



Published in final edited form as:

Psychooncology. 2014 July ; 23(7): 766–772. doi:10.1002/pon.3477.

How language affects peer responsiveness in an online cancer support group: Implications for treatment design and facilitation

Andrea C. Lewallen, M.A.^{1,*}, Jason E. Owen, PhD, MPH¹, Erin O'Carroll Bantum, PhD², and Annette L. Stanton, PhD³

¹Department of Psychology, Loma Linda University, Loma Linda, CA, USA

²University of Hawai'i Cancer Center, Cancer Prevention and Control Program, University of Hawai'i at Manoa, Honolulu, HI, USA

³Departments of Psychology and Psychiatry/Biobehavioral Sciences, Jonsson Comprehensive Cancer Center, University of California, Los Angeles, CA, USA

Abstract

Objectives—Little is known about how positive group interactions develop in online support groups. 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.

Methods—525 discussion board messages posted by 116 participants in the health-space.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 with high levels of positive emotion were less likely to receive a reply, $OR=.94$, $p=.03$. Common message topics related to self-disclosure (51%), the support group (38.5%), medical experiences (30.9%), and experiences with the website (30.1%). Several 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 ($p<.01$).

Conclusions—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 engagement with Internet-based support groups or interventions.

*Correspondence to: Department of Psychology, Loma Linda University, Loma Linda, CA, USA. alewallen@llu.edu.
Reprint requests should be directed to Jason E. Owen: Loma Linda University, Department of Psychology, 11130 Anderson St., Loma Linda, CA 92350; jowen@llu.edu

Keywords

Cancer; oncology; online support groups; social-support; linguistic; emotions

Introduction

Online Cancer Support groups (OSGs) are an effective means of obtaining social support in an accessible and cost-effective manner [1]. However, OSGs are associated with two major problems: low engagement with the intervention and high drop out rates [2-4]. Furthermore, engagement has been shown to mediate treatment outcomes [5-8] and is likely central to establishing adequate levels of social support through group cohesion. However, little is known about how communication styles influence social engagement among users. Identifying mechanisms that contribute to group cohesion, such as linguistic or content-related features of communications between group members, is essential for designing efficacious online group interventions.

Delivering treatment online can reduce numerous barriers associated with traditional face-to-face therapies, including scheduling conflicts and travel requirements, allowing web-based treatments to reach a larger population. Chronic disease populations, which might be especially limited by treatment schedules and illness symptoms, benefit in several areas through participating in online psychosocial interventions. For example, the Comprehensive Health Enhancement Support System (CHESS) meets the emotional and information needs of patients coping with cancer [9, 5-6]. Online interventions result in improvements in depressive symptoms [10, 8] and quality of life [11], as well as increases in perceived social support and information competence [12]. Other benefits include reduced pain, a trend toward increased post-traumatic growth [8], and improvements in health status for those with poor quality of life [13].

Although online support groups can be an efficacious means of attaining support, they are unlikely to become the gold standard of psychosocial treatment. Despite the greater accessibility of these treatments, higher drop-out and low rates of engagement among participants in online interventions pose a serious barrier to treatment [2-4]. For example, Ruland [14], reported that 71% of participants logged in at least once during the length of the study, but only 29% of males and 59% of females posted any messages to the site's discussion board. Similarly, Schultz [15], found that only 29% of all participants who logged on to an online group posted a message. Within the CHESS support group for breast cancer, Shaw and Hawkins [5] characterized 54% of their sample as being "inactive participants" (defined as writing 3 or fewer messages during the study).

Lack of engagement with message-writing components of interventions is of concern because it interferes with the establishment of group cohesion. Generally, support groups are intended to create social interconnectedness, which fosters emotional and self-expression within the group environment. Low emotional suppression is consistently linked with more positive outcomes across time in group intervention studies [16-17], and the benefit of emotionally expressive coping is greatest when the social context is perceived as receptive to the expression [18]. By design, OSGs attempt to create strong group cohesion that

approximates that which is expected in face-to-face groups. However, online participants demonstrate lower commitment to the group, which is partially attributed to the online environment being subject to fewer social incentives to maintain participation than might typically be experienced in face-to-face groups [19]. As a result, identifying markers of group cohesion, such as responsiveness to messages among members, is central to conducting an OSG as intended.

