Journal of Health Communication, 16:1106–1121, 2011

ISSN: 1081-0730 print/1087-0415 online
DOI: 10.1080/10810730.2011.571337

Predictors of Supportive Message Expression and Reception in an Interactive Cancer Communication System

EUNKYUNG KIM

School of Journalism and Mass Communication, University of Wisconsin–Madison, Madison, Wisconsin, USA

JEONG YEOB HAN

Department of Telecommunications, University of Georgia, Athens, Georgia, USA

DHAVAN SHAH

School of Journalism and Mass Communication, University of Wisconsin–Madison, Madison, Wisconsin, USA

BRET SHAW

Department of Life Sciences Communication, University of Wisconsin–Madison, Madison, Wisconsin, USA

FIONA McTAVISH AND DAVID H. GUSTAFSON

Center of Excellence in Cancer Communication Research II, University of Wisconsin–Madison, Madison, Wisconsin, USA

DAVID FAN

Department of Genetics, Cell Biology, and Development, University of Minnesota, Minneapolis, Minnesota, USA

Social support in computer-mediated settings is an important variable in health communication research, yet little is known about the factors that influence the amount of social support one gives and receives in online support groups. To shed some light on this issue, the authors examined demographics, disease-related factors, psychosocial factors, and strategies for coping with breast cancer as potential determinants of which patients provide support to others and which ones consume it. Data collected from 177 participants in the Comprehensive Health Enhancement Support System "Living With Breast Cancer" program revealed that individuals who are younger, have higher levels of positive reframing, and lower levels of self-blame are more likely to provide emotional support in online settings. In contrast,

Address correspondence to Eunkyung Kim, School of Journalism and Mass Communication, University of Wisconsin–Madison, 5050 Vilas Communication Hall, 821 University Avenue, Madison, WI 53706, USA. E-mail: ekkim2@wisc.edu

individuals who are more educated, have less perceived availability of social support, and have lower levels of religious coping are more likely to receive emotional support from others. The authors discuss the theoretical and practical implications for providing effective psychosocial support for women with breast cancer.

Internet-based technologies have changed how patients actively seek out information and receive social support in relation to coping with their illness. Engagement in computer-mediated social support (CMSS) groups, in turn, have been found to help patients effectively cope with their chronic illness during its trajectory by increasing feelings of self-efficacy and information competence and by decreasing breast cancer-related concerns and negative emotions (Han et al., 2008; Rice & Katz, 2000; Shaw et al., 2007; Strecher, 2007).

One of the most prevalent attributes of CMSS groups is supportive communication behavior. It often includes the act of acknowledging others' feelings and providing/receiving reassurance and encouragement. Numerous studies have shown that such expression contributes to positive health outcomes. For example, social support exchanges are thought to increase patients' quality of life by alleviating the harmful effects of stressful experiences (Lieberman & Goldstein, 2005). Nevertheless, little is known about the factors that influence the amount of social support one gives and receives in CMSS groups, especially those centered around breast cancer.

Although previous studies have explored the determinants of CMSS group use within the Comprehensive Health Enhancement Support System, outcome measures were either the number of words written (Shaw et al., 2006) or the number of days patients accessed the groups (Han et al., 2010). Thus, it was impossible to tell the process and nature of discussion and what specific content was exchanged in those groups. The purpose of the present study was to move beyond the holistic view on CMSS group use and focus on specific social support exchanges: giving and getting supportive messages. In so doing, this study identifies various patient characteristics in predicting such exchanges in breast cancer CMSS groups.

Literature Review

Theoretical Basis of the Beneficial Effects of Social Support on Health Outcomes

Social support is thought to increase patients' quality of life by alleviating the harmful effects of stressful experiences, assuring feelings of comfort or a sense of being cared for by others, and helping patients cope effectively (Lieberman & Goldstein, 2005; Sarason, Sarason, & Pierce, 1990). Among diverse theoretical approaches for understanding social support, social comparison theory is particularly relevant and useful to the context of this study, which center on interaction that occur among peers undergoing the shared experience of an illness (Stewart, 1989). In particular, social comparison is conceived of as "the tendency of clients to evaluate themselves and to elicit information about their characteristics, behaviors, opinions, and abilities through contrasting them with similar others in natural or created networks of their social environment" (Stewart, 1989, p. 1280). In this comparison process, patients can enhance their health outcomes by (a) learning strategies and techniques from individuals who are coping more effectively than they are or by (b) bolstering their self-esteem through comparisons with those who are coping less effectively than they are.

Conceptualization and Operationalization of Social Support

Social support is often defined as "verbal and nonverbal behavior that influences how providers and recipients view themselves, their situations, the other, and their relationship and is the principal process through which individuals coordinate their actions in support-seeking and support-giving encounters" (Albrecht, Burleson, & Goldsmith, 1994, p. 421). This study extends this definition to the CMSS context featuring interactions among patients who experience the same illness. Previous studies have categorized the types of social support in different ways, such as emotional and information support (Cutrona & Suhr, 1994). Of these, emotional support behaviors are conceived of as (a) comments that acknowledged or validated others' emotional reaction and feelings or (b) comments that provided reassurance and encouragement. Emotional support exchanges are the primary focus of the present study because they have yielded reliably positive and strong effects on health outcomes in past research (Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

Another issue is just how to measure social support. Some researchers have used retrospect self-reports of *perceived availability of support*, which refers to "the cognitive appraisal of being reliably connected to others" (Stewart, 1989, p. 1275). However, this often produces erroneous estimates of social support exchanges when people interact with anonymous others over a long-term period because people do not recall day-to-day details accurately. In response, others have used *observable enacted social support*, which refers to "the things relational partners do and say with the intention of helping one another manage problems and stress" (Albrecht & Goldsmith, 2003, pp. 269–270). This provides a more valid and objective measure of social support exchanges, especially in the context of anonymous CMSS groups. Thus, we used actual support messages expressed and received in CMSS groups for breast cancer.

