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What is This?

Modeling the impact of online cancer resources on supporters of cancer patients

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Abstract

This article considers the impact of internet use and online social capital on the health outcomes of supporters of cancer patients. Structural equation modeling offers support for the following three-step model: internet use ➔ online social capital ➔ stress and depression. Specifically, asynchronous online communication and offline communication stimulated by online communication had direct positive paths to social interaction and social support which, in turn, were both predictive of healthier or lower levels of stress and depression. These findings support previous research, which has indicated positive associations between mass media use and social capital and between social capital and health outcomes. In contrast, internet information–seeking by information type had a negative direct path to social support and negative indirect paths to stress and depression, indicating that information–seeking online has a detrimental impact on social capital and the health indicators.

Key words

Cancer is the most common cause of death in the United States for people under the age of 65 and the second most common cause overall, followed only by heart disease (Jemal et al., 2006). One in four deaths in the USA results from cancer. In 2006 alone, 564,834 Americans were estimated to die of the disease.

The recent development of the internet gives rise to the question of what benefits this new medium may be able to offer to cancer patients and their supporters. Half of the American public, or about 80 percent of American web users, seek health information online, with about 28 percent of the American online community belonging to an online support group related to a medical condition or personal problem (Pew Internet & American Life Project, 2003, 2005). Online women are more active than online men when it comes to online health information-seeking (85%, compared with 75%) and the use of online support groups (63% compared with 46%).

The internet serves as a conduit for cancer-related information and support. Such internet use by cancer patients has been linked to increases in social support, coping and community, and decreases in loneliness and anxiety (Madara and White, 1997; Mills and Sullivan, 1999; Mossman et al., 1999; Penson et al., 2002; Rodgers and Chen, 2005). For example, Fogel et al. (2002) demonstrated that internet use for medical information among breast cancer patients was associated with higher levels of social support and lower levels of loneliness. In addition, Lieberman et al. (2003) found that use of an online support group led to reductions in depression among breast cancer patients.

Although this research provides an empowering picture of the impact that the internet can have on cancer patients, two important gaps in the literature exist. The first involves the focus of previous research on the impact of internet use on cancer patients, not supporters of cancer patients. Such supporters, some who are caregivers, undergo high levels of stress and depression and require assistance in terms of personal coping and caring for patients (Hinds, 1985; Nikoletti et al., 2003; O'Rourke and Tuokko, 2000; Rolland, 2005). As a means of coping and diminishing stress and depression, such supporters are common seekers of online health information and support. In fact, supporters are more likely than patients themselves to conduct online health-related searches, using the information for their own understanding and to pass along to cancer patients whom they know and for whom they are caregivers (Marziali et al., 2005; Pew Internet & American Life Project, 2003). As the primary caregivers and family health decision-makers (Nussbaum, 2000), women are twice as likely as men to seek out information for a child and more likely in general to seek out online health information for others (Bernhardt and Felter, 2004; Pew Internet & American Life Project, 2003). Although the positive impact of online health resources on caregivers has been demonstrated (Marziali et al., 2005), it has not been tested empirically in relation to cancer.

The second gap involves the testing of related multi-step models involving the concept of social capital, which will be discussed in depth in the next section of this article. Although previous research has demonstrated the relationship between mass media use and social capital (Beaudoin and Thorson, 2004; Shah et al., 2001b) and the relationship between social capital and health outcomes (House et al., 1988; Kawachi and Berkman, 2000; Umberson et al., 1996; Wallack, 2000), little research has actually tested multi-step models. In fact, only two studies could be located which have tested a multi-step model in which mass media use influences social capital – which, in turn, influences health outcomes. One study tested this model but on a sample of cancer patients rather than supporters of cancer patients (Beaudoin and Tao, 2007), while another study assessed a similar three-step model with community-level data (Beaudoin, 2007). Previous research has theorized such a three-step model (Thorson and Beaudoin, 2004; Wallack, 2000), as well as a related model in which internet use influences social support which, in turn, influences stress and depression which, in turn, influence cancer outcomes (Eysenbach, 2003).

The current study aims to address these two gaps in the literature. It models the impact of internet use and online social capital on the health outcomes of supporters of cancer patients. Cancer-related measures of internet use, online social capital and depression and stress are implemented. With these measures, structural equation modeling (SEM) tests the fit of a three-step model in which internet use influences social capital which, in turn, influences health outcomes.