Fortunately, OSGs provide unique opportunities for researchers to track and analyze specific types of engagement that are more difficult to quantify in face-to-face groups. Given that the majority of online communication occurs via written text (discussion posts, e-mails, blog posts, journal posts), investigators can collect rich data on the communication styles of participants. Messages have been categorized broadly based on overall themes or topics [20-21], or specifically based on keyword analysis [22]. Many studies have examined message content using the Linguistic Inquiry Word Count (LIWC) software [23], which was designed to identify psychologically-relevant keywords used in writing samples. A number of studies have suggested that emotional expression, particularly the expression of negative emotions, is associated with better psychological adjustment across time in cancer survivors [13, 24-25]. Furthermore, LIWC has been used to identify correlates of self-focus, as measured by the use of first-person pronouns [26], and there is some evidence to suggest that pronoun use may predict adjustment and success in changing health behaviors across time [27-28].

Understanding how group cohesion and group processes evolve in OSGs is central to improving overall levels of engagement with online interventions and ultimately improving participant distress across time. We suspect that the development of group cohesion in an OSG is dependent on reciprocal communication between participants. The purpose of the present study is to evaluate the impact of emotional expression, self-expression, and message content on responsiveness in an asynchronous discussion board for cancer survivors. Given that cancer survivors benefit from emotionally expressive coping, and that these benefits are linked to social receptivity [18], we hypothesized that messages containing high levels of emotional expression would be more likely to receive a reply from another participant. Based on previous work on altruism [29], we also anticipated specifically that negative emotional expression would be associated with responsiveness from peers. Additionally we hypothesized that greater self-disclosure would be associated with replies from other participants. Finally, we sought to characterize message topics in introductory messages posted to the discussion board and to evaluate the relationship between message topics and subsequent peer responsiveness.

Method

Participants

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 about how to self-enroll using the study website. Participants were also recruited from a number of Internet

sources, including cancer-related Facebook groups, list serves, and other websites for cancer patients and survivors (Owen et al., *in review*). Eligible subjects were English-speaking and had consistent Internet access. In order to identify the effects of the intervention on levels of clinically significant distress, only those who met criteria for current significant distress (4 on the Distress Thermometer; [30]) were included. Once enrolled, participants were randomized to either immediate access to the health-space.net online support group or to a 12-week waitlist control group. The current sample is derived from all participants who received access to the intervention and included individuals from both groups: those who were provided with immediate access to the group and those who began using the group after completing the 12-week waiting period.

Intervention

Data for the present study were derived from a randomized pilot trial of health-space.net, which is an online social-networking intervention for cancer survivors experiencing significant distress. Although the health-space.net website included a number of distinct treatment elements, including a facilitated asynchronous discussion board, a professionally-facilitated chat, personal pages, and weekly guidance modules, only communications from the asynchronous discussion board are included in the present study. The discussion board was the “home” page of the health-space.net intervention and was considered to be the main communication forum for all group members. Upon beginning the 12-week intervention, participants gained access to the discussion board and were encouraged to use the board for communication with peers and facilitators. Facilitators sent each new participant a welcome message encouraging them to complete a personal profile and to introduce themselves to other group members on the discussion board.

Procedure

Messages posted by participants to the asynchronous discussion board were selected for analysis. A MySQL database was used to store the content of each discussion board post along with other information, such as the type of post (e.g., initial message vs. a reply), the identity of the author, the time it was posted, and the number of replies the post received.

Measures

Emotional Expression and Personal Self-Expression—A total of 525 discussion board posts were collected and analyzed using LIWC2001 [31]. LIWC contains a dictionary of more than 4,000 words and word stems that are each categorized into more than 70 word libraries, including emotional expression and pronoun use, among others. In analyzing a target text, LIWC identifies words and word stems from the source text that are contained in each of the LIWC word libraries and creates a simple count of these words. LIWC provides output for each source text (in this case, a discussion board message) that includes word count and the percentage of words that represent each LIWC word library. Only categories related to emotional expression (i.e., positive and negative emotion) and use of personal pronouns (i.e., first person, second person, third person, and impersonal pronouns) were retained for analysis.

