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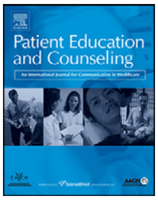

Expression and reception of treatment information in breast cancer support groups: How health self-efficacy moderates effects on emotional well-being

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ABSTRACT

Objectives: To examine the effects of exchanging treatment information within computer-mediated breast cancer support groups on emotional well-being, and to explore whether this relationship is moderated by health self-efficacy.
Methods: Sample: 177 breast cancer patients using an electronic Health (eHealth) program with discussion group. Measure: expression and reception of treatment information; emotional well-being scale (0, 4 months). Analyses: hierarchical regression.
Results: Effects of expression and reception of treatment information on emotional well-being were significantly greater for those who have higher health self-efficacy.
Conclusions: Results conditionally support prior research finding positive effects of treatment information exchanges among breast cancer patients. Such exchanges had a positive impact on emotional well-being for those with higher health self-efficacy, but they had a negative influence for those with lower health self-efficacy.
Practice implications: Given that the association between emotional well-being and exchanging treatment information was moderated by health self-efficacy, clinicians should explain the role of health self-efficacy before encouraging patients to use eHealth systems for treatment exchanges.
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1. Introduction

Breast cancer is the most frequently diagnosed cancer in women in the United States and the second leading cause of cancer death [1,2]. Thus, the diagnosis of breast cancer may have a detrimental impact on patients' mental health, including feelings of isolation and loneliness [3], depression and anxiety [4]. To overcome these psychological concerns, breast cancer patients often seek social support not only from family members and friends but also from fellow patients in social support groups. The social support groups, either online or offline, allow cancer patients to meet others who are, or have been, struggling with similar health problems, share their coping experiences, and make emotional connections, all of which may play a positive role in managing their own illnesses. Moreover, interaction with other cancer patients in a social support group can provide the group members' with opportunities to give and receive informational, emotional, and instrumental support [5].

1.1. Treatment information exchange among breast cancer patients

Beginning with cancer diagnosis, patients face a number of novel challenges. To handle the problems encountered during the diagnosis and treatment processes, it is imperative to acquire relevant information about medical strategies and options. Treatment information is the most frequently sought information among cancer patients [6–8]. Such information encompasses various issues involved in treatment procedures, such as medical descriptions and options, available drugs, and physical symptoms including side effects [7–12]. Research has shown that cancer patients feel more empowered when they believe they have as much health information as they need to make good treatment decisions [13]. Breast cancer patients with satisfactory treatment information cope better with medical regimes [14] and show positive psychological outcomes, such as higher quality of life and lower distress, depression, and anxiety [15–20].

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Although many cancer clinicians and cancer-related websites provide timely and accurate information [21,22], treatment information shared in Computer-Mediated Social Support (CMSS) Groups provides the group participants some unique benefits. Different from other medical information, treatment information shared in cancer CMSS groups is usually based on the patients' own experience. The CMSS participants can read not only various facts about treatment alternatives but also what to expect and how to cope during various medical procedures and therapies. Accordingly, the knowledge and essential coping skills the patients acquire from participating in the CMSS groups have been found to contribute to reducing distress levels and preparing them for the cancer treatment process [23,24].

Previous research has shown that sharing cancer treatment information in CMSS groups is associated with greater health competency. This improvement in cancer patients' information competence about their illness has been linked to exchanging treatment information in CMSS groups [25]. In particular, Shaw et al. [2] found that health information competence is more strongly related to sharing experiential treatment information among CMSS participants than learning medical information from professionals.

Sharing treatment information in CMSS groups also has a positive impact on participants' emotional well-being. In-depth interviews with twelve breast cancer patients who participated in CMSS revealed that exchanging treatments information made them perceive their treatment experience as less stressful, threatening and frightening. Moreover, women with breast cancer reduced their negative expectations and took their treatments more calmly when receiving treatment information from other breast cancer patients via CMSS [24]. Also, Shaw et al. [24] found that treatment information or experience of breast cancer survivors encouraged new breast cancer patients to cope with their health crisis.

1.2. Health self-efficacy and patients' well-being

Although a sizable body of research has examined the effects of exchanging treatment information in CMSS settings [2,21–25], little attention has been paid to psychological factors that may condition the effects of treatment information exchange on patients' well-being. One possible moderator of these effects may be self-efficacy, which has been considered to be positively associated with emotional well-being [26]. In social learning theory, Bandura [27] defined self-efficacy as people's belief in their abilities to generate the motivation, harness the resources, and exercise the action needed to influence events that affect their lives. In short, it is the belief in one's capabilities to produce desirable outcomes [28].