SOCIAL CAPITAL

Before discussing theoretical and empirical work involving the influences of internet use and social capital, it is important to consider various conceptual definitions for social capital. To begin, Bourdieu defined social capital as 'the aggregate of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition' (1986: 248). Putnam defined it as the 'connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them' (2000: 19). There are two important differences between these definitions. First, while Putnam viewed social capital to be the actual networks and the outcomes of the networks, Bourdieu viewed it as the 'the actual or potential resources'. Second, while Bourdieu viewed the productive mechanism to be one of social connections and relationships, Putnam viewed it to be a mix of social connections and social reciprocity and trust. Furthermore, as Coleman explained: 'Social capital is productive, making possible the achievement of certain ends that in its absence would not be possible' (1988: S98). Wellman et al. (2001) articulated three types of social capital. Network capital involves

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relationships with friends, neighbors, relatives and workmates, while participatory capital deals with involvement in political and voluntary organizations. Finally, community commitment involves attitudes toward community. Thus, there is common ground between network capital and social connections and between community commitment and social reciprocity and trust.

In summarizing previous definitions, Lin wrote that 'social capital consists of resources embedded in social relations and social structure, which can be mobilized when an actor wishes to increase the likelihood of success in a purposive action' (2001b: 24). This definition stresses both resources that can result from social connections and the means by which people can access and mobilize such resources to achieve various outcomes. Similarly, Beaudoin and Thorson defined social capital as 'the actual or potential resources that result from social networks and social trust that people share, which, when mobilized, can bring about positive behaviors and outcomes at the individual and collective levels' (2004: 380). With a basis in these previous definitions, the current study defines social capital as the actual and potential resources that result from the social connections and the senses of reciprocity and trust, which, when mobilized, can stimulate various outcomes at the collective and individual levels.

It is important to distinguish between bridging and bonding social capital. Bonding social capital is exclusive, involving social connections that reinforce homogenous groups and exclusive identities (Putnam, 2000). In contrast, bridging social capital is inclusive, existing in relations between people from different social groups. This distinction ties in with that between strong and weak ties (Granovetter, 1973; Lin, 2001b). Strong ties produce bonding social capital, while weak ties produce bridging social capital. For this reason, weak ties are more efficacious than strong ties because they allow for the rapid expansion of social networks and access to information and social resources.

THE INTERNET, SOCIAL CAPITAL AND HEALTH OUTCOMES

At the core of illness experiences, including those related to cancer, is uncertainty (Babrow et al., 1998). There are uncertainties related to diagnosis, prognosis, treatment and recovery. There are uncertainties related to how support should be offered, how much and what type. Such types of uncertainty feed broader uncertainties involving work and social life. Because uncertainty is correlated positively with stress, but negatively with coping and self-efficacy (Bandura, 1982; Lazarus and Folkman, 1984), the diminution of uncertainty can be viewed as a bridge to positive health outcomes.

The linkage between uncertainty and health is central to research involving the theory of problematic integration, which holds that the integration of probabilistic orientations and evaluative orientations is central to the knowledge, attitudinal and behavioral processes by which people construct,

manage and resolve uncertainty (Babrow et al., 1998; Hines et al., 2001). Probabilistic orientations involve the reality of an object, including whether it exists, what it is like, what causes it and how it is likely to behave. Evaluative orientations involve judgments, including whether an object is good or bad. These interrelated orientations help people to make sense of their experiences and thus play a strong role in determining future outcomes and avoiding unwanted suffering and dependence (Hines et al., 2001).

Because the integration of such orientations and the subsequent abatement of uncertainty are problematic (Hines et al., 2001), people may seek out or avoid information as they confront illness experiences. Resolution to disintegrated orientations can come from communication (Babrow et al., 1998). Such communication, which can be at the interpersonal or mass level, can 'create, shape, clarify, obscure, challenge and transform probabilistic and evaluative orientations and the [problematic integration] they so often occasion' (Hines et al., 2001: 555). Thus, communication can be a powerful means to constructing, managing and resolving uncertainty but also a source to further disintegration, which can result from flaws in communication related to message clarity, accuracy, completeness, volume, ambiguity, consistency, applicability and credibility (Babrow et al., 1998).

The internet and health outcomes

Although early internet research indicated that the internet isolates users, broadening the gap between people and increasing feelings of depression and loneliness (Kraut et al., 1998), more recent research suggests that the internet can be a useful tool for confronting uncertainty related to cancer and coping (Fogel et al., 2002; Lieberman et al., 2003; Madara and White, 1997; Mills and Sullivan, 1999; Mossman et al., 1999; Penson et al., 2002; Rodgers and Chen, 2005).