Giving and Getting Support

It is critical to differentiate the two behavioral exchanges of giving and getting social support to uncover the ways in which supportive messages are exchanged in CMSS groups. We adopted a communicative perspective, which argues that social support behaviors are conveyed mainly through interpersonal exchanges (Burleson & MacGeorge, 2002). In this view, supportive behavior is reflected in the exchange of supportive message. Notably, the act of sending and receiving social support represents different communication attributes in CMSS group context. Providing support could be conceived of as the act of writing supportive messages (i.e., expression), while receiving support is the act of reading those messages (i.e., reception).

Given that communication encompasses the interactive behaviors associated with the sender and receiver, examination must consider the bidirectional communication process in the support group and differentiate the two. Writing supportive messages often requires more cognitive effort or active processing than reading those messages. Researchers have found that expressing thoughts and feelings about traumatic events through writing can improve patients' quality of life because it create new understanding of their situations (Pennebaker, 1997; Smyth, True, & Souto, 2001). Further, writing and reading could play different roles. Han and colleagues (2011) found that writing empathic messages had a significant effect on breast cancer-related concerns, but reading those messages only has a contingent effect in combination with writing. Thus, we expected that these two modes of communication would be different and that the factors predicting giving and getting of social support would vary.

Potential Determinants of Providing and Receiving Social Support

There has been little empirical research investigating the factors that influence how much social support cancer patients give and receive. Johnson's (1997) Comprehensive Model of Information Seeking (CMIS) was a useful starting point for our study because it outlines antecedent factors (e.g., demographics, illness experience, psychosocial factors) in explaining supportive communication behaviors. The CMIS draws concepts and findings from a synthesis of three large theoretical traditions that incorporate uses and gratification research, the health belief model, and a model of media exposure and appraisal (Johnson, 1997). With the CMIS framework in mind, our review of the literature concerning social support in clinical psychology, social psychology, and communication fields leads us to identify the following variables: sociodemographics, disease-related factors, psychosocial factors, and coping strategies.

Demographics

Despite some variations in the context, method, and measures across past studies, evidence indicates that sociodemographic factors explain variance in providing and receiving social support (Barbee & Cunningham, 1995; Sarason, Sarason, & Shearin, 1986). Individuals possess different levels of internal and external coping resources, which, in turn, lead to different patterns of social support exchanges. For example, older breast cancer patients are less likely than younger breast cancer patients to experience adverse psychosocial outcomes (Mosher & Danoff-Burg, 2005) and thus may be more likely to provide social support to others. Yet, some studies have found that younger breast cancer patients had lower depression than older breast cancer patients (Nausheen & Kamal, 2007) and therefore may be more likely than older patients to give support to others, a point we return to later. Individuals with low levels of education usually receive more support than those with higher levels of education (Choi, 1996). Women of color are less likely than White women to seek help from others (Johnson, 1997) because the former group has a greater dependence on family, friends, and neighbors for support (Carveth & Gottlieb, 1979). In contrast, no difference between Black and White patients was found in overall support group participation (Michalec, Willigen, Wilson, Schreier, & Williams, 2004). Those patients who live alone are less likely to receive social support from a spouse or family members; thus, they are more likely to seek emotional support from others (Osborne et al., 2005).

Disease-Related Factors

Given the fact that patients with life-threatening illnesses such as breast cancer encounter different demands from each stage of their illness prognosis (Culver, Arena, Antoni, & Carver, 2002), a disease-related factor, namely the stage of cancer, may play a significant role in predicting social support exchanges. Several studies in social psychology have indicated that the severity of the recipient's illness may determine the amount of support provided and sought from others. The more advanced a patient's disease, the more threatened he or she is, and he or she may be socially withdrawn and unsupportive (Epping-Jordan et al., 1999). Thus, it is reasonable to assume that late-stage cancer patients are less likely to give support than those in the early stages of cancer.

Psychosocial Factors

Psychosocial factors have been found to play a crucial role in promoting or inhibiting supportive communication behaviors. One such psychosocial factor, health self-efficacy, is associated with making interpersonal contacts to deal with specific problems when under stress (Du Pré, 2000). Individuals who believe that they can control their illness may actively engage in providing support because they have confidence in dealing with their own situations; also, these people may be reluctant to seek help from others.

Emotional distress may play a part in motivating supportive communication behaviors. For example, people who experience negative emotions and related emotional distress (i.e., anxiety, depression, anger) tend to be self-focused, passive, and lack energy to act effectively (Iwamitsu et al., 2005). Conversely, people who experience positive emotions (i.e., compassion, optimism) generally promote helping behaviors, such as providing effective problem-solving advice (Barbee & Cunningham, 1995) because they are more outwardly and socially focused. Applying this to the cancer context, patients experiencing negative emotions may be less likely to give help to others. In contrast, patients who reported emotional distress about their problem seem likely to seek social support from others (Dunkel-Schetter, Blasband, Feinstein, & Bennett Herbert, 1992).

