Support Matching and Satisfaction in an Online Breast Cancer Support Community

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ABSTRACT

Research suggests that online health support benefits chronically ill users. Their satisfaction might be an indicator that they perceive group interactions as beneficial and a precursor to group commitment. We examined whether receiving emotional and informational support is satisfying in its own right, or whether satisfaction depends on matches between what users sought and what they received. Two studies collected judgments in a breast cancer support community of support users sought, support they received, and their expressed satisfaction. While receiving emotional or informational support in general positively predicted satisfaction, users expressed less satisfaction when they sought informational support but received emotional support. There was also a tendency for users to express more satisfaction when they sought and received informational support. On the other hand, users were equally satisfied with emotional and informational support after seeking emotional support. Implications for membership commitment and interventions in online support groups are discussed.

Author Keywords

Social support; support groups; computer-mediated communication; health informatics; breast cancer

ACM Classification Keywords

H.5.3. Information Interfaces and Presentation: Group and Organization Interfaces: Asynchronous interaction, Computer-supported cooperative work, Evaluation/methodology, Web-based interaction.

INTRODUCTION

Research across decades shows that social support can improve psychological functioning, mental and physical health, and longevity [14, 24]. Many people with chronic or life-threatening illnesses, especially cancer patients and survivors, participate in online health support groups [5]. A recent meta-analysis demonstrates that online support groups are often effective in reducing depression and increasing self-efficacy and quality of life [15].

The straightforward prediction from many theories of social support, such as the classic stress-buffering theory of support [6], is that people will both receive more benefit and perceive they are receiving more when they receive more support. However, the empirical evidence is not so simple [21, 25]. Previous studies suggest that whether the support people receive matches or mismatches the support they need or seek is important in determining their benefits and satisfaction [e.g., 8, 9, 16, 28]. However, it is difficult to draw firm conclusions about the importance of matching from prior research due to the variations in the way matching is defined, populations and support types studied, and the outcome measures used.

The current research focuses on recipients' expressed satisfaction with support and the group that provided it in an online breast cancer support community. Satisfaction can be an immediate outcome linked to a specific episode of support, unlike longer-term outcomes like depression or quality of life. As Hecht observed, "Satisfaction is commonly conceived of as the affect experienced when expectation-type standards are fulfilled" (p. 357) [10]. Therefore, satisfaction is a proxy for benefits because satisfied individuals perceive they are getting benefit from an exchange. Satisfaction is also an important determinant of people's commitment to a group, which determines whether they will stick around to receive benefits from it. For example, Anderson et al. found that satisfaction has positive associations with cohesion and consensus [1].

Receiving emotional and informational support

Because exchanges of informational and emotional support dominate conversation in health support groups [e.g., 19, 18], most research has focused on them. Ridings and Gefen reported that 76% of people who join online health groups do so to exchange emotional and informational support [17].

Our first research question is whether receiving emotional or informational support by itself is sufficient for increasing

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expressed user satisfaction in an online breast cancer support community.

Emotional support refers to the provision of caring, sympathy, or encouragement. An example in our breast cancer support community is: [...] *I do understand the frustration and anger and sadness of when medicines fail you and then returning to unknown territory once more* [...] *I wish you the best on the Ixempra* [...]. [1] Previous work has shown that peer discussion that centers on emotional support bolsters the psychological outcomes of individuals with cancer [13].

Informational support refers to the provision of information or advice. An example in our support community is: [...] *It was explained to me that microcalcifications look like as if one were to throw rock salt on a blacktop driveway and they would "cluster and fall" in many locations* [...]. Individuals in cancer support groups share experiences regarding their illness, medical care, side effects, physician interactions, financial difficulties, etc. Previous work has found that sharing information in cancer support groups is a key component in improving psychological health [12].

Matching support seeking and support provision

Our second research question is whether users express more satisfaction when the emotional and informational support they receive matches the support they sought. While Uses and Gratifications Theory offers a broad framework to examine matching between user needs and various types of media use [e.g., 20], we focus here on the social support literature because our research questions address support received and support matching in an online cancer support group.

The support people receive is not necessarily the support they seek. In a survey study of women with breast cancer, Reynolds and Perrin found that matching between desired and received support had a greater impact on psychosocial functioning than did the amount of support received [16]. In particular, getting support that one did not want (i.e., mismatched support) was negatively related to psychosocial functioning.

