.05, p = .044$ . The same occurred with the Seeking information theme, which was not significant, while its sub-theme seeking information on coping varied significantly with replies from participants,  $\chi^2(1, N = 525) = 5.78, p = .016$ .

The overall theme of Medical issues varied with participant replies, ( $\chi^2(1, N = 525) = 5.05, p = .025$ ), although no sub-themes were significant within this overall theme. Messages related to the author's Self varied significantly with receiving replies from both participants, ( $\chi^2(1, N = 525) = 14.07, p < .001$ ), and facilitators,  $\chi^2(1, N = 525) = 19.40, p < .001$ . Specifically, sharing of the author's cancer story, was significant across receiving replies from both participants ( $\chi^2(1, N = 525) = 11.46, p = .001$ ), and facilitators  $\chi^2(1, N = 525) = 13.67, p < .001$ . See Table 7 for a summary of all chi-square analyses.



Table 7

*Results of chi-square analyses predicting whether receiving a reply from a participant or facilitator varies with message themes*

Message theme	Messages in category	Participant replies		Facilitator replies	
		Received reply	<i>p</i>	Received reply	<i>p</i>
Discussed family	71	42%	.023*	30%	.299
Group overall	202	26%	.053	25%	< .001***
Address individual member	110	19%	.003	11%	< .001***
Group Support	53	42%	.071	43%	.179
Address facilitator	26	81%	.009**	31%	.639
Seek group support	13	54%	.066	54%	.150
Gratitude overall	45	36%	.457	42%	.291
Gratitude to group	35	34%	.631	40%	.525
Gratitude to other	10	40%	.518	50%	.317
Death overall	21	38%	.451	38%	.765
Death of self	8	50%	.232	50%	.372
Death of other	13	31%	.994	31%	.743
Work overall	21	33%	.554	57%	.050
Work concerns	7	57%	.126	71%	.042*
Work general reference	13	23%	.548	38%	.749
Discussed Friends	14	29%	.863	50%	.235
Medical overall	160	38%	.025*	41%	.068
Medical exams/treatment	139	36%	.114	42%	.054
Medical doctors/staff	13	46%	.220	31%	.743
Medical cost/insurance	8	50%	.232	50%	.372
			<		
Self overall	268	38%	.001***	44%	< .001***
Self emotion	113	35%	.218	40%	.230
Self health	88	34%	.605	44%	.107
Self cancer story	58	50%	.001**	57%	< .001***
Self religion	7	29%	.904	14%	.246
Website overall	158	25%	.081	34%	.636
Announcing own site use	86	23%	.103	26%	.044*
Site technical difficulties	43	19%	.073	44%	.190
Seeking info on site use	28	43%	.150	43%	.373
Outside activities overall	64	34%	.492	39%	.473
Outside activities non illness	48	29%	.813	35%	.955
Outside activities illness related	16	50%	.089	50%	.203
Sharing info overall	20	35%	.668	15%	.055

Sharing info on coping	10	50%	.181	10%	.094
Sharing info on treatment	7	43%	.481	14%	.246
Sharing non illness related info	5	20%	.603	20%	.479
Seeking info overall	20	35%	.668	45%	.342
Seeking info on treatment	12	17%	.287	42%	.627
Seeking info on coping	5	80%	.016*	60%	.240
Seeking non illness related info	3	33%	.920	33%	.950
Introducing self to group	64	47%	.003**	55%	< .001***

*Note.* \*Message theme is significant at a minimum of  $p < .05$  for receiving a reply from either a participant or facilitator. Themes were identified in 525 messages. Messages were only assigned one sub-theme within an overall theme when applicable. An overall theme represents the combination of its sub-themes.

### ***Emotional Expression within Message Themes***

When word count was analyzed, messages discussing issues related to Friends tended to use the highest number of positive emotion words ( $M = 10.21$ ,  $SD = 7.81$ ), followed by messages about Work ( $M = .41$ ,  $SD = 7.80$ ), and Family,  $M = 6.49$ ,  $SD = 6.51$ ). Messages discussing issues related to Death contained the highest number of negative words on average ( $M = 4.62$ ,  $SD = 4.38$ ), followed by messages about Work ( $M = 4.18$ ,  $SD = 5.72$ ), and Sharing info,  $M = 3.95$ ,  $SD = 5.61$ ). When the proportion of words used was analyzed, messages that demonstrated some form of Gratitude had the highest proportion of positive words on average ( $M = .07$ ,  $SD = .05$ ), followed by messages about Friends ( $M = .04$ ,  $SD = .02$ ), and Outside Activities,  $M = .04$ ,  $SD = .02$ . On average, messages discussing Death had the highest proportion of negative words ( $M = .03$ ,  $SD = .02$ ), followed by messages about the Self ( $M = .02$ ,  $SD = .03$ ), Medical issues ( $M = .02$ ,  $SD = .02$ ), Family ( $M = .02$ ,  $SD = .01$ ), the Website ( $M = .02$ ,  $SD = .02$ ), and Seeking Information,  $M = .02$ ,  $SD = .01$ . See Table 8 for a summary of means and standard deviations for emotion words used across message themes.