The level of perceived availability of social support may also have some effect on participation in support behaviors. Previous studies indicate that individuals in need of assistance may be more willing to seek/receive help if their available resources are inadequate (Helgeson, Cohen, Schulz, & Yasko, 2000; Plass & Koch, 2001).

Coping Strategies

For cancer patients, coping strategies may be important tools that guide, reflect, or predict their subsequent behaviors in order to manage and ameliorate the effect of their chronic illness (Carver, Scheier, & Weintraub, 1989). Patients who take positive actions in constructing their psychological domains are likely motivated to regain control during the course of their illness by using diverse resources. One such action could include actively seeking support from others (Sarason et al., 1990). Past research found that individuals who cope well with life crises are less likely to be judged negatively and avoided by others than those who are having difficulty in coping and signaled their needs for social support to others (Dunkel-Schetter, Folkman, & Lazarus, 1987). This implies that more adaptive coping strategies such as positive reframing may contribute to more social support expression and reception, whereas less adaptive coping strategies such as self-blaming may contribute to less supportive exchanges. This should also be the case for religious coping, which has been found to be a significant predictor of giving help to others (Schwartz, Meisenhelder, Ma, & Reed, 2003).

Research Questions

The following questions guided our investigation. In CMSS groups among breast cancer patients, who sends and receives emotionally supportive messages during social interaction with peers? Are there any differences between individuals who are more likely to give support to others and those who are more likely to receive support from others? Are the patterns of a specific type of content use (i.e., writing and reading supportive messages) similar to or different from overall discussion group use (i.e., total number of messages written and read)? This research is exploratory in nature, offering an initial examination of antecedent pathways. Therefore, research questions are posed, although there is clearly extant research that provides insights into our research questions.

Research Question 1: What is the relation between sociodemographic factors and providing and/or receiving support?
Research Question 2: What is the relation between disease-related factor and providing and/or receiving support?
Research Question 3: What is the relation between psychosocial factors and providing and/or receiving support?
Research Question 4: What is the relation between strategies for coping with breast cancer and providing and/or receiving support?
Research Question 5: For these predictors, what differentiates the total number of messages written and read versus the content-specific measure of supportive messages written and read?

Method

Participants

The CMSS groups examined in this study were a part of the Comprehensive Health Enhancement Support System, an Internet-based health care system that provides patients and their families with a range of conceptually distinct services, including information (e.g., frequently asked questions), communication (e.g., discussion groups), and interactive (e.g., health tracking) services (Han et al., 2009). Multiple clinical trials have demonstrated that the Comprehensive Health Enhancement Support System contributes to significant improvements in quality of life, participation in health care decisions, and effective use of health care services for those facing life-threatening illness (Gustafson et al., 2001). The CMSS groups in the Comprehensive Health Enhancement Support System are text-based, asynchronous bulletin boards that allow users to anonymously share information and support.

The present study is based on the secondary analysis of discussion posts, system use, and survey responses that were collected as a part of a larger Digital Divide Pilot Project of the Comprehensive Health Enhancement Support System “Living With Breast Cancer” program, where underserved women (i.e., whose income was at or below 250% of the federal poverty level; for a single woman, <$21,475/year; for a family of 4, <$44,125/year) with breast cancer were loaned a computer and given access to the Comprehensive Health Enhancement Support System for 4 months. The intervention was conducted in rural northern Wisconsin and Detroit, Michigan.

Eligibility criterion required that participants were at or below 250% of the federal poverty level, not homeless, within 1 year of diagnosis with early-stage breast cancer or within 1 year of a diagnosis of metastatic breast cancer, and able to read and understand an informed consent letter (Han et al., 2009). Of the 341 eligible patients initially recruited, 286 joined the study and 55 declined. Of the 231 participants who completed the pretest survey, 177 women were active participants who either wrote or read at least one message in the CMSS groups during the 4-month study period. Thus, 177 participants were included in the subsequent analyses.[1]

Procedures

First, we examined emotional support message in CMSS groups by using the InfoTrend computer-aided content coding system, which has been found to be flexible and precise computer-aided content analytic system for key ideas and idea combinations through the implementation of a dynamic rule structure (Shah, Watts, Domke, & Fan, 2002). The analyst creates rules for the system that identify (a) idea categories, (b) words that tap or reveal those idea categories, and (c) rules that allow pairs of ideas to be combined to form more complex meanings. These rules are then tested iteratively against actual content. Once a high level of consistency is achieved between the human programmers' reading and the computer software's coding of a sample of the content, all textual content is coded with the assistance of the computer.

This program avoids the inherent problems with word-counting software, which is inattentive to changes in meaning on the basis of linguistic context. Such programs struggle with homographs (e.g., *shift*, meaning "a period at work" vs. *shift*, meaning "to move quickly"), heterophones (e.g., *bass*, a stringed instrument vs. *bass*, a freshwater fish), qualification (e.g., a physical *wound* vs. an emotional *wound*) and negation (e.g., *helping* vs. not *helping*).