Exploration of topics—All posts were reviewed by the first author in order to identify topics of expression across participants. A modified version of the Giese-Davis et al. [32] theme categories were used to code the presence of 10 topics: *Group Support, Gratitude, Death, Medical Issues, Self-Focused Disclosure, Use of the Healthspace Group Website, Activities outside of the group, Relationships, Information Exchange, and Introduction of the participant to the Group*. Messages were coded such that each topic was identified as either being present or absent within an individual message. This coding procedure allowed multiple topics to be identified as present within a single message. As a result, most messages contained various combinations of topics. A second coder identified topics within 20% of the total messages, and an average kappa of .69 was calculated for all messages indicating substantial inter-rater agreement [33].

Data Analysis

Responsiveness to messages was defined as having received at least one reply from another participant. To examine whether linguistic variables predicted whether a message would receive a reply, logistic regression analyses were used. Responsiveness (present vs. absent) was regressed onto message length (word count), pronoun use (first person, second person, and third person), and emotional expression (positive and negative) separately. To identify whether message topics predict receiving a response from a peer, a 2x2 chi-square was conducted for each message topic with responsiveness.

Results

Sample

The majority of participants were female (78.6%), middle aged ($M = 53.56$, $SD = 10.50$), married (78.6%), and White (83.8 %). Among the 16.2% of participants who were non-White, participants identified themselves as Black (6.8%), Hispanic (4.3%), Multi-ethnic (3.4%) or other ethnicity (1.7%). On average, participants had 16.6 years of education ($SD = 8.3$). A total of 108 participants (93%) reported a single cancer diagnosis, and 7 participants (6%) reported being diagnosed with two or more cancer types. Of those who reported a single primary diagnosis, the cancers were breast (41%, $n = 44$), prostate (14%, $n = 15$), colon/rectal (4%, $n = 4$), gynecologic (10%, $n = 11$), hematologic (4%, $n = 5$), melanoma (4%, $n = 4$), lungs/bronchus (1%, $n = 1$), and other (22%, $n = 24$).

Messages

Original messages (non-replies) averaged a word count of 124.9 words ($SD = 143.2$). Of the 525 original messages, 161 (30.7%) received at least one reply from a participant. The number of participant replies received ranged from 0 to 9. On average, original messages received .51 ($SD = 1.1$) replies from their peers. Original messages tended to be self-focused, and they expressed more positive than negative emotions. Relative to the means of 43 studies analyzing LIWC samples [31], messages were relatively brief (124.9 words vs. 353.0 words in normative data), contained higher proportions of positive emotional expression (3.9% vs. 2.4%) and similar proportions of negative emotional expression (1.7% vs. 1.6%). Messages also contained similar proportions of first person singular (8.1% vs. 8.5%) and second-person pronouns (1.9% vs. 1.0%; see Table 1).

Linguistic Predictors of Responsiveness

Longer messages were significantly more likely to receive a reply from a peer than shorter messages, OR = 1.30 (CI 95% = 1.12, 1.51), $p = .001$. Additionally, messages that had a greater use of second-person pronouns (e.g., you, your) were less likely to receive a reply from a peer, OR = .92 (CI 95% = .86 - .99), $p = .040$. Use of first-person singular pronouns (e.g., I, me), first person plural pronouns (e.g., we, our, etc.), and third person pronouns (e.g., they, their, etc.) were not predictive of receiving a subsequent reply from a peer. With respect to emotional expression, higher use of positive emotion words was associated with a lower likelihood of receiving a reply (OR=.94 (CI 95% = .88, .96), $p = .034$). Use of negative emotion words was not predictive of receiving a peer reply (see Table 2).