Self-efficacy has been conceptualized as various health-specific efficacies [29]. Bandura [26] considered patient perceptions of self-efficacy in a health content to be an important cognitive mechanism when dealing with illness situations. When patients seek information, their self-efficacy regarding health outcomes or goals can shape their information seeking strategies. Individuals who believe they have a great deal of control over achieving health-related goals may actively seek out information about their disease, while those who doubt their ability may not search for the information or may even avoid it. Previous studies have labeled individuals' beliefs about the ability to manage their health conditions as health self-efficacy [30,31].

Witte [32] argues that when risk perceptions are high, such as when dealing with life threatening diseases, efficacy beliefs take on added importance. Heightened levels of personal risk may generate high level of anxiety. When individuals feel anxious about their overall well-being due to their perception of being at risk from a serious disease, their self-efficacy – perceived ability to manage the disease – greatly influences their behavior decisions [32]. When perceived risk is high, low levels of health self-efficacy are likely to be counter-productive, whereas high levels of self-efficacy tend to foster risk-reducing behaviors.

A significant positive association also has been found between cancer patients' perceived self-efficacy and their overall mood states and quality of life, such as emotional, physical, and social well-being [33–37]. For example, newly diagnosed breast cancer patients with higher self-efficacy had less depression and anxiety, and a more positive and active coping style than those who have less self-efficacy [34]. A recent longitudinal study on 684 breast cancer patients also revealed that self-efficacy at baseline was associated with emotional well-being and had a direct effect on emotional functioning [35]. Similarly, Lin [36] observed that perceived self-efficacy had a significant negative correlation with intensity and interference of pain in daily life among cancer patients, which could enhance other health outcomes such as emotional or social well-being. In other studies, self-efficacy was found to buffer the relationship between depression and cancer, influencing physical dysfunction and symptom management [37,38].

1.3. Aims and hypotheses

Bringing these two lines of inquiry together, this study examines the effect of treatment information expression and reception within online support groups, focusing the moderating role of cancer patients' level of health self-efficacy. This builds on recent work attempting to distinguish between message expression and reception effects. Most communication effects are conceived as a consequence of informational or persuasive message reception [39]. Complementing this perspective involved understanding that "the act of expression might change the message sender, that expressed ideas often do not exist intact, if at all, in the speaker's mind prior to expression" [40]. As discussed above, research has shown that treatment information expression and reception in CMSS groups helped participants to view surgeries and therapies as less stressful, threatening and frightening [24]. This leads the first hypothesis.

H1. Treatment information expression (H1-1) and reception (H1-2) in CMSS groups will be positively associated with emotional well-being.

Prior research shows patients' perception of personal efficacy is an important factor in dealing with their illness. For instance, when confronting adverse events, those who retain the belief that they will be able to exert control over their thoughts and actions tend to persevere. In addition, individuals with a high level of health self-efficacy are more likely to reject negative thoughts about themselves than individuals with a sense of personal inefficacy [41]. Thus, when breast cancer patients exchange treatment information in CMSS groups, their levels of health self-efficacy should play a key role in understanding the shared information. Those with high health self-efficacy will likely benefit more from the treatment information because they believe they have the motivation and resources to put the information into action. The opposite should be true to those low in health self-efficacy, with higher levels of treatment information exchange reducing well-being. Accordingly, we offer the second hypothesis, in two parts.

H2. The relationship between emotional well-being and treatment information expression (H2-1) and reception (H2-2) will be moderated by health self-efficacy such that the positive relationship between these variables will be greater for those with high self-efficacy.

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2. Methods

2.1. Participants

The data analyzed in this study were collected as a part of the Digital Divide Pilot Project (DDPP). DDPP was a population-based study to examine the feasibility of reaching low-income women with breast cancer with the electronic Health (eHealth) system. Eligibility criteria required that participants were at or below 250% of the federal poverty level, not homeless, within one year of diagnosis with early-stage breast cancer or within one year of a diagnosis of metastatic breast cancer. Participants were identified through a variety of sources, such as the National Cancer Institute's Cancer Information Service, hospitals and clinics, public health departments, and the Medicaid program, and recruited from rural Wisconsin and Detroit, Michigan. Once a patient was referred to the study, a research team member reviewed eligibility criteria with the patient. Eligible women who agreed to participate were informed the purpose of the study and the risks and benefits of being involved, and were asked to read and sign a consent form. The participants were also informed that their computer use would be monitored [30]. After submitting their pre-test, all study participants were provided a computer with access to the Comprehensive Health Enhancement Support System (CHESS) for 4 months. They also received personal training on how to use CHESS, including message reading and writing in CMSS. Detroit recruitment started in June 2001 and ended in April 2003 and Wisconsin recruitment began in May 2001 and ended in April 2003.