We used the InfoTrend system to analyze the content of the 19,695 message posts produced by participants during the study period. Consistent with writing norms, a discrete message post was the unit of analysis. Through the iterative process of testing our coding rules against actual content, emotional support construct was coded to capture the following types of statements as they occur in natural language: "I'm so sorry for you," "Sorry to hear about...," "My heart goes out to you," "You have my sympathy," "I know this has been a hard time for you," "You can get through it," "You hang in there", "We're here for you," and many other phrases.[2]

Reliability estimates conducted on a subset of 200 discussion posts between human and computer coding produced an estimate of 91% agreement across these different categories. On this basis, we calculated Scott's pi by comparing the percentage expected agreement by chance across the seven coded categories with the actual agreement. It was determined to be 87.5% greater than by chance, indicating a highly reliable coding system.

---

[1] To compare whether individuals who retained in our analysis ($n = 177$) were different from those who did not ($n = 54$) in terms of their baseline scores (i.e., demographics, disease-related factors, pretest value of outcome variable), we performed a t test and a chi-square test. The results revealed that our study sample had more Caucasians and a higher level of education than those who we excluded from the analysis ($\chi^2 = 62.612$, $p < .001$; $|t| = 2.244$, $p < .05$, respectively).

[2] Along with our emotional support categories (i.e., expressions of empathy as well as understanding and statements offering encouragement; inter-item correlation = 92 for writing and inter-item correlation = 98 for reading), five different content categories were coded: (a) requests of help, (b) talk about medical treatment, (c) offers of prayer, (d) references to Christian beliefs, and (e) references to general religious views. Most of these categories are not relevant to the focus of this study and were coded for parallel articles (i.e., religious expression and reception) we are developing.

Next, we integrated the emotional support message coding with action log data, which automatically tracks the message as a chain of expression and reception interactions on an individual keystroke level. This tracking of usage data enabled us to track which participant wrote and/or open which messages and when. Then, we combined these action-level, content-coded data with pretest survey data to examine potential predictors of supportive communication behaviors to answer the research questions posed.

Measures

Dependent Variables

Our main outcome variables are emotional support giving and receiving ($M = 0.12$, $SD = 0.18$ for support giving; $M = 0.33$, $SD = 0.32$ for support). Emotional support giving and receiving were measured by the total count of emotional support categories posted and read divided by the total number of messages posted and read, respectively. Note that this study uses a measure of proportion rather than a raw count. This approach makes more sense than simply using raw scores because people differ in how much they read or write. Thus, the percentage here reflects writing/reading more or less within a specific content category (i.e., emotional support) rather than the overall number of messages written/read.

To answer Research Question 5, additional variables are included: the total number of messages posted and read during the study period ($M = 15.08$, $SD = 43.10$ for total posting; $M = 269.60$, $SD = 538.95$ for total reading). Because the distribution of discussion group usage was highly positively skewed, we conducted log transformations for our dependent variables and used them for subsequent analyses.

Independent Variables

Our independent variables were measured at baseline survey. We observed demographic, disease-related, psychosocial and coping factors. Demographic factors include age, ethnicity (African American = 0, Caucasian = 1), education, and living situation (live alone: *yes* = 1, *no* = 0). The disease-related factor classified patients by their stage of cancer: patients at Stages 0, I, or II were coded as early (=0) and those at Stages III, IV, or inflammatory were coded as late (=1).

Table 1 presents descriptive characteristics of the present study sample. The participants had a mean age of 51.37 years and educational backgrounds with about 31.1% having a high school degree and about 30.5% having at least an associate or technical college degree. The racial characteristics of the sample were 76.3% Caucasian and 23.7% African American; 26.6% participants lived alone, whereas 73.4% participants lived with others. 68.4% of women had early stage cancer, whereas 31.6% of women had late stage cancer.

Three psychosocial factors were considered. Health self-efficacy ($M = 2.75$, $SD = 0.75$, $r = .45$) assessed breast cancer patients' perceptions of self-efficacy specific to health-related situations (Gustafson et al., 2005). Negative emotion ($M = 2.81$, $SD = 0.91$, Cronbach's $\alpha = .89$) includes a range of emotions that are negative in character (Gustafson et al., 2001). Perceived availability of social support ($M = 2.94$, $SD = 0.88$, Cronbach's $\alpha = .83$) assesses the existing informational and emotional support from friends, family, coworkers, and others; it was developed

Table 1. Demographic characteristics

	Participants ($N = 177$)
Age (years)	
M	51.37
SD	11.82
Ethnicity	
Caucasian	135 (76.3%)
African American	42 (23.7%)
Education	
Some junior high	1 (0.6%)
Some high school	13 (7.3%)
High school degree	55 (31.1%)
Some college	54 (30.5%)
Associate or technical degree	25 (14.1%)
Bachelor's degree	23 (13%)
Graduate degree	6 (3.4%)
Live alone	
Yes	47 (26.6%)
No	130 (73.4%)
Stage of cancer	
Early stage (Stage 0, 1, 2)	121 (68.4%)
Late stage (State 3, 4, or inflammatory)	56 (31.6%)

for previous Comprehensive Health Enhancement Support System studies (Gustafson et al., 2001).