Cutrona proposed that support is successful when support matches needs arising from causes of stress [7]. In a lab-based test of this claim, Curtona and Suhr had married participants talk about stressors with their partners [9]. Although the authors treated controllability as a proxy for support seekers' needs, they did not directly measure the support sought. In general, participants were more satisfied with the more informational and emotional support they received from their spouses. While emotional support was satisfying irrespective of controllability of stressors, satisfaction with informational support varied with controllability of stressors for support givers and receivers.

Cutrona et al. examined support matching (specified as emotional disclosure leading to emotional support and advice/information requests leading to informational support) on perceptions of partner sensitivity and marital satisfaction [8]. Partner sensitivity was rated higher when participants expressed their emotions and got emotional support in return. However, when participants made information requests, support matching or mismatching did not significantly influence partner sensitivity ratings. In addition, a mismatch in which one partner expressed emotions and received informational support in return reduced martial satisfaction. However, Cutrona et al. acknowledged that their coding system did not adequately capture support seekers' intent [8]. Thus, it is impossible to understand from this study what support seekers were actually looking for.

Wolff et al. examined the relationship between needed and gotten emotional support on complaints about health and experience of negative affect among older and younger people [28]. This research used a daily survey and did not assess support sources. Degree of matching was equated to a "balance score" computed by subtracting daily ratings of emotional support needed from daily ratings of emotional support received (p. 70) [28]. Younger participants had more complaints about health and more negative affect when they received too little or too much emotional support relative to their needs (i.e., a matching effect). In contrast, the more emotional support older participants got, the less negative affect they reported. However, this research is limited in that it only explored emotional support.

Support matching has also been examined in online health support groups. In an Internet-based support community for self-harm called "SharpTalk," Smithson et al. examined the type of support "opening posters" seemed to be seeking and their reactions to the support they received from group members who replied to their posts [22]. Using conversation analysis, they found "[...] posters often prioritized the telling of their problems, while respondents often oriented to possible advice [...] [P]osters did appear to respond to requests to elaborate, and to statements of 'being here' [...] better than they did to offers of advice, which they often rejected or ignored" (p. 498) [22]. Even when opening posters requested advice, these users appeared to be searching for empathy or "[...] a way into a supportive conversation" (p. 498) [22]. Thus, there was no evidence that support matching was beneficial in the case of asking for and receiving advice. What appeared to be beneficial for these users was receiving emotional support in general. However, given the qualitative nature of this study, what users wanted from the group could only be inferred from their reactions.

Thus, prior research suggests that support matching may be important, but due to variations in populations,

[1] All quoted posts from the examined online community are lightly disguised in this paper to preserve user anonymity.

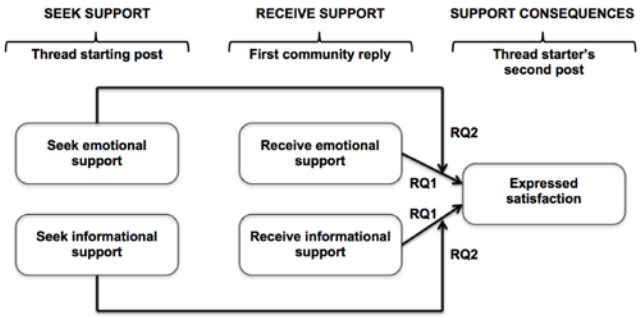

Figure 1. Conceptual model of relationships between seeking support, receiving support, and satisfaction

operationalization of matching, support types, and outcomes measured, previous work shows mixed findings. We systematically investigated the benefits of receiving support in general and receiving support matched to support sought within an online breast cancer support community.

STUDY 1: MATCHING BETWEEN SEEKING AND RECEIVING SUPPORT

To address gaps in prior work, we gathered observers' judgments of support seeking (message intent) in the thread starting post, support received in the first reply from the community, and satisfaction the thread starter expressed in her first follow-up post in the same thread. Figure 1 shows our conceptual model of examined relationships between support sought, support received, and user satisfaction.

Research Site

This study investigated threads from the discussion boards of a large online breast cancer support community. In these discussion boards, breast cancer patients, survivors, and caregivers post questions, self-disclose personal stories and health information, and learn about others' experiences. These discussion boards are organized by forums, containing topic threads.

One thousand threads were randomly selected from this online community's discussion boards (containing 66 forums at the time of data collection), and these threads served as the units of analysis (thread length: M = 20.97 posts; Mdn = 9 posts; min = 1 post; max = 2327 posts). For each thread, we analyzed support processes occurring at three times (Figure 1): (1) the thread starting post, which we sometimes refer to as simply the initial post; (2) the first reply to that post, which we sometimes refer to as the first reply; and (3) the thread starter's second or follow-up post in the same thread. Following Barak and Gluck-Ofri's methods [3], we chose the first reply for analysis because reply structure (i.e., who is replying to whom) can become complex as threads get longer. In contrast, the first reply is most likely a response to the thread starting post. Furthermore, Wang et al. found similar results when examining the relationships between thread starting posts and the support they received in analyses based on the first reply or the first five replies [27]. Six hundred thirty-eight threads in our sample contained a follow-up post by the thread starter. The number of community replies between thread starter users' first and second posts was M = 4.04; Mdn = 2; SD = 5.86; min = 0; max = 75.