Initially 341 eligible patients were recruited. Among them, 286 patients joined the study and 231 completed both the pretest and a 4-month posttest surveys (81% retention rate). Of the 231 participants, 177 women either wrote or read messages in CMSS groups during the four-month study period. While 174 women read at least one message, 24 women did not write any message. On average, a DDPP participant posted 15.1 messages (SD = 43.1) and read 269.6 (SD = 549.0) posts. To investigate the effect of participation in CMSS on health benefits, the sample of this study is limited to the 177 women who wrote or read at least one message in CHESS during the four-month study period. To figure out the difference in the sample characteristics between those who are included in our analysis ($N = 177$) and those who are not ($N = 54$), we compared baseline scores of demographics, disease factors, and pretest score of the dependent variable. The results revealed that our study sample had more Caucasians ($\chi^2 = 62.61$, $p < .001$) and higher educated respondents than those excluded from analysis ($|t| = 2.24$, $p < .05$).

2.2. Intervention: computer-mediated groups in CHESS

CMSS groups examined in this study were part of the "CHESS: Living with Breast Cancer" eHealth system, which was developed by an interdisciplinary team of health care clinicians, system engineers, computer programmers, health educators and communication specialists [42]. It is an Internet-based system that provides patients and their caregivers with a range of conceptually distinct services [21,30]. The support groups within CHESS are text-based, asynchronous bulletin boards allowing users to anonymously share information and support. Groups are monitored by a trained facilitator to ensure that discussions are supportive and do not contain unchallenged inaccurate or harmful information. However, the facilitator neither controls the type and quality of information presented by group participants, nor takes an active role in guiding the topics of communication and rarely intervenes.

2.3. Data construction

The data used in this study resulted from a reconstruction of the DDPP data. First, a computer-aided content analysis program, InfoTrend, was employed to analyze participants' word usage within individual discussion posts. Second, each coded discussion post was combined with action log data that show the multi-dimensional expression/reception nexus among CHESS users. Finally, these newly constructed data on treatment information writing and reading were combined with survey data collected for the DDPP study.

2.3.1. Computer-aided content analysis

This study employed InfoTrend to code for key ideas and idea combinations in participant message texts through the implementation of a dynamic rule structure [43]. Different from other word-counting programs, this program uses the computer language to enter (a) idea categories, (b) words that tap or reveal those idea categories, and (c) rules that allow pairs of ideas in the text to be combined to form more complex meaning. With these three components, human coders can create and refine specific coding rules capturing syntactical complexities of language. InfoTrend requires a series of iterations testing the performance of the coding rules before the computer is permitted to code all content. These steps led to greater precision in the computer's application of the content analysis [39,43].

Using this program, 19,695 message posts produced by DDPP participants were analyzed. Consistent with norms of CMSS groups, a discrete message post was the unit of analysis. Through the coding process described above, seven social support categories were coded: (1) medical treatment information exchanges, (2) statements offering encouragement and support, (3) requests of help, (4) expressions of empathy and understanding, (5) offers of prayer, (6) references to Christian beliefs, and (7) references to general religious views. Many of these coding categories required the InfoTrend system to capture the syntactical complexities of language. For the treatment exchange category, we developed a customized dictionary on all possible types of treatment-related words used in our discussion groups: (1) surgery, (2) medical therapy, (3) general treatment, (4) drugs and creams, (5) other medical terms. Examples of each subcategory are presented in Table 1. To test the effect of exchanging treatment information on our hypothesized outcomes, the other six content categories were used as control variables.

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. This was a conservative test, as an entry was coded as a disagreement if any aspect of it was misidentified by the computer. On this basis, Scott's Pi was calculated by comparing the percent expected agreement by chance across the seven coded categories with the

Table 1
Subcategories and their examples of the treatment information exchange category.

Subcategories	Examples
Surgery	"lumpectomy," "mastectomy," "plastic surgery," "reconstruct," etc.
Medical therapy	"mammogram," "radiation," "chemo," "hormone," etc.
General treatment term	"heal-" "infection" "treatment," "test," "therapy" "check-up," etc.
Drugs	"Tamoxifen," "Taxol," "Tylenol," "Demerol," "depressant," "vanicream," etc.
Other medical terms	"tumor," "lymph," "gland," "immune-" "node" "polyp" "grade," "anesthesia," "ct scan," "cat scan," "biops-" "colonoscop" "arimidex-" "taxotare-" "celexa-," "effexor-," etc.

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actual agreement. It was determined to be 87.5% greater than by chance [39].