Last, we measured strategies for coping with breast cancer with the Brief Cope that is a shorter version of the original 60 item COPE scale developed by Carver and his colleagues (1989). It has strong evidence of validity and reliability (Carver, 1997). These include positive reframing ($M = 2.85$, $SD = 0.95$, $r = .59$), self-blame ($M = 3.68$, $SD = 1.81$, $r = .70$), and religious coping ($M = 3.10$, $SD = 0.92$, $r = .76$). (See the Appendix for the exact wording of each item belonging to these psychosocial and coping scales.)

Analysis

We used hierarchical ordinary least squares regression models to test models predicting our dependent variables.[3] In our analyses, we entered the independent variables as measured at baseline in the following specified sequences to predict social support interactions: demographics (Research Question 1), the disease-related factor

---

[3] To (a) determine whether our results can be validly accepted with an appropriate level of confidence and (b) calculate the effect size in our study using the given sample (J. Cohen, 1988), we conducted a post hoc power analysis using the program developed by Russ Lenth (2006–2009). Our analysis reveals that the values of observed power of the model predicting emotional support giving, emotional support receiving, total posting, and total reading are .89, .85, .99, and .99, respectively. Thus, our sample has the adequate power to examine our research questions, providing greater confidence in our interpretation of the findings.

(Research Question 2), psychosocial factors (Research Question 3), and coping with breast cancer (Research Question 4). For Research Question 5, we entered predictor variables in the same way but we replaced dependent variables with total number of posting and reading.

Results

Total Amount of Emotional Support Giving and Receiving

Our regression model accounted for a total of 13.9% of variance when predicting the provision of emotional support. Among sociodemographic variables, only age remained significant in the final model, with younger patients providing more emotional support ($\beta = -.24$, $p < .01$). For the factors in coping with breast cancer, individuals with higher levels of positive reframing are more likely to give emotional support ($\beta = .20$, $p < .05$), whereas individuals with higher levels of self-blame are less likely to give emotional support to others ($\beta = -.21$, $p < .05$).

Predicting the reception of emotional support, our regression model accounted for a total of 11.2% of variance. Among the demographic factors, only education approached conventional levels of statistical significance, but it did not exceed $p = .05$. This finding suggests that individuals who have high levels of education are more likely to seek emotional support from others ($\beta = .14$, $p < .10$). In addition, perceived availability of social support was significantly and negatively related to reading emotional support messages, suggesting that individuals who lack available support are more likely to seek emotional support from others ($\beta = -.27$, $p < .01$). Last, we found religious coping approached statistical significance, implying that individuals who use religious coping mechanisms less were more likely to seek emotional support from others ($\beta = -.16$, $p < .10$).

Total Number of Posts and Messages Read

As shown in Table 2, our regression models accounted for a total of 28.8% and 20.3% of the variance, respectively, when predicting the total number of messages written and read. We found a significant negative relation between age and the total number of posts ($\beta = -.28$, $p < .001$), a positive relation between race and the total number of messages posted ($\beta = .38$, $p < .001$), and a positive relation between living situation and the total number of posts written ($\beta = .14$, $p < .05$). In other words, patients who are younger, Caucasian, and living alone are more likely to post messages in the discussion group. Among psychosocial factors, we found a negative and significant relation between the perceived availability of social support and the total number of posts, suggesting that individuals who perceive a lack of available social support are more likely to post messages ($\beta = -.31$, $p < .001$). Religious coping was positively related to the total number of posts, thus those who use more religious coping are more likely to post messages ($\beta = .20$, $p < .01$).

We had largely similar results for the number of posts patients read. We found that, with the exception of religious coping, the same factors predicted the number of posts read. Among demographic factors, individuals who are younger, Caucasian, and living alone are more likely to read posts from others in the discussion group ($\beta = -.24$, $p < .01$; $\beta = .31$, $p < .001$; $\beta = .17$, $p < .05$ respectively). We also observed

Table 2. Predicting emotional supportive message seeking and total number of posting and reading from pretest measures

Criterion variable	Emotional support giving	Emotional support receiving	Total posting	Total reading
Block 1: Demographics and disease-related factors (pretest)				
Age	−.24**	.01	−.28***	−.24**
Ethnicity (Caucasian = 1)	.06	.03	.38***	.31***
Education	.12	.14$^{\#}$	.04	.06
Live alone (yes = 1)	.12	.02	.14*	.17*
Stage of cancer (late = 1)	−.01	−.07	.07	.04
Incremental R^2 (%)	5.8	3.1	18.2***	16***
Block 2: Psychosocial factors (pretest)				
Health self-efficacy	−.12	.14	.09	−.10
Negative emotion	−.04	.06	−.07	−.12
Perceived availability of social support	−.10	−.27**	−.31***	−.16$^{\#}$
Incremental R^2 (%)	1.2	5.8*	5.8**	2.7
Block 3: Coping with breast cancer (pretest)				
Positive reframing	.20*	.10	.04	.04
Self-blame	−.21*	−.05	−.14	−.08
Religious coping	.09	−.16$^{\#}$	.20**	.11
Incremental R^2 (%)	6.9*	2.3	4.8*	1.6
Total R^2 (%)	13.9	11.2	28.8	20.3

$^{\#}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

a negative relation that approached significance between the perceived availability of social support and the number of posts read ($\beta = -.16$, $p < .10$).