Findings in this area can be assessed in terms of advantages and disadvantages of online information and support. Advantages include access to information and support that is anonymous and free of the constraints of time and space, opportunities for sharing experiences with cancer patients and supporters, and interactions that diminish the importance of demographic factors such as ethnicity, age and income (Finfgeld, 2000; Rodgers and Chen, 2005). In addition, the online support group environment can help people to overcome the discomfort common to face-to-face meetings, especially when it comes to men, who are often wary of participation in therapeutic groups (Broom, 2005).

There are various disadvantages as well, including concerns related to the credibility and accuracy of online information, the potential overload of such information, the distressing effects that can result from gaps in time between a question and a response and various forms of uninhibited, aggressive remarks, including flaming (Berland et al., 2001; Broom, 2005; Finfgeld, 2000;

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Kayany, 1998). Flaming and other types of destructive posts can foster a negative tone in some online discussion groups, which can deter social support and personal benefit (Sanchez-Johnsen et al., 2004).

The internet and social capital

The influence of the internet and other mass media on social capital has been theorized upon via an informational versus symbolic dichotomy (Shah et al., 2001b). The mass media provide people with information that can influence social interaction and civic participation. In addition, symbolically the mass media can help to foster a sense of community, enhancing social cohesion and self-efficacy. The internet and online communities have been discussed in great depth in relation to the development of community and social capital (Wellman, 2001; Wellman et al., 2001). There have been hopes that the medium can restore community to America, being a forum that can promote social meeting and interaction and the open discussion of issues and ideas.

Empirical support for the relationship between internet use and social capital comes from a line of research. Social capital is positively associated with news use (Beaudoin and Thorson, 2004; Brehm and Rahn, 1997; Shah et al., 2001b) and exposure to socially-oriented public health media messages (Beaudoin and Thorson, 2007; Beaudoin et al., 2006; Thorson and Beaudoin, 2004). In addition, some research has attempted to flesh out the direction of effect between mass media use and social capital, indicating support for a media effects model in which mass media use influences social capital (Shah et al., 2002; Thorson and Beaudoin, 2004). Related research has demonstrated that social capital is positively associated with internet use (Drentea and Moren-Cross, 2005; Kavanaugh and Patterson, 2001; Mickelson, 1997; Shah et al., 2001a, 2001b; Wellman, 2001; Wellman et al., 1996). For example, Dutta-Bergman (2005) found that people with internet access had higher levels of community involvement, community satisfaction and participation in a local sports league, community youth groups, community religious organizations and community charities than people without internet access. In an earlier study, Wellman and colleagues (2001) demonstrated that the effect of internet use on social capital is supplemental in terms of extending upon existing offline relationships. In contrast, synchronous and asynchronous internet use were negatively associated with a general sense of online community as a result of exposure to unpleasant people online. Furthermore, the internet appears to be a powerful medium when it comes to the development of weak social capital ties that bridge geographic barriers, creating 'nonlocal' communities (Haythornthwaite, 2002; Wellman et al., 2001).

Social capital and health outcomes

Another line of research has considered the associations between public health status and levels of social capital and the related concept of social

support. Research has demonstrated that people and communities with higher levels of social capital and social support are healthier than those with lower levels (Umberson et al., 1996). For example, House et al. (1988) showed that mortality rate was negatively associated with level of social integration, regardless of ethnicity and gender, when controlling for age. Kawachi and Berkman (2000) demonstrated that people with higher levels of social capital have lower mortality rates and better self-report health status than people with lower levels of social capital. Wallack (2000) found that participation in neighborhood watch groups was positively associated with wise and healthy behaviors during a summer heatwave. Furthermore, social support predicts low levels of stress and depression (Aneshensel and Frerichs, 1982; Cohen and Wills, 1985).

Modeling the process

Thus, previous research suggests two important relationships, in which mass media use influences social capital, and in which social capital influences health outcomes. Research has theorized upon a combination of these two models, which takes form in a three-step model where mass media use influences social capital which, in turn, influences health outcomes (Thorson and Beaudoin, 2004; Wallack, 2000). In the realm of cancer, Eysenbach (2003) set forth a model that can be abbreviated as follows: internet use influences social support which, in turn, influences stress and depression which, in turn, influence cancer outcomes.

The causal direction and theoretical basis of the posited three-step model underpin several important health initiatives, including the Search Institute (Benson et al., 1999), the California's Healthy Kids Resilience Assessment (Constantine et al., 1999), and the Kansas Health Foundation (Beaudoin and Thorson, 2007; Beaudoin et al., 2006; Thorson and Beaudoin, 2004). However, only two studies could be located which have tested the efficacy of such a model. With a sample of online cancer patients, Beaudoin and Tao (2005) demonstrated that the relationship between internet use and health outcomes was mediated by social capital. With community-level data, Beaudoin (2007) found that social capital mediated the relationship between news use and youth-related health outcomes.