2.3.2. Action log data and survey data

When the effect of CMSS use is examined, especially when the support groups are operated with text-based and asynchronous bulletin boards, it is crucial to distinguish effects arising from message expression and those arising from message reception. To address this issue, we integrated the discussion message coding with action log data that tracks the message as a chain of expression and reception events. The action log data collection system was developed by the CHESS research team and automatically tracked usage data on an individual keystroke level. This enabled us to track which participant wrote and/or read each message. Finally, this action-level, content-coded data is combined with survey data to examine how treatment information expression and reception is linked to psychosocial health outcome to patients [39].

2.4. Measures

2.4.1. Dependent variable: emotional well-being

Emotional well-being is the primary dependent variable of this study. Participants were asked to indicate the level of frequency on a five-point scale (0 = not at all, 4 = very much), asking how often they had felt each of the following: (1) “I feel sad,” (2) “I feel like my life is a failure,” (3) “I feel nervous,” (4) “I am worried about dying,” (5) “I feel like everything is an effort,” and (6) “I am worried that my illness will get worse.” These items were reversed before computing an emotional well-being scale (pretest: $M = 2.36$ $SD = 1.01$ Cronbach’s $\alpha = 0.87$; posttest: $M = 2.80$ $SD = .82$ Cronbach’s $\alpha = .85$). The reliability, validity, and responsiveness to clinical changes of these items have been tested extensively in the field of health communication [2,30,44,45].

2.4.2. Independent variable: treatment information expression and reception

Both expression and reception of medical treatment information are the primary independent variables in this study. Treatment expression is operationalized by the total counts of treatment categories produced divided by total number of all coding categories posted. Likewise, treatment reception is constructed as the total counts of treatment expressions read divided by total number of all coding categories consumed. It is noteworthy that this study uses a measure of proportion rather than a raw number of the total counts. With this approach, we can rule out the potential confounding effect of writing/reading other types of supportive categories specified in our coding scheme. In addition, it allows us to take into account the variance among participants in the volume of message expression and message reception. On average participants wrote about treatment information 14 times and other types of supportive expressions 27 times during the study period. Conversely, they read about treatment information an average of 239 times and read supportive statements an average of 486 times.

2.4.3. Moderating variable: health self-efficacy

Health self-efficacy was measured during the pretest with a three-item scale assessing breast cancer patients’ perceptions of self-efficacy about health-related situation [29]. Respondents were asked to report their level of agreement on the following three statements: (1) “I was confident that I could make a difference in my health,” (2) “I set some definite goals to improve my health,” and (3) “I actively worked to improve my health” (pretest: $M = 2.79$ $SD = .73$ Cronbach’s $\alpha = 0.76$). All items were measured on a five-point scale ranging from zero (disagree very much) to four (agree very much) [2,30].

2.4.4. Control variables

We included four social and demographic controls: age, ethnicity (a dummy variable with Caucasian coded 0 and Non-Caucasian coded 1), education, and living situation (a dummy variable with ‘‘Living alone’’ coded 1 and ‘‘Living not alone’’ coded 0). In addition to these controls, this study includes patients’ clinical characteristics that were expected to have an influence on the dependent variable: stage of cancer, the number of surgeries or treatments between pre and posttests, duration between diagnosis and intervention (days), and physical well-being at the posttest. Physical well-being was measured with Karnofsky’s performance scale. Patients were asked to report which best describes how they had been feeling in the week before the posttest. Responses were recorded on a 5-point scale that ranged from *feeling normal with no complaints and able to carry on your usual activities* to *very sick, hospitalized for some time or in bed all of the time.* Finally, based on the study design, the effect of having a peer advocate was controlled. To examine the effect of a peer advocate on several health outcomes, the original study randomly assigned participants into either the CHESS group or the CHESS plus peer advocate group. According to Gustafson and his colleagues [29], there was a significant difference in emotional well-being between the peer advocate and non-peer advocate groups. Because emotional well-being is the primary dependent variable of this study, we included the peer advocate variable as a covariate in our analysis. Of the 177 participants included in this study, 94 (53.1%) participants had a peer advocate and 83 (46.9%) did not have a peer advocate.

Table 2
Demographic and clinical characteristics.

Demographic characteristics	Study participants ($n = 177$)
Age	
Mean (SD)	51.37 (11.82)
Ethnicity	
Caucasian	135 (76.3%)
Non-Caucasian	42 (23.7%)
Live alone	
Yes	47 (26.6%)
No	130 (73.4%)
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%)
Clinical characteristics	
Stage of cancer	
Stage 0	17 (9.6%)
Stage I	29 (16.4%)
Stage II	53 (29.9%)
Stage III	27 (15.3%)
Stage IV	9 (5.1%)
Inflammatory	7 (4.0%)
N/A	35 (19.8%)
Surgery or treatment	
Mastectomy	81 (45.8%)
Lumpectomy	89 (50.3%)
Chemotherapy	112 (63.3%)
Radiation	87 (49.2%)
Hormonal therapy	73 (41.2%)
# of surgeries/treatments between pre- and post-test	
Mean (SD)	1.19 (.85)
Time: diagnosis to intervention (days)	
Mean (SD)	109.23 (118.36)
Physical well-being (posttest)	
Mean (SD)	1.96 (.89)