Table 8

*Means and standard deviations for emotion words used across overall themes*

Theme	Positive emotion			Negative emotion		
	Word count	Proportion	Message length controlled	Word count	Proportion	Message length controlled
Self	5.00 (4.92)	.03 (.02)	-.09 (1.17)	3.01 (3.66)	.02 (.03)	.01 (1.30)
Group	4.41 (3.71)	.05 (.08)	.22 (1.01)	1.94 (2.90)	.01 (.02)	.02 (.97)
Intro of self	3.69 (3.13)	.03 (.02)	-.38 (.82)	1.55 (2.28)	.01 (.01)	-.50 (1.11)
Medical	4.46 (4.00)	.03 (.02)	-.24 (1.09)	2.79 (3.00)	.02 (.02)	.03 (1.12)
Family	6.49 (6.51)	.03 (.02)	.15 (1.41)	3.41 (4.62)	.02 (.01)	-.16 (1.42)
Friends	10.21 (7.81)	.04 (.02)	.97 (.92)	3.79 (5.84)	.01 (.01)	-.37 (2.20)
Gratitude	6.64 (7.01)	.07 (.05)	.79 (1.43)	2.29 (4.67)	.01 (.01)	-.06 (.90)
Death	5.62 (4.80)	.03 (.02)	.04 (1.07)	4.62 (4.38)	.03 (.02)	.89 (1.63)
Work	7.45 (7.80)	.03 (.02)	-.17 (1.70)	4.18 (5.72)	.01 (.01)	-.23 (1.53)
Website	2.73 (3.23)	.03 (.03)	-.15 (.83)	1.34 (2.00)	.02 (.02)	-.04 (.80)
Outside activities	5.69 (3.65)	.04 (.02)	.33 (1.12)	1.98 (2.30)	.01 (.02)	-.32 (1.09)
Sharing info	7.05 (6.30)	.03 (.01)	.09 (.74)	3.95 (5.61)	.01 (.74)	.04 (1.52)
Seeking info	4.30 (5.26)	.03 (.03)	-.16 (.68)	3.30 (5.50)	.02 (.01)	.44 (1.34)

*Note. N = 525 messages*

## CHAPTER FOUR

### DISCUSSION

#### **Considering Message Length**

Given the correlation results described above, proportion of words used and word count with message length controlled were deemed to be the most informative variables for analysis. Although it is believed that word count can provide critical information that may be lost when analyzing the use of specific words by proportion, word count does not appear to be an appropriate means for analyses that examine LIWC variables as both dependent and independent variables. As is demonstrated by the first correlational analysis (Table 2), when using word count, all variables will correlate significantly and positively with each other. This is likely due to the fact that using a greater amount of all word types (i.e. writing a longer message) will associate positively with using more specific word types (such as emotion words or specific pronouns). Put differently, as the number of emotion words written increases, the number of all pronoun types used will increase, mainly due to the fact that message length is increasing as well. As a result, word count was used while controlling for the overall message length. Doing so yielded results that were fairly similar to the use of proportions.

#### **Emotional Expression**

##### ***Emotional Expression and Self-Focus***

Based on correlational analyses using both the proportion of words used and word count with message length controlled, the hypothesis that negative emotional expression is associated with self-focus was supported. These results suggested that self-focus, as

measured by use of first person pronouns, is associated with both the expression of negative emotion and the lower expression of positive emotion. Although the regression results varied based on whether proportion was used or word count with message length controlled was used, the direction of these results remained the same. When using word count with message length controlled, the use of first person pronouns accounted for the expression of negative emotion beyond what was accounted for in lower expression of positive emotional. This result suggests that writing messages that are focused on oneself will not only be lower in positive emotion, but will contain greater negative expression than messages that focus on others. Furthermore, correlations using word count with message length controlled, suggested that using third person pronouns, which indicate a viewpoint of experiencing oneself within a group, such as “we” and “our,” are associated with expressing positive emotion.

As discussed by Shaw et al. (2008), focus on others within a group is likely associated with positive emotion, given that a group setting will provide cancer survivors with a sense of universality and commonness related to difficult issues. On the other hand, focusing on the self may result in individuals dwelling on intrusive cancer related thoughts and experiencing greater negativity and anxiety. However, it is important to note an important distinction between Shaw’s study and the current study. Shaw examined the use of first person pronouns throughout a four-month intervention as a predictor of negative emotions at the end of the study, while the current study considers the association between first person pronouns and negative expression within each individual message. As a result, no conclusions can be drawn regarding self-focus and dwelling on

negative issues based on this study. The conclusions made only apply for expressions made within individual messages.

### ***Emotional Expression and Social Support***

One result supported the hypothesis that expression of negative emotions within a message would predict receiving a reply from a participant. This result was obtained when the number of emotion words was examined rather than the proportion of words or the word count while controlling for message length. Word count was an appropriate variable for this analysis because the dependent variable (receiving a reply) was not a LIWC variable. Therefore it could not vary naturally with the independent variables (positive and negative emotional expression). Participants were more likely to reply to messages containing a greater number of negative emotion words. This result supports the idea put forth by Stanton and colleagues (2000) that the benefits of expression may be mediated by increased social support. Receiving a response from a peer after having written a message containing a greater number of negative emotion words, likely provides the author of the message with a sense of social receptivity to those emotions. This may be especially beneficial to those who perceive themselves to be constrained in their emotional expression otherwise (Low et al., 2010).