HYPOTHESES

The current study tests the aforementioned three-step model on a sample of supporters of cancer patients. The testing of three hypotheses below involves the manner in which various cancer-specific measures of internet use and online social capital predict two health outcomes: stress and depression. Internet use is measured in terms of online communication and online information-seeking. There were three communication measures: synchronous online communication, asynchronous online communication and offline

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communication stimulated by online communication (Fogel et al., 2002; Wellman et al., 2001). While synchronous online communication, including communication via instant messenger and online chat, occurs at one point in time, with feedback and response immediate, asynchronous online communication is conducted free of the constraint of time, with feedback and response delayed. Asynchronous online communication includes writing emails, browsing discussion groups and posting and answering related questions. Offline communication stimulated by online communication involved telephone and in-person communications with people who initially were met online. Internet use for information-seeking was measured by medium (Fogel et al., 2002) and information type (Johnson, 1997). The use of this dichotomy allows for testing whether the effects of information use are a function of medium type or content type. Medium types include online health sites, online news sites, portals and search engines and weblogs. Cancer information types include general information, specific types of cancer, cancer prevention, cancer detection or diagnosis, cancer treatment and how to deal with cancer.

Online social capital is measured in terms of interpersonal trust, social interaction and social support. Interpersonal trust involves respondent perceptions of the trust and honesty of people with whom they had interacted in discussion groups and elsewhere online (Beaudoin and Thorson, 2004; Brehm and Rahn, 1997). Social interaction involves people's interactions with others on the internet (Beaudoin and Thorson, 2004; Brehm and Rahn, 1997). Social support, which can be considered a social capital outcome, shares some similarity with the traditional social capital measure of neighborliness (Beaudoin and Thorson, 2004; Putnam, 2000).

In relation to these specific measures, we articulate three general hypotheses that are based in the above literature.

> H1: Internet use will be positively associated with online social capital.

> H2: Online social capital will be positively associated with health outcomes.

> H3: The relationship between internet use and health outcomes will be mediated by online social capital.

METHOD
The three hypotheses were tested with data from an online survey of 302 supporters of cancer patients who were recruited from Yahoo! cancer-related discussion groups. The survey, which was housed on the website of a professional online survey company, was conducted from 21 March 2005 to 30 April 2005.

Measurement
Measures included demographics, internet use, online social capital and health outcomes. Descriptive statistics appear in Table 1, with statement wording for the non-demographic measures depicted in the Appendix.

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• Table 1   Descriptive statistics

	M	SD
Gender (M = 1)	.21	.41
Age	39.86	12.55
Education	7.40	1.44
Household income	3.46	1.68
Ethnicity (W = 1)	.93	.26
Cancer patients known	3.40	1.41
Synchronous online communication	1.16	1.86
Asynchronous online communication	3.01	1.92
Offline communication stimulated by online communication	.66	1.34
Information-seeking by information type	3.04	.99
Information-seeking by medium type	3.10	1.70
Interpersonal trust	3.54	.56
Social support	3.65	.82
Social interaction	8.87	6.05
Stress	3.32	.65
Depression	3.62	.70

Demographics   Demographics, which were used as control variables, included age, household income, ethnicity (W = 1), gender (M = 1) and age. Also, the number of relatives, friends and acquaintances with cancer was measured.

Internet use   Factor analysis (principal components, with orthogonal rotation) indicated three dimensions of internet use for communication. Asynchronous online communication had five items (eigenvalue = 2.85, variance explained = 31.61%; α = .82). Offline communication stimulated by online communication had two items (eigenvalue = 1.70, variance explained = 18.93%; r = .511, $p < .01$). Synchronous online communication had two items (eigenvalue = 1.65, variance explained = 18.27%; r = .464, $p < .01$). Factor analysis (principal components, with orthogonal rotation) indicated two dimensions of internet use for information. Internet information-seeking by information type had six items (eigenvalue = 4.14, variance explained = 41.44%; α = .91). Internet information-seeking by medium type had four items (eigenvalue = 2.53, variance explained = 25.31%; α = .80).

Online social capital   Interpersonal trust was measured with four items (α = .88). For social interaction, there were two items (r = .464, $p < .01$). Social support was indexed by three items (α = .90) from the ISEL scale (Cohen and Hoberman, 1983).