Measuring support sought, support received, and expressed satisfaction

We posted tasks as Human Intelligence Tasks (HITs) on the crowdsourcing online marketplace Amazon Mechanical Turk (MTurk) and had workers from this community (Turkers) read portions of the cancer support threads and make judgments of support sought, support received, and satisfaction in posts from the breast cancer support community threads. Buhrmester et al. reported that MTurk data quality matched or surpassed psychometric standards of traditional studies [4]. Furthermore, Snow et al. demonstrated that the combined ratings of between five to seven Turkers yielded judgments of textual content comparable to judgments made by experts, including expressions of emotion, event timing, similarity of words, disambiguation of word meaning, and language-based entailment/implication [23].

To qualify for our HITs, Turkers had to have a United States location and a 98% approval rate for their previous work on MTurk. Turkers received $0.05 per HIT when they judged the amount people were seeking and receiving support (seeking support task and receiving support task) and $0.12 per HIT when they judged satisfaction (satisfaction task). To increase their attention while doing HITs, Turkers also highlighted portions of the post text that supported their numerical judgments. Ten Turkers completed each HIT (a Turker could complete multiple HITs in the same task if he chose to, but he could not complete the same HIT twice), and tasks were completed by different sets of Turkers. The judgments Turkers made in seeking support, receiving support, and expressed satisfaction tasks are described below.

Seeking support in thread starting posts

Turkers were provided with brief definitions of emotional support elicitation ("When seeking emotional support, the writer is trying to get understanding, encouragement, affirmation, sympathy, or caring.") and informational support elicitation ("When seeking informational support, the writer is trying to get advice, referrals or knowledge."), taken from Bambina [2]. They then read a thread starting post and rated how much the post was seeking emotional support and seeking informational support on Likert scales with end-points "1 (not at all)" and "7 (strongly)".

Social support received from community replies

Turkers were provided with brief definitions of emotional support ("Emotional support messages provide understanding, encouragement, affirmation, sympathy, or caring.") and informational support ("Informational support messages provide advice, referrals or knowledge."). They read a thread starting post for context and the first reply it

Variable	*M*	*SD*	Min	Max	ICC
Seek emo support	2.75	1.66	1	7	0.91
Seek info support	4.21	2.01	1	7	0.95
Receive emo support	2.68	1.43	1	6.5	0.92
Receive info support	2.93	1.47	1	7	0.92
Composite satisfaction	4.80	0.71	1.93	6.58	0.92

Table 1: Descriptive statistics and intra-class correlations for seeking emotional and informational support in thread starting posts (*N*=1000); receiving emotional and informational support in first replies (*N*=974); and satisfaction in thread starters' second posts (*N*=638).

received and rated the amount of emotional support and informational support provided by the reply on Likert scales with end-points "1 (none)" and "7 (a great deal)".

Satisfaction in thread starters' second posts

To assess expressed satisfaction, Turkers were shown a pair of posts – a thread starter's initial post and her second post in the same thread, but none of the intervening replies – and then answered four questions about the exchange. (1) "Overall, how satisfied was this person in her second message with the conversation that she participated in?" (2) "How satisfied was this person in her second message with the health information that she received from the other members of this online community?" (3) "How much did this person's level of distress change from her first message to her second message?" and (4) "How much did this person's closeness to the other members of this online community change from her first message to her second message?" Questions 1 and 2 were assessed on Likert scales with end-points "1 (Completely dissatisfied)" and "7 (Completely satisfied)", and Questions 3 and 4 were assessed on Likert scales with end-points "1 (Decreased very much)" and "7 (Increased very much)".

Analytic Methods

To assess agreement among judges, we computed the intra-class correlations (ICC) for each task. The ICC can be interpreted as the proportion of variance in judgments that is attributable to the stimuli that were judged (rather than error or biases among different judges). Table 1 shows the ICCs for Study 1 variables.

We aggregated Turkers' judgments by calculating the mean Turker rating for each question. The four questions form a highly reliable composite satisfaction scale (Cronbach's alpha = 0.89). We combined ratings from the four question measures into a composite satisfaction measure by first reversing the distress question and then averaging across questions. Table 1 provides unstandardized descriptive statistics for Study 1 variables.