Thematic Content of Original Messages

The most common topics were *Self-Focused Disclosure* (51%, $n = 268$), *Group Support* (38.5%, $n = 202$), *Medical Issues* (30.9%, $n = 162$), posts related to *Use of the Healthspace Group* (30.1%, $n = 158$), *Activities outside of the group* (16.4%, $n = 86$), *Relationships* (14.6%, $n = 77$), and posts containing a general *Introduction* of the participant to the group (12.2%, $n = 64$). Less common topics included *Gratitude* (8.6%, $n = 158$), *Information Exchange* (7.2%, $n = 158$), and *Death* (4.0%, $n = 158$). Descriptions of each topic are provided in Table 3.

Thematic Predictors of Peer Replies

A chi-square analysis revealed that messages discussing *Medical Issues* (38.3% received reply when topic present, 27.3 % received reply when topic absent, $\chi^2 = 6.373$, $p = .012$), *Self-Focused Disclosure* (38.1% received reply when topic present, 23.0 % received reply when topic absent, $\chi^2 = 14.073$, $p < .001$), *Relationships* (40.3% received reply when topic present, 29.0% received reply when topic absent, $\chi^2 = 3.906$, $p = .048$), and messages containing an *Introduction* to the group were significantly more likely to receive a reply from peers (46.9% received reply when topic present, 28.4% received reply when topic absent, $\chi^2 = 9.005$, $p = .003$; see Table 4).

Discussion

The present study is among the first to quantitatively examine communication variables as they relate to subsequent peer responses on an online cancer discussion board. Overall, three factors were identified as predictors of responsiveness: greater message length, lower use of second-person pronouns, and lower use of positive emotion words. This study also provided a qualitative approach to characterizing communication by identifying common message topics that were more likely to yield a peer response. Of each topic identified, four topics significantly predicted receiving at least one peer response: *Self-Focused Disclosure*, *Medical Issues*, *Relationships*, and *Introduction* messages.

Messages with higher word count were more likely to receive a response from a peer. Higher message length likely provides the necessary space for an author to discuss topics that elicit peer responsiveness. There was considerable overlap between messages with high word count and message topics that predicted responsiveness. For example, posts that were

highest in word count included *Introduction* messages, and *Introduction* messages often provided a context for *Self-Focused Disclosure* through the telling of one's cancer story. Given that *Introduction* messages were often a participant's first post to the discussion board, they tended to be relatively lengthy in order to allow the author to retell their full cancer story, beginning with initial symptoms and diagnosis, and continuing through the repercussions of treatment and current health status. Lengthy messages rarely focused on the group as a whole, or other participants within the group. These findings suggest that participants are responsive to detailed re-tellings of their peers' experiences, and likely prefer to respond to messages in which authors are open to sharing details of themselves in order to connect with the group. It is also likely that longer messages demonstrate greater investment in the group, which may beget the investment of others.

In a previous study, Shaw and colleagues [26] identified participant use of first-person pronouns as an indicator of self-focus in written expression. Based on this study, we expected that messages containing greater proportions of first-person pronouns would be higher in self-focused expression, making them more likely to receive a reply from a peer. Although this hypothesis was not supported, our findings suggested that messages placing greater focus on others (containing greater proportions of second-person pronouns) were less likely to receive a reply. Messages containing higher proportions of second-person pronouns revealed a common pattern of communication. Although some of these posts contained a broad message directed toward the entire group, they often included messages that were specifically directed to another member of the group by name (e.g., "I hope things get better for you (less pain and an answer to what is wrong with your stomach- I find myself thinking of you often and what you are going through)"). Although authors may feel a sense of cohesion with the individual specifically addressed, these messages do not encourage other participants to add to the discussion by responding. Given that these messages had minimal responses, it is reasonable to suspect that any responses made by the members mentioned may have occurred through the private messaging system rather than the discussion board. Although this type of message may reinforce cohesion among specific pairs of members and should not necessarily be discouraged, facilitators should be aware of their limited contributions to furthering discussions and cohesion among the group as a whole.