Health outcomes   Stress was measured with eight items (α = .85) from the perceived stress scale (Cohen et al., 1983). Depression was measured with eight items (α = .89) from the CES–D scale (Radloff, 1977). For these two indexes, responses were sequenced so that higher levels indicate better health status.

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Analysis procedure

SEM was used, with a maximum likelihood method of estimation. SEM estimates multiple simultaneous relationships among observed and latent variables. The excellent fit between a hypothesized model and the sample data would be indicated by a comparative fit index (CFI) value of .95 and higher, a non-significant χ^2 value and a root mean square error of approximation (RMSEA) value of close to .06 or less (Hu and Bentler, 1999). The initial model was the three-step model in which internet use influences social capital which, in turn, influences health outcomes. Demographics were implemented as control variables. Non-significant paths were pruned and other paths were added when suggested by modification indices and backed by theoretical rationale. When this initial SEM suggested mediation, another SEM was conducted to test whether the addition of a direct path offered an improvement to the initial model (Holmbeck, 1997).

RESULTS

General findings

The sample, as noted in Table 1, is primarily female. On average, the respondents were almost 40 years old and had studied at college level. More specifically, 90.3 percent had a high school degree, while 55.8 percent had a college degree. In addition, 93 percent of the sample were white and the average income was at least $50,000 but less than $75,000.

The respondents belonged to various cancer-related online discussion groups. For example, 12 percent of the respondents belonged to thyroid cancer groups, such as the Yahoo! groups 'Thyca' and 'Thryvors'; about 10 percent belonged to non-Hodgkin's lymphoma groups, such as the Yahoo! group 'nhl'; another 10 percent belonged to breast cancer groups, such as the Yahoo! groups 'BreastCancer-StageIV,' 'Breast_cancer_survivor_network,' and 'Bosombuds'; and about 6 percent belonged to prostate cancer groups, such as the Yahoo! group 'Prostatecancersupport'. Respondents, on average, knew between three and four people who currently had cancer. The closest such cancer patients were as follows: spouse or partner, 16 percent; other family member, 25 percent; close friend, 24 percent; and other acquaintance, 36 percent.

The tested SEM had an excellent fit with the sample data (χ^2 [26, 302] = 25.40, $p <$ .496, CFI = .99, RMSEA = .00). The model accounted for the following amounts of variance: social support, 4 percent; social interaction, 39 percent; interpersonal trust, 2 percent; stress, 12 percent; and depression, 12 percent. The effects of demographics, although not depicted in Figure 1, are presented in Table 2. Modification indices suggested the addition of paths from synchronous and asynchronous online communication to offline communication stimulated by online communication.

Findings in terms of hypotheses

Hypothesis 1 predicted that internet use would be positively associated with online social capital. As depicted in Figure 1 and Table 3, offline communication stimulated by online communication had significant direct paths to social interaction ($\beta = .13$) and social support ($\beta = .10$).

Asynchronous online communication had a significant direct path to social interaction ($\beta = .51$). In addition, asynchronous online communication had indirect effects on social support ($\beta = .01$) and social interaction ($\beta = .02$) and synchronous online communication had indirect effects on social support ($\beta = .04$) and social interaction ($\beta = .06$). These findings offer support for H1. In contrast, the path from information-seeking by information type to social support had a negative standardized coefficient ($\beta = -.16$).

H2 predicted that online social capital would be positively associated with health outcomes. As depicted in Figure 1 and Table 3, social interaction had significant paths to stress ($\beta = .11$) and depression ($\beta = .14$) and social support had significant paths to stress ($\beta = .11$) and depression ($\beta = .13$). Thus, this hypothesis is supported.

H3 predicted that online social capital would mediate the relationship between internet use and health outcomes. Figure 1 offers initial support for the roles of social interaction and social support in mediating the effects of

• Table 2   Effects of exogenous variables on social capital and health outcomes

SOURCES OF INFLUENCE

|	EFFECTS	AGE	GENDER (M = 1)	EDUCATION	INCOME	ETHNICITY (W = 1)	CANCER PATIENTS KNOWN
Social	Direct	.06	−.12★	−.03	−.06	−.01	.02
interaction	Indirect	.05	−.14★	−.07	.00	.02	.04
	Total	.11	−.25★	−.10	−.06	.01	.06
Social	Direct	−.01	−.07	−.03	−.02	−.05	.05
support	Indirect	.01	.02	.02	.00	.00	.03
	Total	.00	−.04	−.02	−.02	−.05	.08
Interpersonal	Direct	−.11★	−.02	.03	−.04	.06	.02
trust	Indirect	.00	.00	.00	.00	.00	.00
	Total	−.11★	−.02	.03	−.04	.06	.02
Stress	Direct	.24★	.10★	.01	.09	−.04	.09
	Indirect	.01	−.03	−.01	−.01	−.01	.02
	Total	.25★	.06	.00	.08	−.05	.11★
Depression	Direct	.18★	.10	.04	.13★	−.06	.11★
	Indirect	.02	−.04	−.02	−.01	−.01	.02
	Total	.19★	.06	.02	.12★	−.06	.13★

Note: Coefficients are standardized.