Below we provide an example of a thread starting post, the first community reply, and the thread starter user's follow-up post. (The initial post also had two additional replies, which are not shown.) The thread starter expressed an above average amount of satisfaction in her follow-up post.

Thread starting post (seek emotional support = 1, seek informational support = 6.1):

Can someone explain this to me. What does it mean for them to be clustered? I have many flecks, according to mammo results, within of this pacman shaped thing. The lump is deep and can't be felt, but is visible on mammo...but nothing was shown on US. They looked like three little circles that, if connnected, would create a triangle.

First community reply post (receive emotional support = 2.2; receive informational support = 4.6):

[User name omitted for privacy],

It was explained to me that microcalcifications look like as if one were to throw rock salt on a blacktop driveway and they would "cluster and fall" in many locations. They usually don't appear on a sonogram but as I've read do line the ducts of the breast so they seem to be scattered but they can be running through one duct that may extend throughout several places in the breast. Dr. Susan Love's book is very detailed in explaining this and I'd much rather you get a hold of that book and read her expert description than mine.

Good luck with your research. Hope I could be of some assistance.

Thread starter's second post to the thread (composite satisfaction = 5.4):

Thank you all so much for your thoughts. This web site is fantastic and everyone here is delightful. My doctor has requested a biopsy, it will be conducted on the 30th. Like many here until then I am waiting on pins and needles. Since the biopsy is a synthesis of my biggest fears, needles, heights and cancer...I'm feeling VERY nervous, but hopefully that the results will be OK. Again, thanks for everyone's support.

Results

Six hundred thirty-eight threads in our sample had a follow-up post from the thread starter, introducing potential selection bias because over one third of the thread starters did not have a follow-up post. This is of concern because the act of posting a second time might be influenced by the replies the initial post received and may itself reflect satisfaction. To control for selection bias, we employed Heckman selection models [11], which control for a thread starter's propensity to write a follow-up post when analyzing the effects of support receiving and matching on user expressed satisfaction.

Table 2 presents Heckman models predicting expressed satisfaction from the extent to which initial posts sought support and replies provided it. The number of replies between thread starters' first and follow-up posts is included as a control variable. Model 1 presents main effects of the predictors, and Model 2 presents main and interaction effects. The dependent variable in both

		Model 1 Satisfaction main effects (RQ1)			Model 2 Satisfaction main effects (RQ1) and interaction effects (RQ2)		
	Variables	**Coef.**	**SE**	***p***	**Coef**	**SE**	***p***
Predictor variables (Outcome: Composite satisfaction)	Seek emotional support	-.080	.052	.118	-.088	.053	.096
	Seek informational support	.122	.052	.020	.159	.054	.003
	Receive emotional support	**.154**	**.050**	**.002**	**.136**	**.051**	**.008**
	Receive informational support	**.179**	**.047**	**.000**	**.164**	**.048**	**.001**
	Posts between thread starter posts 1 and 2	.248	.038	.000	.227	.039	.000
	Seek emo support X Receive emo support				**.012**	**.038**	**.752**
	Seek emo support X Receive info support				**-.006**	**.037**	**.866**
	Seek info support X Receive emo support				**-.090**	**.040**	**.025**
	Seek info support X Receive info support				**.079**	**.041**	**.052**
	Constant	.543	.072	.000	.493	.075	.000
Selection variables (Selection: Having a second post in the thread)	Has profile	.265	.075	.000	.242	.075	.001
	Post count before thread	-.003	.040	.934	-.001	.038	.969
	Seek emotional support	.230	.050	.000	.236	.050	.000
	Seek informational support	.134	.052	.010	.140	.051	.006
	Receive emotional support	-.051	.050	.304	-.058	.049	.242
	Receive informational support	.042	.048	.375	.038	.047	.420
	Constant	.259	.056	.000	.272	.056	.000

Table 2: Heckman selection models predicting composite satisfaction in a follow-up post (N = 638) from seeking emotional and informational support in the thread starting post, and receiving emotional and informational support in the first reply post. Model 1 includes only main effects, while Model 2 includes main effects and interactions. Effects in bold pertain to RQ1 and RQ2. Models 1 and 2 include selection models that predict whether a thread starter would have a follow-up post. The Likelihood Ratio test shows the selection and prediction equations were not independent. Model 1 LR test of indep. eqns. $x^2 = 14.92$ ($p = 0.0001$). Model 2 LR test of indep. eqns. $x^2 = 15.96$ ($p = 0.0001$).