Our hypothesis that greater use of negative emotion would predict peer responsiveness was not supported. However, messages with higher positive emotion were *less* likely to receive a reply. In other words, group members were more likely to respond to those whose messages contained less positive emotion overall. This pattern of responses may be best understood within the context of altruism through social support. Altruism has been cited as a common therapeutic factor in cancer support groups [29, 34-35], and may be expressed through a participant's response to peer messages as a means of offering support. As a result, participants may be less compelled to allocate responses to messages displaying a more positive tone, which may be perceived as authored by members with adequate coping and less need for support. As authors reduce the number of positive emotions expressed, a greater need for support may be perceived, eliciting the altruistic motives of other participants.

As mentioned before, there was considerable overlap of topics present in messages. Although *Medical Issues*, *Relationships*, and *Introduction* messages were independently associated with peer responsiveness, it was rare that these topics occurred in the absence of *Self-Focused Disclosure*. For example, introductory messages consistently told personal cancer stories that discussed the author's self in the context of their medical and personal experiences with illness. We suspect that messages containing high levels of Self-focused disclosure are more likely to elicit greater levels of empathy from readers who resonate with the personal experiences shared by the author. Consistent with Yalom's Universality principle [29], readers are likely to establish a connection with the author, which reduces feelings of being alone. Shared experiences such as those described in messages with a Medical topic such as diagnoses and treatments, likely provide a commonality that is more difficult to attain outside of the online group. As a therapeutic factor, Universality may elicit a desire in readers to return support for authors by providing a personal response. The Relationship topic might also prompt peer empathy when reflecting difficulties experienced with family members, friends, or coworkers. These messages may indicate to others that the author is experiencing inadequate social support outside the group context, causing members to feel drawn to providing social support.

There are several limitations of the present study. First, it is important to recognize that cancer survivors in this study had to report significant distress in order to be eligible to participate. Results may not generalize to OSGs comprised of non-distressed survivors. It should also be noted that our sample was over-representative of women with breast cancer. It is possible that group cohesion may have been enhanced by the homogeneity of the group and results may not generalize as well to more heterogeneous groups. Second, with respect to our linguistic data, LIWC uses proportions to control for differences in total word count across messages. Depending on the length of a message, using proportions may under or overestimate the amount of expression specific to each variable. For example, in the two-word message "I'm sad," the proportion of negative emotion words is 50% and is equivalent to a 1000-word message containing 500 negative emotion words. Third, it is worth noting that in many online communities, levels of engagement vary across participants, such that a smaller community of active participants (i.e., a "core") forms within the larger number of enrolled participants. As a result, the messages used are representative of communication among individuals who had higher than average engagement. Therefore, findings may be more informative on how to improve engagement and group cohesion among individuals that are at least minimally engaged with the intervention, but less informative on how to improve engagement overall.

Identifying linguistic and qualitative characteristics that predict peer responses in an OSG is a crucial step in understanding and ameliorating the issue of low engagement that plagues many Internet-based interventions. Based on the findings of this study, facilitators can promote engagement among participants by designing prompts that encourage self-focused disclosure related to cancer, treatment, and/or the impact of cancer on life and relationships. Encouraging participants to take time to write longer, more detailed messages that express specific personal experiences and communicate openly about concerns or challenges are more likely to be met with altruistic and empathic responses that enhance group cohesion

among members. For example, structured guidance exercises or suggestions could be used to assist participants with writing their first posts to a discussion board. While participants may begin to address other members individually as the group evolves, facilitators should take into account that messages directed towards individuals are less likely to receive public responses, and are therefore limited in their contribution to furthering group cohesion. In turn, maintaining adequate cohesion among the group may establish a sense of emotional receptivity, reciprocity, and social support that has the potential to improve the overall efficacy of OSGs.