★ $p < .05$

offline communication stimulated by online communication, asynchronous online communication and information–seeking by information type on stress and depression.

Figure 1 indicates 10 potential paths of mediation:

1 from offline communication stimulated by online communication to social interaction to stress;
2 from offline communication stimulated by online communication to social interaction to depression;
3 from offline communication stimulated by online communication to social support to stress;
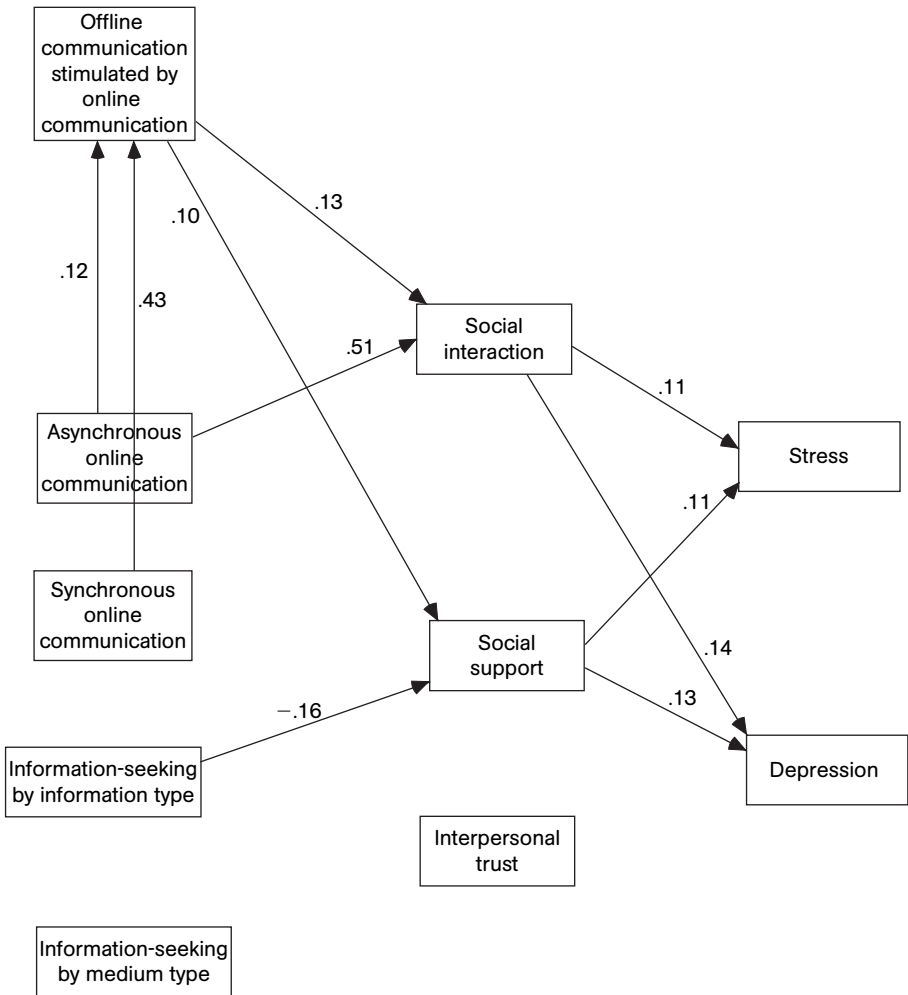
• Figure 1   Structural equation model

4 from offline communication stimulated by online communication to social support to depression;

5 from asynchronous online communication to social interaction to stress;

6 from asynchronous online communication to social interaction to depression;

7 from asynchronous online communication to social support to stress;

8 from asynchronous online communication to social support to depression;

9 from information-seeking by information type to social support to stress; and

10 from information-seeking by information type to social support to depression.

These mediation effects were verified with an additional SEM (Holmbeck, 1997). The resulting model had an excellent fit with the sample data (χ^2 [20, 302] = 14.80, p < .787, CFI = .99, RMSEA = .00) but, as noted by the changes in degrees of freedom and χ^2 values, did not represent a significant improvement over the first model. Thus, H3 is supported.