Heckman models was composite satisfaction. To control for selection biases, Models 1 and 2 in Table 2 also contain selection models which predict if a thread starter would have a follow-up post based on whether the thread starter created a profile on the site (*Has profile*), the number of posts the thread starter created before initiating the thread (*Post count before thread*), seeking emotional and informational support in thread starting posts, and receiving emotional and informational support in first replies. The *Has profile* and *Post count before thread* variables were included to identify active users, who might be more likely to return and have a follow-up post. Variables included in the Heckman models in Table 2 (except *Has profile*) were centered and standardized (*Posts between thread starter posts 1 and 2*, and *Post count before thread* were log transformed).

Predicting second thread posts of thread starters

Selection models demonstrate that a thread starter creating a profile and seeking emotional and informational support in her initial post were significant positive predictors of having a follow-up post (Models 1 and 2, Table 2). The number of posts by a thread starter before she posted her thread starting post and receiving emotional and informational support in the first community reply were not significant predictors of having a follow-up post (Models 1 and 2, Table 2).

Predicting expressed satisfaction

Regarding RQ1, people expressed more satisfaction in their follow-up posts when they received emotional and informational support in the first reply to their initial post. These main effects were qualitatively similar in both Heckman models (see the bolded lines in Models 1 and 2 in Table 2). In addition, and unrelated to our research questions, people expressed more satisfaction when they sought informational support in their initial posts, independent of the support they received. Seeking emotional support did not predict expressed satisfaction. The number of community replies between thread starters' first and follow-up posts was a significant positive predictor of satisfaction, suggesting the more replies a thread starter received, the more satisfied she was.

The interaction effects in Model 2 of Table 2 addressed RQ2, that matching between sought and received support would influence satisfaction. The data do not support a matching hypothesis when women sought emotional support, with no interaction on satisfaction between seeking emotional support and receiving either emotional support (b = .012, p > .75) or informational support (b = -.006, p > .86). That is, women were equally satisfied with receiving emotional or informational support after seeking emotional support.

There was, however, support for a matching hypothesis when women sought informational support. The significant

Variable	*M*	*SD*	Min	Max	ICC
Positive emo disclosure	1.55	0.96	1	6.7	0.90
Negative emo disclosure	2.39	1.52	1	6.7	0.94
Positive info disclosure	1.89	1.09	1	6.6	0.85
Negative info disclosure	3.58	1.72	1	7	0.91
Question asking	4.94	2.17	1	7	0.91

Table 3: Descriptive statistics and intra-class correlations for self-disclosure and question asking in thread starting posts (*N*=1000).

negative interaction between seeking informational support and receiving emotional support (b = -.090, p < .05) suggests dissatisfaction when women sought informational support and received emotional support. Moreover, the positive interaction between seeking informational support and receiving informational support (b = .079, p = .052) suggests that women were more satisfied with informational support when they actually sought it.

STUDY 2: MATCHING BETWEEN BEHAVIORAL SPEECH ACTS AND RECEIVING SUPPORT

We conducted a second analysis to predict satisfaction from speech acts that might elicit social support rather than from observers' judgments of support elicitation. Previous research indicates that people explicitly ask questions when seeking informational support, but use self-disclosure as an implicit way of eliciting emotional support [2, 27]. It is possible that Study 1 found no support for a matching hypothesis when women sought emotional support because Turkers had more difficulty recognizing implicit elicitation of emotional support than informational support.

Given that users employ different linguistic strategies to elicit emotional and informational support, we examined RQ1 and RQ2 using judgments of thread starting post behavioral speech acts (self-disclosure and question asking) in place of judgments of thread starting post intent (seeking emotional and informational support). Study 2 methods were similar to Study 1 and used the same thread sample and data for support received and expressed satisfaction in Study 1. However, Study 2 examined Turker judgments of question asking and four kinds of self-disclosure collected for the same thread starting posts as Study 1.

An example of negative emotional and informational self-disclosure from our data is: [...] *I had been so depressed this entire weekend my results showed progression and so met with doctor today and hes taking me off gemzar and going to begin ixempra* [...]. An example of positive emotional and informational self-disclosure from our data is: […] *Today is my three year cancerversary!!* [...] *In some sense it is difficult to believe it has been three years and in other ways it seems like it has been way longer. Either way, I feel very blessed to be here and living a wonderful life (even through constant therapy)* […]. Wang et al. found that emotional and informational self-disclosure (both positive and negative kinds) were effective ways to evoke emotional support from the community; these relationships were mediated by the extent to which a user was perceived to be seeking emotional support [27].