Acknowledgments

Funded by NCI #1R03CA137391-01A1

References

1. Ritterband LM, Gonder-Frederick LA, Cox DJ, Clifton AD, West RW, Borowitz SM. Internet interventions: In review, in use, and into the future. *Professional Psychology: Research and Practice*. 2003; 34(5):527–534.10.1037/0735-7028.34.5.527
2. Ritterband LM, Thorndike FP, Cox DJ, Kovatchev BP, Gonder-Frederick LA. A behavior change model for internet interventions. *Annals of behavioral medicine: a publication of the Society of Behavioral Medicine*. 2009; 38(1):18–27.10.1007/s12160-009-9133-4 [PubMed: 19802647]
3. Eysenbach G. The law of attrition. *Journal of Medical Internet Research*. 2005; 7(1):e11.10.2196/jmir.7.1.e11 [PubMed: 15829473]
4. Wangberg SC, Bergmo TS, Johnsen JAK. Adherence in Internet-based interventions. *Patient Preference and Adherence*. 2008; 2:57–65. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2770402&tool=pmcentrez&rendertype=abstract>. [PubMed: 19920945]
5. Shaw BR, Hawkins R, McTavish F, Pingree S, Gustafson DH. Effects of insightful disclosure within computer mediated support groups on women with breast cancer. *Health Communication*. 2006; 19(2):133–42.10.1207/s15327027hc1902_5 [PubMed: 16548704]
6. Shaw BR, Han JY, Baker T, Witherly J, Hawkins RP, McTavish F, Gustafson DH. How women with breast cancer learn using interactive cancer communication systems. *Health Education Research*. 2007; 22(1):108–19.10.1093/her/cyl051 [PubMed: 16829544]
7. Wise M, Han JY, Shaw B, McTavish F, Gustafson DH. Effects of using online narrative and didactic information on healthcare participation for breast cancer patients. *Patient Education and Counseling*. 2008; 70(3):348–56.10.1016/j.pec.2007.11.009 [PubMed: 18201859]
8. Lieberman MA, Golant M, Giese-Davis J, Winzlenberg A, Benjamin H, Humphreys K, Kronenwetter C, Russo S, Spiegel D. Electronic support groups for breast carcinoma: a clinical trial of effectiveness. *Cancer*. 2003; 97(4):920–5.10.1002/cncr.11145 [PubMed: 12569591]
9. McTavish FM, Gustafson DH, Owens BH, Wise M, Taylor JO, Apantaku FM, Berhe H, Thorson B. CHES: An interactive computer system for women with breast cancer piloted with an underserved population. *Journal of Ambulatory Care Management*. 1995; 18(3):35–41. [PubMed: 10143478]
10. Winzelberg AJ, Classen C, Alpers GW, Roberts H, Koopman C, Adams RE, Ernst H, Dev P, Taylor BC. Evaluation of an internet support group for women with primary breast cancer. *Cancer*. 2003; 97(5):1164–73.10.1002/cncr.11174 [PubMed: 12599221]
11. Rehse B, Pukrop R. Effects of psychosocial interventions on quality of life in adult cancer patients: meta analysis of 37 published controlled outcome studies. *Patient education and counseling*. 2003; 50(2):179–86. [PubMed: 12781933]
12. Gustafson DH, Hawkins R, Pingree S, Mctavish F, Arora NK, Mendenhall J, Cella DF, Serlin RC, Funmi A, James S, Andrew S. Effect of Computer Support on Younger Women with Breast Cancer. *Journal of General Internal Medicine*. 2001; 16:435–445. [PubMed: 11520380]