DISCUSSION

SEM offered support for a three-step model in which internet use influences social capital which, in turn, influences health outcomes. Specifically, social interaction and social support mediate the impact that asynchronous online communication and offline communication stimulated by online communication have on stress and depression. It should be noted that these online forms of social capital are likely to be bridging and weak in nature (Haythornthwaite, 2002; Wellman et al., 2001). Such ties are the most productive because they broadly grow a person's social networks and reach to potential opportunity and information (Granovetter, 1973; Lin, 2001b).

These findings have practical implications. Because of the stress and depression that confront supporters of cancer patients and the related attempts of such supporters to achieve coping and the mitigation of uncertainty, it is important to consider the effects that the internet can have on an online sample of supporters of cancer patients. Online communication bares productive returns, unlike online information-seeking. Thus, online communication appears to offer a productive forum for the integration of probabilistic and evaluative orientations (Babrow et al., 1998). These can take form in supporters communicating with others online, considering the realities of cancer and developing related knowledge and attitudes. The achievement of diminished levels of stress and depression suggests the improved health status of such supporters. It can be inferred that, in turn, improvements in the health status of supporters could encourage improvements in the

• Table 3 Effects of endogenous variables on social capital and health outcomes

Sources of influence	Effects	Offline Communication	Asynchronous Online Communication	Synchronous Online Communication	Information Seeking of Information Type	Information Seeking by Medium Type	Social Interaction	Social Support	Social Trust
Social interaction	Direct	.13★	.51★	.00	.00	.00	—	—	—
	Indirect	.00	.02★	.06★	.00	.00	—	—	—
	Total	.13★	.53★	.06★	.00	.00	—	—	—
Social support	Direct	.10★	.00	.00	−.16★	.00	—	—	—
	Indirect	.00	.01★	.04★	.00	.00	—	—	—
	Total	.10★	.01★	.04★	−.16★	.00	—	—	—
Interpersonal trust	Direct	.00	.00	.00	.00	.00	—	—	—
	Indirect	.00	.00	.00	.00	.00	—	—	—
	Total	.00	.00	.00	.00	.00	—	—	—
Stress	Direct	.00	.00	.00	.00	.00	.11★	.11★	.00
	Indirect	.03★	.06★	.01★	−.02★	.00	.00	.00	.00
	Total	.03★	.06★	.01★	−.02★	.00	.11★	.11★	.00
Depression	Direct	.00	.00	.00	.00	.00	.13★	.13★	.00
	Indirect	.03★	.07★	.01★	−.02★	.00	.00	.00	.00
	Total	.03★	.07★	.01★	−.02★	.00	.13★	.13★	.00

Note: Coefficients are standardized.

★ $p < .05$

well–being of the cancer patients themselves. In this manner, the health outcomes of supporters would lead to increases in support offered to cancer patients which, in turn, would lead to improvements in cancer patient health outcomes.

These findings also have implications for research involving mass communication and social capital. Previous research had theorized upon the manner in which mass media use could influence social capital as a means to the development of health outcomes, with this general causal linkage at the core of several public health initiatives. The current study offers support for this modeling, specifically indicating that internet use can serve to alleviate the stress and depression of supporters of cancer patients via the mediation of social capital. This model is applicable to the supporters of cancer patients as well as the patients themselves (Beaudoin and Tao, 2007). That the effects of internet use on health outcomes are not direct indicates that the use of the medium is not the source of a person's stress and depression. It is not a scenario in which spending time online makes a person more or less depressed and more or less stressed. In contrast, internet use influences the development of social capital. The more such social capital is developed, the lower levels of stress and depression a person will have. Both links have been demonstrated by previous research, but the current analysis allows for the merging of the two two-step models to create one three-step model. This alteration indicates the complexity of internet effects. The current findings suggest that such effects are not the simple function of internet exposure or usage, but rather the more complex function of a process involving technology and social structure.

Such mediation, in a broader sense, is not new to mass communication. Research has suggested that the link between mass media use and outcomes such as knowledge and behavior is mediated by cognition (Eveland, 2001) and, more specifically, perceived efficacy and perceived threat (Witte, 1992). In addition, as early as the 1940s, scholars in the area of two-step flow demonstrated that information flows not directly from the mass media to the masses, but via the mediation of opinion leaders (Katz, 1957). This theory indicates the complexity of media effects and the important mediation influence that social constructs, such as influential peers, can have on the media effects process.