An example of question asking from our data is: *Can someone explain this to me. What does it mean for them to be clustered?* [...]. Wang et al. also found that question asking was an effective way to evoke informational support from the community, and this relationship was mediated by the extent to which a user was perceived to be seeking informational support [27].

Measuring self-disclosure and question asking

Separate judgment tasks were presented for emotional self-disclosure, informational self-disclosure, and question asking, and tasks were completed by different sets of Turkers. Ten Turkers completed each emotional self-disclosure HIT and each informational self-disclosure HIT. Six Turkers completed each question asking HIT. Turkers received $0.05 per HIT for emotional self-disclosure and informational self-disclosure tasks and $0.03 per HIT for question asking tasks.

Self-disclosure in thread starting posts

Turkers rated the amount of self-disclosure in thread starting posts. All self-disclosure tasks specified, "Self-disclosure is defined as the process by which one person reveals something about oneself to others."

Emotional self-disclosure tasks specified, "Emotional self-disclosure is concerned with the extent to which the writer has discussed her feelings and emotions with others, such as happiness, fears, sadness, and anger." Turkers read the thread starting post and rated the amount of positive emotional self-disclosure and the amount of negative emotional self-disclosure on Likert scales with end-points "1 (Not at all)" and "7 (Very much)".

Informational self-disclosure tasks specified, "Informational self-disclosure is concerned with the extent to which the writer has discussed her personal information with others, such as health conditions, diagnosis results, and family status." Turkers read the thread starting post and rated the amount of positive informational self-disclosure and the amount of negative informational self-disclosure on Likert scales with end-points "1 (Not at all)" and "7 (Very much)".

Question asking in thread starting posts

Question tasks specified, "When asking a question, the writer is requesting a response from the group. Questions can be asked directly and indirectly." Turkers read the thread starting post and rated how much the post was asking a question on a Likert scale with end-points "1 (Definitely does not contain a question)" and "7 (Definitely contains one or more questions)".

Analytic Methods

Analytic methods were the same as those used in Study 1. Table 3 shows unstandardized descriptive statistics and

		Model 1 Satisfaction main effects (RQ1)			Model 2 Satisfaction main effects (RQ1) and interaction effects (RQ2)		
	Variables	**Coef.**	**SE**	***p***	**Coef.**	**SE**	***p***
Predictor variables (Outcome: composite satisfaction)	Positive emotional disclosure	-.026	.063	.684	-.041	.065	.534
	Negative emotional disclosure	-.055	.057	.338	-.050	.059	.397
	Positive informational disclosure	.080	.064	.209	.080	.065	.218
	Negative informational disclosure	-.017	.064	.794	-.033	.067	.622
	Question asking	.176	.052	.001	.231	.055	.000
	Receive emotional support	**.149**	**.048**	**.002**	**.119**	**.051**	**.020**
	Receive informational support	**.193**	**.044**	**.000**	**.186**	**.045**	**.000**
	Posts between thread starter posts 1 and 2	.227	.038	.000	.205	.039	.000
	Positive emo disclosure X Receive emo support				**.043**	**.056**	**.447**
	Negative emo disclosure X Receive emo support				**.003**	**.047**	**.949**
	Positive info disclosure X Receive emo support				**-.009**	**.059**	**.881**
	Negative info disclosure X Receive emo support				**.056**	**.055**	**.307**
	Positive emo disclosure X Receive info support				**.008**	**.058**	**.894**
	Negative emo disclosure X Receive info support				**-.022**	**.048**	**.644**
	Positive info disclosure X Receive info support				**-.012**	**.054**	**.826**
	Negative info disclosure X Receive info support				**-.034**	**.054**	**.533**
	Question asking X Receive emo support				**-.097**	**.041**	**.019**
	Question asking X Receive info support				**.073**	**.046**	**.107**
	Constant	.476	.072	.000	.432	.076	.000
Selection variables (Selection: Having a second post in the thread)	Has profile	.244	.078	.002	.221	.077	.004
	Post count before thread	.005	.042	.899	.002	.040	.965
	Positive emotional disclosure	.131	.067	.050	.123	.066	.061
	Negative emotional disclosure	.098	.059	.098	.098	.059	.095
	Positive informational disclosure	.073	.066	.265	.081	.065	.213
	Negative informational disclosure	.132	.064	.039	.131	.064	.039
	Question asking	.130	.052	.013	.131	.052	.011
	Receive emotional support	-.059	.050	.232	-.065	.049	.189
	Receive informational support	.049	.047	.296	.046	.046	.323
	Constant	.269	.056	.000	.282	.056	.000

Table 4: Heckman selection models predicting composite satisfaction in a follow-up post (N = 638) from self-disclosure and question asking in the thread starting post, and receiving emotional and informational support in the first reply post. Model 1 includes only main effects, while Model 2 includes main effects and interactions. Effects in bold pertain to RQ1 and RQ2. Models 1 and 2 include selection models that predict whether a thread starter would have a follow-up post. The Likelihood Ratio test shows the selection and prediction equations were not independent. Model 1 LR test of indep. eqns. $x^2 = 10.51$ ($p = 0.0012$). Model 2 LR test of indep. eqns. $x^2 = 12.17$ ($p = 0.0005$).