13. Owen JE, Klapow JC, Roth DL, Shuster JL, Bellis J, Meredith R, Tucker DC. Randomized pilot of a self-guided internet coping group for women with early-stage breast cancer. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*. 2005; 30(1):54–64.10.1207/s15324796abm3001_7 [PubMed: 16097906]
14. Ruland CM, Jeneson A, Andersen T, Andersen R, Slaughter L, Moore SM. Designing Tailored Internet Support to Assist Cancer Patients in Illness Management. *AMIA Symposium Proceedings*. 2007:635–639.
15. Schultz PN, Stava C, Beck ML, Vassilopoulou-Sellin R. Internet message board use by patients with cancer and their families. *Clinical Journal of Oncology Nursing*. 2002; 7(6):663–7.10.1188/03.CJON.663-66 [PubMed: 14705483]
16. Giese-Davis J, Koopman C, Butler LD, Classen C, Cordova M, Fobair P, Benson J, Kraemer HC, Spiegel D. Change in emotion-regulation strategy for women with metastatic breast cancer following supportive-expressive group therapy. *Journal of Consulting and Clinical Psychology*. 2002; 70(4):916–925.10.1037//0022-006X.70.4.916 [PubMed: 12182275]
17. Lepore, SJ.; Smyth, JM. *The writing cure: How expressive writing promotes health and emotional well-being*. Washington DC, US: American Psychological Association; 2002.
18. Stanton AL, Danoff-Burg S, Cameron CL, Bishop M, Collins CA, Kirk SB, Sworowski LA, Twillman R. Emotionally expressive coping predicts psychological and physical adjustment to breast cancer. *Journal of Consulting and Clinical Psychology*. 2000; 68(5):875–882.10.1037//0022-006X.68.5.875 [PubMed: 11068973]
19. Owen JE, Bantum EO, Golant M. Benefits and challenges experienced by professional facilitators of online support groups for cancer survivors. *PsychoOncology*. 2009; 18(2):144–155. [PubMed: 18546089]
20. Klemm P, Reppert K, Visich L. A nontraditional cancer support group: The internet. *Computers in Nursing*. 1998; 16(1):31–36. [PubMed: 9454992]
21. Grimsbo GH, Finset A, Ruland CM. Left hanging in the air: Experiences of living with cancer as expressed through e-mail communications with oncology nurses. *Cancer Nursing*. 2010; 34(2): 107–116.10.1097/NCC.0b013e3181eff008 [PubMed: 20921887]
22. Seale C, Ziebland S, Charteris-Black J. Gender, cancer experience and internet use: a comparative keyword analysis of interviews and online cancer support groups. *Social Science & Medicine*. 2006; 62(10):2577–90.10.1016/j.socscimed.2005.11.016 [PubMed: 16361029]
23. Pennebaker JW, Mehl MR, Niederhoffer KG. Psychological aspects of natural language. use: our words, our selves. *Annual Review of Psychology*. 2003; 54:547–77.10.1146/annurev.psych.54.101601.145041
24. Lieberman MA, Goldstein BA. Not all negative emotions are equal: the role of emotional expression in online support groups for women with breast cancer. *Psycho-oncology*. 2006; 15(2): 160–8.10.1002/pon.932 [PubMed: 15880627]
25. Low CA, Stanton AL, Danoff-Burg S. Expressive disclosure and benefit finding among breast cancer patients: mechanisms for positive health effects. *Health Psychology*. 2006; 25(2):181–189.10.1037/0278-6133.25.2.181 [PubMed: 16569109]
26. Shaw BR, Han JY, Hawkins RP, McTavish FM, Gustafson DH. Communicating about self and others within an online support group for women with breast cancer and subsequent outcomes. *Journal of Health Psychology*. 2008; 13(7):930–9.10.1177/1359105308095067 [PubMed: 18809644]
27. Arntz A, Hawke LD, Bamelis L, Spinhoven P, Molendijk ML. Changes in natural language use as an indicator of psychotherapeutic change in personality disorders. *Behavior Research and Therapy*. 2012; 50:191–202.
28. Rohrbaugh MJ, Shoham V, Skoyen JA, Jensen M, Mehl MR. We-talk, communal coping, and cessation success in a couple-focused intervention for health-compromised smokers. *Family Process*. 2012; 51:107–121. [PubMed: 22428714]
29. Yalom, DI.; Leszcz, M. *The Theory and Practice of Group Psychotherapy*. Fifth. New York, NY: Basic Books; 2005.