Discussion

Despite the importance of supportive communication for improved health outcomes, research has not focused on the process and nature of social support exchanges that take place in computer support groups for patients with breast cancer. Research in this area has been particularly slow to take into account both sides of the enacted social support exchanges: message provision and message reception. Therefore, this study aimed to fill this gap by identifying the determinants of engaging in the production and reception of emotional social support messages in CMSS groups.

Consistent with previous findings, ours indicate that two types of social support exchanges represent different constructs with unique antecedents. In particular, individuals who had more resources at pretest were more likely to provide emotional support to others, whereas those who lacked resources were more likely to seek to receive emotional support from peer patients to compensate for deficits in their social network (Han et al., 2010; Helgeson et al., 2000; Winefield, 2006). We found that younger patients provide more emotional support than do older ones. As suggested, this may be because younger patients are less likely to experience emotional and physical distress than are older patients (Nausheen & Kamal, 2007). As expected, individuals who perceived themselves as having little available social support were more likely to seek help from those who have a similar illness experience in order to meet their needs (Han et al.). Among potential factors, it should be noted that diverse coping strategies for breast cancer explained the most substantial variance in predicting the giving of support. This is in line with a previous study that found that individuals who actively cope with cancer were significantly more willing to offer support to other patients than were those who do not (Schwarzer & Weiner, 1991). It is interesting to note that the only exception was education, for which we found that individuals who were more educated were more likely to receive emotional support from others in the discussion group. We can speculate a number of possibilities for this relation: (a) individuals who are more educated may feel pressured in that family, caregivers, and health care providers will expect them to cope well, so it is difficult for them to request any help from them; or (b) individuals with higher education are better at articulating their needs and better at receiving the emotional support they seek. Either account may explain why individuals who are more educated receive higher levels of emotional support from other patients in an online discussion group. Overall, patients engaged in diverse patterns of the giving and/or receiving of emotional social supportive behaviors depending on their needs, resources, and strategies.

Before discussing the implications of this study in greater detail, it is important to highlight some of its shortcomings. We assume that certain type of coping strategies will remain constant during the intervention period. Our measurement approach, however, does not give us the opportunity to see if there is change or consistency of coping strategies during the intervention period since we do not reassess this variable (Lazarus, 1993).[4] Therefore, future studies should consider a longitudinal design to assess change in coping strategies when predicting supportive communication behaviors. Further, the sample solely comprises underserved breast cancer patients. Although this is a worthy population for whom to identify effective use and effect of eHealth interventions, the degree of generalization to other populations remains to be tested.

It is noteworthy that our natural observational measure yielded fairly consistent findings with studies using self-report measures of support giving and receiving (Sarason et al., 1990; Stewart, 1989). Our study found that these unobtrusive measures are useful to uncover the dynamic interaction among users. However, we must acknowledge that our emotional supportive message reception measure does not allow us to discern whether a patient skimmed through the message or whether she processed its content in a thorough manner. Although the tracking data allow us to examine much more detailed and accurate information about users' support

[4] To obtain a sense of individuals' tendency of changing coping strategies for breast cancer between baseline and a 4-month coping measures, we subtracted the posttest value of each coping strategy measures from the pretest value and tested the distribution of these change variables. For example, the median value of change scores between pre- and posttest coping strategies in our data is zero across three coping strategies. For positive reframing, 68.7% of patients had an equal to or higher value of 0, which possibly means that patients maintain or even increase a positive reframing strategy at a 4-month posttest. For a self-blame, 67% of patients maintain or increase this coping strategy. Of patients, 71.6% maintained or increased a religious coping strategy. Even though this evidence is preliminary, patients maintain fairly constant coping strategies during the whole intervention.

receiving behaviors, it can only track whether participants opened a message, which does not necessarily mean that a person read and fully processed the content of the message. Future study should validate our measure by collecting additional data on Web page viewing behavior, potentially using interruptive pop-up questions that query the user on their processing of the materials they just encountered. Further, the cognitive processing of the reception activity may vary from scanning (i.e., exposure) to seeking (i.e., attention) activity. Future research is also needed to develop diverse reception measures from observational data as they will provide more granular insights than those generated by this study.

It is important to note that our finding suggests that the unique contribution of the content-specific discussion use measure (i.e., emotionally supportive message reading and writing) is consequential in understanding support behaviors as compared with the overall discussion use measure (i.e., total reading and writing). In other words, we found that these two measures differed with respect to their antecedents. Consistent with past finding, individuals who lack available social support at baseline post and read more messages, possibly to compensate for the deficit in their social network (Han et al., 2010). They sought emotional support messages from others yet did not offer supportive messages. It may be possible that they wrote support-seeking messages rather than support-giving messages. These possibilities all suggest that discussion may be more dynamic and complicated than previously thought; thus, future research warrants further exploration of these dynamics.

Our findings have a number of practical implications in efforts to develop effective psychosocial support interventions for breast cancer patients. Knowing the specific profiles of those individuals who give and receive emotional support among patients in online discussion groups would be valuable information to allocate resources to specific targets and maximize the benefits for patients. It would, for example, be critical to identify patients who are isolated from their social environment via maladaptive coping and then try to enhance or maintain their state of adaptive coping during a study intervention. Thus, patients with few resources before an intervention stand to benefit most by engaging in online support groups. At the same time, it is important to promote the active and informal leadership role of providing supportive messages for patients who already have some resources available to them in CMSS groups in order to sustain online support initiatives.