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2.5. Analytic framework

To examine the effects of expression and reception of treatment information, and their interaction effect with health self-efficacy on emotional well-being, we employed hierarchical regression analysis. The eight demographic and clinical characteristic variables were entered in a first block with peer advocate and pretest value of emotional well-being. A second block consisted of health self-efficacy, followed by a third block of expression and reception of treatment information. In the final block, two interaction terms were entered to test if health self-efficacy moderated the effects of expression and reception of treatment information within CHESS on emotional well-being. Both interaction terms were constructed by multiplying the standardized values of the main effect variables — health self-efficacy with expression and reception of treatment information — to reduce possible multicollinearity problems between the interaction terms and their components [46]. This provided us with an initial assessment of whether expression and reception of treatment information, health self-efficacy, and their interactions had significant effects on emotional well-being.

3. Results

3.1. Patient characteristics

The mean age of the participants was 51 years old. 76.3% of women were Caucasian. 26.6% of the patients lived alone. Participants had a diverse educational background, with 31.1% having a high school education, 30.5% having attended some college, 27.1% were college graduates and 3.4% attended graduate school. Participants had one surgery or medical treatment in the study period on average. Of the 177 patients, 9.6% had stage 0, 16.4% had Stage I, 29.9% had Stage II, 15.3% had Stage III, 5.1% had Stage IV, and 4.0% had inflammatory breast cancer. 35 (19.8%) participants did not know their exact cancer stages. Average period between diagnosis and the Intervention was 109 days. Table 2 summarizes the descriptive statistics of all the patients' demographic and clinical characteristics.

Table 3
Hierarchical regression analyses predicting hypothesized outcome variable.

Criterion variable	Emotional well-being (posttest)
Block 1. Control variables	
Emotional well-being (pretest)	$.60^{***}$
Age	.00
Ethnicity (Caucasian = 1)	−.07
Education	$.16^{*}$
Live alone (Yes = 1)	$-.14^{*}$
Peer advocate (Yes = 1)	$.15^{*}$
Physical well-being (prostest)	−.11
Stage of cancer	.02
Number of surgery or treatments	$-.14^{*}$
Time: diagnosis to intervention	$-.25^{***}$
Δ R^2(%)	*46.4^{***}*
Block 2. Health self-efficacy	
Health self-efficacy (pretest)	.08
Δ R^2(%)	*0.4*
Block 3. Main effect: treatment information exchange	
Treatment information expression	−.04
Treatment information reception	.07
Δ R^2 (%)	*0.4*
Block 4. Interaction effect	
Health efficacy (pretest) × treatment information expression	$.13^{*}$
Health efficacy (pretest) × treatment information reception	$.16^{*}$
ΔR^2 (%)	*2.8^{*}*
Total R^2 (%)	*48.6^{***}*

Notes. Cell entries are final standardized Beta (β) for Blocks 1, 2, and 3, while cell entries are before-entry standardized Beta (β) for Block 4. $N = 140$.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

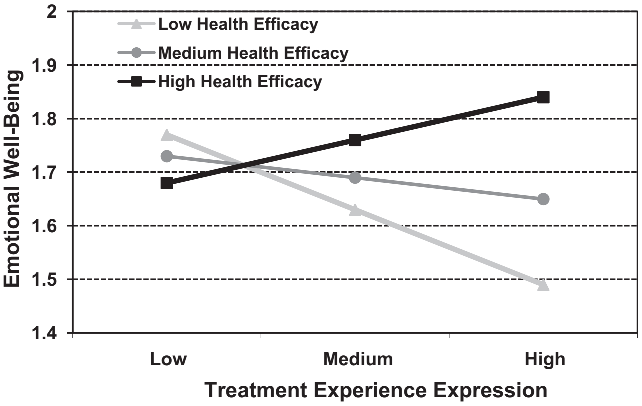

Fig. 1. Interaction between health self-efficacy and treatment information expression on emotional well-being (scale ranges only partially displayed on *Y*-axis).

3.2. Main effects

The first hypothesis predicted that expression and reception of treatment information within CMSS would be positively associated with emotional well-being. Contrary to our expectation, however, both expression and reception of treatment information were not directly related to patients' emotional well-being (Treatment information Expression: $\beta = -.04$, *ns*; Treatment information reception: $\beta = .04$, *ns*). Thus, H1-1 and H1-2 were not supported.