30. Hawkes AL, Hughes KL, Hutchison SD, Chambers SK. Feasibility of brief psychological distress screening by a community-based telephone helpline for cancer patients and carers. *BMC Cancer*. 2012; 10(14):1–10. [PubMed: 22212211]
31. Pennebaker, JW.; Francis, ME.; Booth, RJ. LIWC2001 Manual. New Jersey Erlbaum Publishers; Mahwah: 2001. Linguistic Inquiry and Word Count.
32. Giese-Davis, J.; Spiegel, D. Emotional expression and cancer progression. In: Davidson, RJ.; Scherer, KR.; Hill Goldsmith, H., editors. *Handbook of Affective Sciences*. Oxford University Press; Oxford: 2003. p. 1053-1082.
33. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977; 33(1):159–174. [PubMed: 843571]
34. Shaw BR, McTavish F, Hawkins R, Gustafson DH, Pingree S. Experiences of women with breast cancer: exchanging social support over the CHESS computer network. *Journal of Health Communication*. 2000; 5(2):135–59. 10.1080/108107300406866 [PubMed: 11010346]
35. Vilhauer RP. Perceived benefits of online support groups for women with metastatic breast cancer. *Women's Health*. 2009; 49(5):381–404.

Table 1
Linguistic characteristics of original messages posted to the health-space discussion board

LIWC Category	Proportion of words used		
	Mean	SD	Range
Positive emotion	.039	.053	0-1
Negative emotion	.017	.023	0-.33
First person singular	.086	.044	0-.22
First person plural	.007	.015	0-.14
Second person	.018	.031	0-.25
Third person	.010	.016	0-.08

Note. $N = 525$ original messages; average word count per message was 125, $SD = 143.2$.

Table 2

Linguistic predictors of peer responsiveness

	OR	95% CI	B	Wald test	<i>p</i>
Word count	1.30**	1.1-1.5	.263	12.027	.001
First-person singular pronouns	1.03	1.0-1.1	.026	1.249	.264
First-person plural pronouns	1.02	1.0-1.1	.021	.125	.723
Second-person pronouns	.92*	0.9-1.0	-.086	5.446	.020
Third-person pronouns	1.05	1.0-1.2	.045	.531	.466
Positive emotion	.94*	0.9-1.0	-.065	4.536	.033
Negative emotion	1.01	1.0-1.1	.012	.099	.753

Note. Logistic regression models predicted peer responsiveness (at least one reply to original message) or lack of peer responsiveness (no replies to original messages)

Table 3
Definitions of identified topics

Topic	Definition of Topic
Self-focused disclosure	Discussed the author's emotional state, physical health, frustration due to illness-related symptoms, and personal stories regarding their diagnosis and treatment.
Group Support	Addressed specific group members, facilitators, or the group in general. Messages typically offered support to others rather than seeking support from the group.
Medical Issues	Described medical exams, treatments, issues related to medical staff, or concerns related to medical costs and health insurance.
Use of the Website	Described a participant's use of the website, such as plans to attend chat sessions or requests for information about how to use the site.
Outside Activities	Described activities unrelated to the online group, such as recreational experiences, work activities, or cancer-related fundraising.
Relationships	Discussed issues communicating cancer-related experiences with others, and the impact of diagnosis and treatment on friends and family.
Introduction	Introduced new participants to the group and typically discussed diagnosis, treatment, and impact of cancer on life in general.
Gratitude	Included expressions of gratitude or thankfulness.
Information Exchange	Requested information from others or attempted to share advice with others.
Death	Typically contained references to the death of a family member, friend, or group member. References to the author's own death were included but rare.

Table 4

Relation of message topic with subsequent peer responsiveness

Topic	% Total messages containing topic	% received peer reply		χ^2	p
		Topic present	Topic absent		
Self***	51.0	38.1	23.0	14.1	< .001
Support group	38.5	25.7	33.7	3.7	.053
Medical*	30.9	38.3	27.3	6.4	.012
Website	30.1	25.3	33.0	3.0	.081
Outside activities	16.4	43.9	29.8	0.9	.354
Relationships*	14.6	40.3	29.0	3.9	.048
Introduction**	12.2	46.9	28.4	9.0	.003
Gratitude	8.6	35.6	30.2	0.6	.457
Info exchange	7.2	31.6	30.6	0.1	.899
Death	4.0	38.1	30.4	0.6	.451

Note. N = 525 messages total. df = 1 for all chi-squares.