This study presented a snapshot of the dynamic process and nature of supportive communication among patients. Through observing this supportive message exchange, we aimed to provide a better understanding of how patients, whether or not they have many resources, are actively helping each other by giving and receiving emotional support to cope with their life-threatening disease in online support groups.

References

Albrecht, T. L., Burleson, B. R., & Goldsmith, D. (1994). Supportive communication. In M. L. Knapp & G. R. Miller (Eds.), *Handbook of interpersonal communication* (pp. 419–449). Thousand Oaks, CA: Sage.

Barbee, A. P., & Cunningham, M. R. (1995). An experimental approach to social support: Interactive coping in close relationships. In B. Burleson (Ed.), *Communications yearbook 18* (pp. 381–413). Thousand Oaks, CA: Sage.

Burleson, B. R., & MacGeorge, E. L. (2002). Supportive communication. In M. Knapp & J. A. Daly (Eds.), *Handbook of interpersonal communication* (pp. 374–424). Thousand Oaks, CA: Sage.

Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the brief COPE. *International Journal of Behavioral Medicine*, *4*, 91–100.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, *56*, 267–283.

Carveth, W. B., & Gottlieb, B. H. (1979). The measurement of social support and its relation to stress. *Canadian Journal of Behavioral Sciences*, *11*, 179–188.

Choi, N. G. (1996). The never-married and divorced elderly: Comparison of economic and health status, social support, and living arrangement. *Journal of Gerontological Social Work*, *26*, 3–25.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Culver, J. L., Arena, P. L., Antoni, M. H., & Carver, C. S. (2002). Coping and distress among women under treatment for early stage breast cancer: Comparing African Americans, Hispanics and non-Hispanic Whites. *Psycho-Oncology*, *11*, 495–504.

Cutrona, C. E., & Suhr, J. A. (1994). Social support communication in the context of marriage: An analysis of couples' supportive interactions. In B. R. Burleson, T. L. Albrecht, & I. G. Sarason (Eds.), *Communication of social support: Messages, interactions, relationships, and community* (pp. 113–135). Thousand Oaks, CA: Sage.

Dunkel-Schetter, C., Blasband, D., Feinstein, L. G., & Bennett Herbert, T. (1992). Elements of supportive interactions: When are attempts to help effective? In S. Spacapan & S. Oskamp (Eds.), *Helping and being helped in the real world* (pp. 83–114). Newbury Park, CA: Sage.

Dunkel-Schetter, C., Folkman, S., & Lazarus, R. S. (1987). Correlates of social support receipt. *Journal of Personality and Social Psychology*, *53*, 71–80.

Du Pré, A. (2000). *Communicating about health*. Mountain View, CA: Mayfield Publishing.

Epping-Jordan, J. E., Compas, B. F., Osowicki, D. M., Oppedisano, G., Gerhardt, C., Primo, K., et al. (1999). Psychological adjustment in breast cancer: Processes of emotional distress. *Health Psychology*, *18*, 315–326.

Gustafson, D. H., Hawkins, R. P., Pingree, S., McTavish, F., Arora, N., Mendenhall, J., et al. (2001). Effects of computer support on younger women with breast cancer. *Journal of General Internal Medicine*, *16*, 435–445.

Gustafson, D. H., McTavish, F. M., Stengle, W., Ballard, D., Hawkins, R., Shaw, B., et al. (2005). Use and impact of eHealth system by low-income women with breast cancer. *Journal of Health Communication*, *10*, 194–218.

Han, J. Y., Hawkins, R. P., Shaw, B., Pingree, S., McTavish, F., & Gustafson, D. (2009). Unraveling uses and effects of an interactive health communication system. *Journal of Broadcasting & Electronic Media*, *53*, 112–133.

Han, J. Y., Shah, D., Kim, E., Namkoong, K., Lee, S., Moon, T. J., et al. (2011). Empathy in online cancer support groups: Distinguishing message expression and reception effects. *Health Communication*, *26*, 185–197.

Han, J. Y., Shaw, B., Hawkins, R. P., Pingree, S., McTavish, F., & Gustafson, D. (2008). Expressing positive emotions within online support groups by women with breast cancer. *Journal of Health Psychology*, *13*, 1002–1007.

Han, J. Y., Wise, M., Kim, E., Pingree, R., Hawkins, R., Pingree, S., et al. (2010). Cancer-related information seeking within an interactive health communication system: An application of the Comprehensive Model of Information Seeking (CMIS). *Journal of Computer-Mediated Communication*, *15*, 367–388.

Helgeson, V. S., Cohen, S., Schulz, R., & Yasko, J. (2000). Group support interventions for women with breast cancer: Who benefits from what? *Health Psychology*, *19*, 107–114.

Iwamitsu, Y., Shimoda, K., Abe, H., Tani, T., Okawa, M., & Buck, R. (2005). Anxiety, emotional suppression, and psychological distress before and after breast cancer diagnosis. *Psychosomatics*, *46*, 19–24.

Johnson, D. J. (1997). *Cancer-related information seeking*. Cresskill, NJ: Hampton Press.

Lazarus, R. S. (1993). Coping theory and research: Past, present, and future. *Psychosomatic Medicine*, *55*, 234–247.