The remainder of the analyses indicated that when taking message length into account, greater use of negative emotion (as measured by proportion or word count with message length controlled) did not predict whether a message would receive a reply, beyond what was predicted by the use of positive emotion. However, results suggested that messages containing higher expression of positive emotion were less likely to receive

a reply. This finding confirms the direction of the original hypothesis by supporting the idea that group members are more likely to show support to those whose messages are less positive overall. This does not necessarily mean that negative messages did not tend to receive replies, but rather that the likelihood of a negative message receiving a reply did not outweigh the likelihood that a messages with high positive expression would not receive a reply. It is possible that group participants do not feel compelled to answer messages that are very positive due to the lower altruistic function of replying to those who are perceived to be doing well. It is also interesting to hypothesized that group members may show a greater sensitivity to emotional expression than was expected. These findings suggest that group members may not only provide support to those who explicitly expressed negative emotions, but to those whose messages that were less positive overall.

### **Common Message Themes and Social Support**

Numerous themes were identified within messages. Interestingly, themes that predicted support from participants did not necessarily predict support from facilitators and vice versa. Themes that predicted support from both participants and facilitators included addressing an individual group member, discussing the self (specifically sharing an individual cancer story), and introducing the self to the group. It is likely that the latter two were both significant given considerate overlap across these themes. Although not always the case, messages containing the message author's cancer story tended to be part of a message dedicated to introducing the author to the group.

Of greatest interest is the most common theme appearing in messages, discussion of the message author's self. This theme appeared across more than half of all messages and had the highest correlation with the number of replies from participants. It was also positively associated with negative emotion and negatively associated with positive emotion. This finding suggests a broader role of self-focus and negative expression than that which was put forth by Shaw and colleagues in 2008. Although dwelling on the self consistently over time may be associated with ruminating on distressing thoughts and eventually evoke greater negative emotionality, focusing on the self on a message-to-message basis may provide a foundation for improved coping via increases in social support from group members.

### **Limitations**

It should be noted that the findings of this study are to be interpreted with caution given some clear limitations in the methodological design. Firstly, it is important to consider that LIWC variables are subject to limitations regarding how the amount of each word type is measured. Word count, proportions, and word count with message length controlled were all presented due to the unique advantages and disadvantages associated with each variable. Therefore, it is advised that none of these variables be considered in isolation. This presents a problem with regards to interpreting results that are not entirely consistent across these three variables. However, when considering the findings of this study, no analyses using these variables yielded results that were directly conflicting with each other. Although some variables provided significant results when others did not, the directionality of results was consistent across all variables.



Secondly, errors related to the qualitative aspects of this study are to be expected, given the subjective nature of message interpretation. Specifically, the coding of messages is subject to error given that a single individual coded all messages into themes. Although this eliminates issues related to inter-coder reliability among multiple coders, it provides a significant challenge in measuring consistency across messages. Additionally, while each theme presented in this study was coded as an independent theme present within the message, it is unrealistic to assume that themes are truly discrete. In order to allow for the greatest representation of complex messages, the text was coded such that all applicable overall themes could be assigned to a single message. However, within each overall theme, only one subtheme could be assigned. As a result, there is likely some error that occurred in that multiple message subthemes were represented within a message, and the coder was forced to select the most prominent one.

### **Clinical Implications and Directions for Future Research**

The overall findings of this study suggest that focusing on oneself is very common within an online cancer support group. Self-focus can also be associated with greater expression of negative emotion and less expression of positive emotion. Messages discussing the self and expressing more negative and fewer positive emotions are also associated with receiving replies from other members of the group. Based on these findings negative emotions may serve as a valuable form of expression in OSGs. Cancer survivors are often prompted to find the silver lining of their diagnosis. While these exercises are likely to promote positive expression and reduce rumination on distressing thoughts, exercises that encourage the exploration of negative emotions and the

confrontation of distressing thoughts may serve a unique benefit as well. Placing theories of catharsis aside, asking participants to write a message post that is more focused on negative emotions may awaken the altruistic tendencies of the support group. As a result, participants will receive support for sharing their negative emotions, which will likely reduce perceived social constraints and improve group interconnectedness.

Based on these findings, future research should focus on exploring the role of social support in OSGs as it relates to positive outcomes. While this study focused on the written messages alone, future studies may focus on the emotionality of messages as they relate to individuals over time, as well as an individual's reception of social support over time. Although the current study suggests that expression of negative emotion will increase social support, it may be of interest to see how an individual's emotional expression varies as they receive social support across the span of a study. Based on Shaw and colleagues (2008), one may hypothesize that negative emotional expression may decrease over time as a function of receiving support in response to initial negative postings. In other words, individual's who express negative emotions in their messages might gain improved coping skills as a result of social support and show increased positive expression over time.

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