3.3. Interaction effects of health self-efficacy

The second hypothesis stated that the relationship between emotional well-being and treatment information expression and reception would be moderated by health self-efficacy such that those with high self-efficacy would benefit more from such exchanges. As expected, both interaction effects between health self-efficacy and treatment word expression and reception were statistically significant (health self-efficacy × treatment information expression: $\beta = .13$, $p < .05$; health self-efficacy × treatment information reception: $\beta = .16$, $p < .05$; see Table 3). To examine the nature of these findings, we decomposed these interactions. As

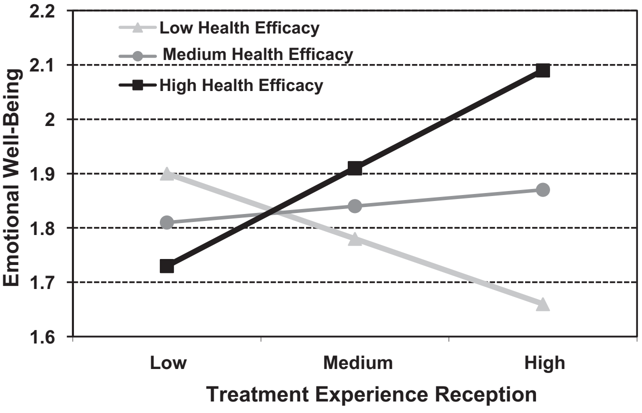

Fig. 2. Interaction between health self-efficacy and treatment information reception on emotional well-being (scale ranges only partially displayed on *Y*-axis).

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Fig. 1 illustrates, treatment information expression had positive impact on emotional well-being for those who have higher health self-efficacy, while it had negative influence for those who have lower health self-efficacy. Similarly, when people with higher health self-efficacy read treatment information, they experience benefits to their emotional well-being. In contrast, for those who have lower health self-efficacy, reading treatment related expressions reduced their emotional well-being (see Fig. 2). In sum, the effects of treatment expression and reception on emotional well-being were moderated by health self-efficacy. These results support the hypotheses 2-1 and 2-2.

4. Discussion and conclusion

4.1. Discussion

This study explored the effect of treatment information expression and reception among CMSS users on their emotional well-being and its interactive relationship on health self-efficacy. Only the interaction hypothesis was supported for both treatment information expression and reception. Thus, breast cancer patients' health self-efficacy appears to condition whether they experience emotional benefits from exchanging treatment information. Those who have higher health self-efficacy seemingly accrue emotional benefits from expression and reception of treatment information in CMSS, while these same exchanges have negative effects on those who have lower health self-efficacy. This finding is particularly interesting, because extant qualitative research has observed that treatment information exchanges among breast cancer patients have several positive health outcomes, including psychological benefits [24]. However, this study suggests that the positive effects are conditional, based on the patients' level of health self-efficacy. In future study, the influence of health self-efficacy should be considered when the effects of expression and reception of messages in CMSS groups are examined.

It is noteworthy that this study has taken a novel methodological approach to examine the treatment information expression and reception effects in CMSS groups. First, we conducted a computer-aided content analysis, using InfoTrend. As mentioned earlier, InfoTrend enables us to deal with syntactical complexities of language. This is critical in coding expressions that are context specific. Thus, employing InfoTrend makes our findings more robust. Second, we combined these codings with group participants' action log data and survey data. This procedure enabled us to track the multi-dimensional expression/reception nexus among CMSS users and examine the effects of message exchange on patients' psychosocial benefits by actually tracking what each participant wrote or read within this e-health system. This type of granular analysis has distinct advantages in terms of understanding communication effects with CMSS, especially distinguishing expression and reception effects. Yet given the somewhat dated nature of the data presented here, it seems to be necessary to replicate our findings with a more recently collection.

4.2. Conclusion

This study contributes to the literature on treatment information effects by showing the moderating effect of health self-efficacy on the relationship between exchanging treatment information and breast cancer patients' emotional well-being. It extends the CMSS effects research by examining expression and reception effects separately and in a more precise manner. Future research should attempt to understand the contextual meaning of treatment information as it is being used within CMSS groups. By simply counting treatment information such as "mammogram" and "radiation," it may be hard to fully understand the context in which patients discuss their health issues. Additional research is needed to develop more sophisticated coding rules to capture the full richness of the treatment expression and reception occurring in the groups of women with breast cancer, as well as other CMSS settings. Further, experimental testing is needed to examine the causal relationship between the intervention and emotional well-being, controlling the influence of patients' coping mechanisms developed through interactions and experiences during treatment, and ruling out the possibility that those with greater emotional well-being simply exchange more treatment information when feeling efficacious.