Lenth, R. V. (2006–2009). *Java applets for power and sample size* [Computer software]. Retrieved April 15, 2010, from http://www.stat.uiowa.edu/~rlenth/Power

Lieberman, M. A., & Goldstein, B. A. (2005). Self-help on-line: An outcome evaluation of breast cancer bulletin boards. *Journal of Health Psychology*, *10*, 855–862.

Michalec, B., Willigen, M. V., Wilson, K., Schreier, A., & Williams, S. (2004). The race gap in support group participation by breast cancer survivors: Real or artifact? *Evaluation Review*, *28*, 23–143.

Mosher, C. E., & Danoff-Burg, S. A. (2005). Review of age differences in psychological adjustment to breast cancer. *Journal of Psychosocial Oncology*, *23*, 101–114.

Nausheen, B., & Kamal, A. (2007). Familial social support and depression in breast cancer: An exploratory study on a Pakistani sample. *Psycho-Oncology*, *16*, 859–862.

Osborne, C., Ostir, G. V., Du, X., Peek, M. K., & Goodwin, J. S. (2005). The influence of marital status on the stage at diagnosis, treatment, and survival of older women with breast cancer. *Breast Cancer Research and Treatment*, *93*, 41–47.

Pennebaker, J. W. (1997). *Opening up: The healing power of expressing emotions*. New York: Guilford Press.

Plass, A., & Koch, U. (2001). Participation of oncological outpatients in psychosocial support. *Psycho-Oncology*, *10*, 511–520.

Rice, R., & Katz, J. E. (2000). *Internet and health communication: Experience and expectations*. Thousand Oaks, CA: Sage.

Sarason, B. R., Sarason, I. G., & Pierce, G. R. (Eds.). (1990). *Social support: An interactional view*. New York: Wiley.

Sarason, I. G., Sarason, B. R., & Shearin, E. N. (1986). Social support as an individual difference variable: Its stability, origins, and relational aspects. *Journal of Personality and Social Psychology*, *50*, 845–855.

Schwartz, C., Meisenhelder, J. B., Ma, Y., & Reed, G. (2003). Altruistic social interest behaviors are associated with better mental health. *Psychosomatic Medicine*, *65*, 778–785.

Schwarzer, R., & Weiner, B. (1991). Disease-related stigmas causing attributions, emotions and social support. *Journal of Social and Persona Relationships*, *8*, 133–140.

Shah, D. V., Watts, M. D., Domke, D., & Fan, D. P. (2002). News framing and cueing of issue regimes: Explaining Clinton's public approval in spite of scandal. *Public Opinion Quarterly*, *66*, 339–370.

Shaw, B., Han, J., Kim, E., Gustafson, D., Hawkins, R. P., Cleary, J., et al. (2007). Effects of prayer and religious expression within computer support groups on women with breast cancer. *Psycho-Oncology*, *16*, 676–687.

Shaw, B., Hawkins, R. P., Arora, N., McTavish, F., Pingree, S., & Gustafson, D. (2006). An exploratory study of predictors of participation in a computer support group for women with breast cancer. *CIN: Computers, Informatics, Nursing*, *24*, 18–27.

Smyth, J., True, N., & Souto, J. (2001). Effects of writing about traumatic experiences: The necessity for narrative structuring. *Journal of Social & Clinical Psychology*, *20*, 161–172.

Stewart, M. J. (1989). Social support: Diverse theoretical perspectives. *Social Science and Medicine*, *28*, 1275–1282.

Strecher, V. (2007). Internet method for delivering behavioral and health-related interventions (eHealth). *Annual Review of Clinical Psychology*, *3*, 53–76.

Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: A review with emphasis on underlying mechanisms and implications for health. *Psychological Bulletin*, *119*, 488–531.

Winefield, H. R. (2006). Support provision and emotional work in an Internet support group for cancer patients. *Patient Education and Counseling*, *62*, 193–197.

Appendix

Question Wording

Health Self-Efficacy: It was measured by combining two items with a five-point scale ranging from 0 (*disagree very much*) to 4 (*agree very much*) about the women's perception of their own self-efficacy specific to a health-related situation.

1. I am confident that I can have a positive effect on my health.
2. I am actively working to improve my health.

Negative Emotion: It was measured on a 5-point scale ranging from 1 (*never*) to 5 (*always*) asking how often participants had felt each of the following:

1. Helpless
2. Angry
3. Hopeless
4. Worried
5. Frustrated
6. Anxious

Perceived Availability of Social Support: It was measured on a 5-point scale ranging from 0 (*not at all*) to 4 (*very much*) about how true each of the following statements were:

1. There are people I could count on for emotional support.
2. There are people who will help me understand things I'm finding out about my illness.
3. I am pretty much all alone (reversed).
4. There are people who can help me find out the answers to my questions.

Strategies for Coping with Breast Cancer: It was measured on a 5-point scale ranging from 1 (*I haven't been doing this at all*) to 4 (*I've been doing this a lot*) gauging how patients have tried to deal with stress in the past 2 weeks.

A) Positive Reframing:

1. I've been trying to see breast cancer in a different light, to make it seem more positive.
2. I've been looking for something good in what is happening.

B) Self-Blame:

1. I've been criticizing myself.
2. I've been blaming myself for things that happened.

C) Religious Coping:

1. I've been trying to find comfort in my religion or spiritual beliefs.
2. I've been praying or meditating.