ICCs for self-disclosure and question asking. Units of analysis were the same as Study 1, except that Turker ratings for seeking emotional and informational support in thread starting posts were replaced with Turker ratings for self-disclosure and question asking. For example, the thread starting post in the example provided in Study 1 methods has the following Turker ratings: positive emotional self-disclosure = 1, negative emotional self-disclosure = 1, positive informational self-disclosure = 1.2, negative informational self-disclosure = 2.3, asking question = 6.17.

Results

Heckman models were also employed for analysis. Table 4 presents Heckman models that predict expressed satisfaction from speech act variables in thread starting posts and support received in community replies. The number of community reply posts between thread starters' first and second posts was again included as a control predictor. Model 1 presents main effects of predictors, and Model 2 presents main and interaction effects. The dependent variable in both models is the composite satisfaction in thread starters' follow-up post in a thread. Models 1 and 2 in Table 4 also contain selection models which predict if a thread starter would have a second post to a thread from the selection variables of whether the thread starter created a profile on the site (*Has profile*), the number of posts by the thread starter before she posted her thread starting post (*Post count before thread*), question asking and four kinds of self-disclosure in thread starting posts, and receiving emotional and informational support in first replies. Variables included in the Heckman models in Table

4 (except *Has profile*) were centered and standardized (*Posts between thread starter posts 1 and 2*, and *Post count before thread* were log transformed). Refer to Table 4 selection models for significant and not significant predictors of a thread starter having a follow-up post in a thread.

Predicting expressed satisfaction

Heckman analyses with behavioral speech acts (Models 1 and 2, Table 4) were very similar to Study 1 findings. Regarding main effects, users expressed more satisfaction when they received either emotional or informational support (RQ1). They also expressed more satisfaction when they asked questions in their thread starting posts and when they received more replies. There was no support for a matching hypothesis when thread starters expressed speech acts that elicit emotional support (i.e., no interactions between any type of self-disclosure type in thread starting posts and getting either emotional or informational support in first replies (RQ2)). There was support for the matching hypothesis when users asked questions. They were less satisfied with the emotional support they received after asking questions than the emotional support they received without asking questions (b = -.097, p < .02). However, they were not more satisfied with informational support following questions than not following questions (b = .073, p < .11).

DISCUSSION

This research sheds light on what makes social support effective and how these processes unfold in a large online breast cancer support community. We addressed gaps in previous work by collecting quantitative, independent measures of seeking support, receiving support, and reactions to support. Our findings were very similar for two ways of operationalizing support elicitation: direct judgments of seeking social support (Study 1) and judgments of behavioral speech acts that typically elicit support (Study 2).

Regarding RQ1, users expressed more satisfaction the more they received either emotional or informational support. This suggests that judges perceive that receiving emotional and informational support is beneficial for online breast cancer support users, at least for brief exchanges. However, the results also suggest that in some situations, women's satisfaction depended on what they were seeking in the first place. Specifically, matching was associated with more satisfaction when women were seeking informational support but not emotional support.

When users sought emotional support, they were equally satisfied when they received either emotional or informational support in return. Our findings diverge from Cutrona et al. who found that the match between emotional disclosure and emotional support positively influenced reactions toward partners' sensitivity [8].

However, receiving emotional support was not always satisfying in this online cancer support community. Both studies demonstrate a mismatch effect: when women sought informational support or asked questions and received emotional support in return, they were less satisfied with the support than under other conditions in which they received emotional support. This result is analogous to Reynolds and Perrin's findings that mismatched support had a negative relationship to psychosocial functioning in women with breast cancer [16]. However, this finding is inconsistent with arguments in the couples support literature that providing emotional support is a good support strategy in general, regardless of what someone sought [e.g., 9].