4.3. Practice implications

The benefits of social support groups, either online or offline, has been well recognized among scholars and healthcare practitioners. Treatment information is among of the most frequently discussed ideas within these systems. The benefits of these sorts of exchanges for emotional well-being are well established. Considering the findings of this study, however, clinicians may wish to reflect on the moderating role of health self-efficacy for the relationship between exchanging treatment information and emotional well-being. If the benefits of exchanging treatment information in CMSS are conditioned by health self-efficacy, clinicians should explain the roles of health self-efficacy to breast cancer patients before encouraging such exchanges within e-health systems. In other words, breast cancer patients should be informed that giving and receiving treatment information in CMSS groups could have harmful effects on their emotional well-being when they do not have enough confidence in their ability to manage their health conditions. Further study of these relationships is needed.

Conflict of interest statement

None declared.

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References

[1] American Cancer Society. Cancer facts and figures 2009; Available from: URL: http://www.cancer.org/downloads/STT/500809web.pdf.
[2] Shaw B, Han JY, Baker T, Witherly J, Hawkins RP, McTavish F, Gustafson D. How women with breast cancer learn using interactive cancer communication systems. Health Educ Res 2007;22:108–19.
[3] Andersen BL. Psychological interventions for cancer patients to enhance the quality of life. J Consult Clin Psychol 1992;60:552–68.
[4] Spiegel D. Psychosocial aspects of breast cancer treatment. Semin Oncol 1997;24:36–47.
[5] Rains SA, Young V. A meta-analysis of research on formal computer-mediated support groups: examining group characteristics and health outcomes. Hum Commun Res 2009;35:309–36.
[6] Molenaar S, Sprangers M, Oort F, Rutgers E, Luiten E, Mulder J, et al. Exploring the black box of a decision aid: what information do patients select from an interactive Cd-Rom on treatment options in breast cancer? Patient Educ Couns 2007;65:122–30.
[7] Jenkins V, Fallowfield L, Saul J. Information needs of patients with cancer: results from a large study in UK cancer centres. Br J Cancer 2001;84:48–51.

[8] Rutten LJ, Arora NK, Bakos AD, Aziz N, Rowland J. Information needs and sources of information among cancer patients: a systematic review of research (1980–2003). Patient Educ Couns 2005;57:250–61.

[9] Blank TO, Adams-Blodnieks M. The who and the what of usage of two cancer online communities. Comput Human Behav 2007;23:1249–57.

[10] Klemm P, Bunnell D, Cullen M, Soneji R, Gibbons P, Holecek A. Online cancer support groups: a review of the research literature. Comput Inform Nurs 2003;21:136–42.

[11] Klemm P. Late effects of treatment for long-term cancer survivors: qualitative analysis of an online support group. Comput Inform Nurs 2008;26:49–58.

[12] Owen JE, Klapow JC, Roth DL, Tucker DC. Use of the internet for information and support: disclosure among persons with breast and prostate cancer. J Behav Med 2004;27:491–505.

[13] Bakker DA, Fitch MI, Gray R, Reed E, Bennett J. Patient-health care provider communication during chemotherapy treatment: the perspectives of women with breast cancer. Patient Educ Couns 2001;43:61–71.

[14] Rubin HR, Gandek B, Rogers WH, Kosinski M. Patients' ratings of outpatient visits in different practice settings: results from the medical outcomes study. J Amer Med Assoc 1993;270:835.

[15] Davies NJ, Kinman G, Thomas RJ, Bailey T. Information satisfaction in breast and prostate cancer patients: implications for quality of life. Psychooncology 2008;17:1048–52.

[16] Mallinger JB, Griggs JJ, Shields CG. Patient-centered care and breast cancer survivors' satisfaction with information. Patient Educ Couns 2005;57:342–9.

[17] Okamura H, Fukui S, Nagasaka Y, Koike M, Uchitomi Y. Psychoeducational intervention for patients with primary breast cancer and patient satisfaction with information: an exploratory analysis. Breast Cancer Res Treat 2003;80: 331–8.

[18] Rainey LC. Effects of preparatory patient education for radiation oncology patients. Cancer 1985;56:1056–61.

[19] Schofield PE, Butow PN, Thompson JF, Tattersall MH, Beeney LJ, Dunn SM. Psychological responses of patients receiving a diagnosis of cancer. Ann Oncol 2003;14:48–56.

[20] van der Molen B. Relating information needs to the cancer experience: information as a key coping strategy. Eur J Cancer Care 1999;8:238–44.

[21] Gustafson DH, Hawkins R, Pingree S, McTavish F, Arora NK, Mendenhall J, et al. Effect of computer support on younger women with breast cancer. J Gen Intern Med 2001;16:435–45.