Moreover, Study 1 is consistent with a matching hypothesis when people were seeking informational support: when women in this community sought informational support and then received it, they were more satisfied with the support than when they got informational support under other circumstances. These findings consistent with matching for informational support diverge from the findings of Smithson et al., where requesting advice on SharpTalk (i.e., seeking informational support) appeared to be a strategy to elicit empathy from the community and a springboard for the thread starters to talk more about their issues [22]. Our results also suggest that just as matching needed and gotten emotional support is beneficial in everyday life of younger people [28], matching sought and received informational support might be beneficial in exchanges among users in online breast cancer support.

Thus, our findings contribute a piece to the puzzle about when support matching is beneficial, but differ from previous work where different populations, definitions of matching, and outcome measures were used. One of the most interesting results of our research is that seeking emotional support did not moderate the effects of receiving social support, particularly the lack of a matching effect between seeking and getting emotional support on satisfaction. One explanation could be that seeking emotional support might be based on longer-term needs than seeking answers to questions [26], requiring more time for support matching to occur. Another explanation is that when seeking emotional support, it might be that just being responded to (receiving either emotional or informational support) is sufficient to feel recognized and supported in online breast cancer support communities. That is, it might be the act, rather than the content, that signals support.

For instance, in the following example with Turker ratings, the user is seeking more emotional support than informational support in her thread starting post, receives more informational support than emotional support in the first reply (the two community replies after the first reply are not shown), and has a composite satisfaction score that is above the mean composite satisfaction score.

Thread starting post (seek emotional support = 5.6; seek informational support = 3.2; positive emotional self-disclosure = 1.3; negative emotional self-disclosure = 4.5; positive informational self-disclosure = 2.6; negative informational self-disclosure = 5.2; asking question = 4.83):

This is more a question for my psychological health than for any other thing. My five years on tamoxifen will be finished in April and i will place myself into menopause so I can switch to an AI (haven't decided whether to begin with lupron or go immediately for the ooph). I am experiencing a lot of anxiety about the double issue of both menopause and beginning an AI. I am not scared of menopause -- I experienced it with chemopause for a bit and it wasn't that bad for me, also its inevitable, I'm 47 years of age. But I am scared of the side effects of sopping up all the remaining estrogen in addition to sudden menopause. My gynecologist, who is also a surgeon and takes out many ovaries, claims that there won't be many extra SEs from the AI. My onc is less optimistic. Anything someone could say to make me feel better about this, I would welcome. I am especially nervous about the sexual side effects and also, since I am a runner, the outcome on my joints.

First community reply post (receive emotional support = 1.2; receive informational support = 4.4):

I've had many joint problems from AIs that I haven't had from only menopause. The AIs tend to cause many tendon problems, and that's what's been aggravating my hip and wrists. From the literature, it's not certain if these tendon problems are reversible or not...great.

Menopause hasn't been my favorite experience. But it's doable. I haven't been plagued by hot flashes, but certainly less libido, belly fat, and vaginal atrophy.

Some individuals have more issues with one brand of AI than a different one. Arimidex crippled me, Femara seemed not problematic, and Aromasin has hurt my hip and wrists, but not as intensely as Arimidex did...

[User name omitted for privacy]

Thread starter's second post to the thread (composite satisfaction = 5.43):

Thanks ladies. Very reassuring.

Future work should therefore examine whether the quantity of feedback matters more when seeking emotional or informational support.

Limitations

The main limitation of this work is that all measures of support sought, support received, and expressed satisfaction were made by judges who were not participants in the cancer support community. Future work would benefit from acquiring measures from support group participants. Other limitations include that only first replies to thread starting posts were coded, and not all posts in a given thread were included in analyses, which may not have fully captured thread complexity. We did, however, control for an important aspect of thread structure that positively influenced satisfaction in both studies: the number of community reply posts between thread starters' first and second posts. Our studies also only examined the satisfaction of users who started threads. However, given that no posts come before a thread starting post in a thread, this is the best place to measure support initially sought, and our Heckman models controlled for whether users came back to post a second time. Lastly, we only studied one disease (breast cancer) that impacts mostly older women, and therefore support group dynamics might differ for different diseases, ages, and gender.

Design implications and future work

Using machine learning and survival analysis, Wang et al. discovered that linguistic emotional support encountered by users was linked with elevated commitment to an online breast cancer support community, but linguistic informational support did not greatly impact user commitment [26]. Since users express satisfaction in their language, a machine learning model could also be built to measure the level of satisfaction in all posts in an online support community. Thus, expressed user satisfaction could be monitored by a machine learning model in real time and across time as users post, and facilitators and/or relevant community members could be alerted to provide feedback to users flagged as dissatisfied. Future work on satisfaction in online health support would also profit from an analysis of whether linguistically expressed satisfaction predicts membership commitment.

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