[22] Gustafson DH, Hawkins RP, Boberg EW, McTavish F, Owens B, Wise M, et al. CHESS: ten years of research and development in consumer health informatics for broad populations, including the underserved. Int J Med Inform 2002;65: 169–77.

[23] Leventhal H, Johnson JE. Laboratory and field experimentation: developing a theory of self-regulation. In: Wooldridge PJ, Schmitt M, Skipper JK, Leonard RC, editors. Behavioral science and nursing theory. 1983. p. 189–262.

[24] Shaw B, McTavish F, Hawkins RP, Gustafson D, Pingree S. Experiences of women with breast cancer: exchanging social support over the CHESS computer network. J Health Commun 2000;5:135–59.

[25] van Uden-Kraan CF, Drossaert CH, Taal E, Shaw B, Seydel ER, van de Laar MA. Empowering processes and outcomes of participation in online support groups for patients with breast cancer, arthritis, or fibromyalgia. Qual Health Res 2008;18:405–17.

[26] Carver C, Harris S, Lehman J, Durel L, Antoni M, Spencer S, et al. How important is the perception of personal control? Studies of early stage breast cancer patients. Pers Soc Psychol Bull 2000;26:139–49.

[27] Bandura A. Self efficacy mechanism in human agency. Am Psychol 1982;37: 122–47.

[28] Bandura A, Pastorelli C, Barbaranelli C, Caprara GV. Self-efficacy pathways to childhood depression. J Pers Soc Psychol 1999;76:258–69.

[29] Schwarzer R, Renner B. Social-cognitive predictors of health behavior: action self-efficacy and coping self-efficacy. Health Psychol 2000;19: 487–95.

[30] Gustafson DH, McTavish FM, Stengle W, Ballard D, Hawkins R, Shaw BR, et al. Use and impact of eHealth system by low-income women with breast cancer. J Health Commun 2005;10:194–218.

[31] Lee SY, Hwang H, Hawkins R, Pingree S. Interplay of negative emotion and health self-efficacy on the use of health information and its outcomes. Communic Res 2008;35:358–81.

[32] Witte K. Putting the fear back into fear appeals: the extended parallel process model. Commun Monogr 1992;59:329–49.

[33] Cunningham AJ, Lockwood GA, Cunningham JA. A relationship between perceived self-efficacy and quality of life in cancer patients. Patient Educ Couns 1991;17:71–8.

[34] Burgess C, Morris T, Pettingale K. Psychological response to cancer diagnosis–II. Evidence for coping styles (coping styles and cancer diagnosis). J Psychosom Res 1988;32:263–72.

[35] Rottmann N, Dalton SO, Christensen J, Frederiksen K, Johansen C. Self-efficacy, adjustment style and well-being in breast cancer patients: a longitudinal study. Qual Life Res 2010;19:827–36.

[36] Lin CC. Comparison of the effects of perceived self-efficacy on coping with chronic cancer pain and coping with chronic low back pain. Clin J Pain 1998;14:303–10.

[37] Bisschop MI, Kriegsman DM, Beekman AT, Deeg DJ. Chronic diseases and depression: the modifying role of psychosocial resources. Soc Sci Med 2004;59:721–33.

[38] Broome BA. The impact of urinary incontinence on self-efficacy and quality of life. Health Qual Life Outcomes 2003;1:35.

[39] Han JY, Shah DV, Kim E, Namkoong K, Lee SY, Moon TJ, et al. Empathic exchanges in online cancer support groups: distinguishing message expression and reception effects. Health Commun, in press.

[40] Pingree RJ. How messages affect their senders: a more general model of message effects and implications for deliberation. Commun Theory 2007;17:439–61.

[41] Ozer E, Bandura A. Mechanisms governing empowerment effects: a self-efficacy analysis. J Pers Soc Psychol 1990;58:472–86.

[42] 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 Educ Couns 2007;70:348–56.

[43] Shah DV, Watts MD, Domke D, Fan DP. News framing and cueing of issue regimes: explaining Clinton's public approval in spite of scandal. Public Opinion Q 2002;66:339–70.

[44] Brady MJ, Cella DF, Mo F, Bonomi AE, Tulsky DS, Lloyd SR, et al. Reliability and validity of the functional assessment of cancer therapy-breast quality-of-life instrument. J Clin Oncol 1997;15:974–86.

[45] Cella D, Paul D, Yount S, Winn R, Chang CH, Banik D, et al. What are the most important symptom targets when treating advanced cancer? A survey of providers in the national comprehensive cancer network (NCCN) Cancer Invest 2003;21:526–35.

[46] Cohen J, Cohen J. Applied multiple regression/correlation analysis for the behavioral sciences. Mahwah, N.J: L. Erlbaum Associates; 2003.

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