Information-seeking by information type had a direct negative impact on social support and an indirect negative impact on stress and depression. These negative effects suggest that the more supporters seek out different types of online cancer information, the less social support they will have and, subsequently, the higher levels of stress and depression they will experience. This makes sense in terms of previous research, which has suggested that the internet can intimidate, confuse and frighten people (Penson et al., 2002). This could result from information overload or the poor quality and inaccuracy of such online information (Berland et al., 2001) This finding supports the research of Beaudoin and Tao (2007).

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Whether supporters of cancer patients trust other people online and in cancer-related discussion groups does not alter the outcome of their online activity. This finding offers general support for the study of Beaudoin and Tao (2007). In addition, Wellman et al. (2001) demonstrated negative associations between both synchronous and asynchronous internet use and general sense of online community as a result of exposure to unpleasant people online. However, the finding is at odds with previous research, which has demonstrated that trust is critical to both the social capital process (Coleman, 1988; Putnam, 2000) and various interactions in the online environment (Hossain and Wigand, 2004; Vishwanath, 2003; Wallace, 1999).

It is important to ponder various rationales for the non-significant role of interpersonal trust in the current study. Trust and reciprocity online certainly differ from trust and reciprocity offline. Reciprocity is central to social capital, although such reciprocity is, at times, unclear (Portes, 1998). In an example of perfect exchange, Person A does a favor to person B, who then returns the favor. According to Coleman's (1988) discussion of reciprocity expectations, the favor from person A to person B creates an expectation within person A and an obligation within person B. However, in most social capital scenarios the favor exchange is asymmetric (Lin, 2001a). Thus, person A does a favor to person B, but person A receives nothing immediately in return. Instead, the favor must be acknowledged by the social structure in which persons A and B interact. Critical to such reciprocity exchange is not the expectation of repayment, but the presence of exchange in a common social structure (Portes, 1998).

Although reciprocity can be unclear even in offline social exchange, it is especially so in online social exchange. While there is certainly a chance that person A will repay person B, this is less likely in an online chatroom or support group than in an offline setting. Thus reciprocity in an online chatroom or support group is weaker or perhaps more generalized, with the favor given not to person B, but to the social structure in which persons A and B interact. That social structure would hold an indirect obligation to return the favor to person A, with the return favor likely coming from someone other than person B. The success and longevity of such a social structure would hinge on such indirect repayments of favors and indirect meetings of expectations. The online social structure's difficulty in upholding a form of reciprocity may explain the negligible role of interpersonal trust in the current model.

Furthermore, itinerant social environments, whether offline or online, would not be conducive to the development of trust in a specific person. In having itinerant populations, online support groups would be unlikely to contribute to the development of history-based trust, which grows among multiple actors and 'thickens and thins as a function of their cumulative interaction' (Kramer, 1999: 575). Amid such an itinerant online population,

single-time interactions are common. Such single-time interactions between two people are unlikely to lead to the development of trust. Useful here is Uslaner's (2003) dichotomy of trust. 'Strategic trust' would involve how person A would expect person B to behave in a certain fashion as a result of previous experiences between persons A and B. In contrast, 'moralistic trust', in being more generalized, involves trust in humanity. It does not result from singular events, or interactions with individuals. Thus, the creation of an expectation within person A would not directly involve the creation of an obligation within person B. Moralistic trust seems more applicable to an online support group than strategic trust.

CONCLUSION

There are two limitations that should be noted. First, because the sample was only of users of Yahoo! cancer-related discussion groups, generalization of the findings to users of other cancer- and health-related groups should be done only with caution. Second, although SEM suggests a direction of causation, it does not determine causality to the degree of experimental research. However, the suggested directions of causation from internet use to social capital and from social capital to health outcomes have been theorized upon and demonstrated by previous research.

The current study has implications for health practitioners and researchers alike. The internet can have positive effects on supporters of cancer patients. Such people bear stress and depression as cancer patients go through the stages of diagnosis, prognosis and treatment. Health practitioners should understand the potential benefits of internet use when they make recommendations to such supporters and media practitioners should understand this potential as they develop future forms of information and support on the internet. The findings also have theoretical implications. There is support for a multi-step model that has been theorized upon by previous research, but tested by only two studies that could be located. Support for the three-step model suggests a dynamic process underlying the nexus of internet use, online social capital and health. There is evidence for social capital being an essential step in the process by which the internet can diminish stress and depression levels. Thus, although previous research had tested direct associations between internet use and levels of stress and depression, it now appears that these relationships are joined by social capital. While social interaction and social support are integral to the model, interpersonal trust is not. This finding, in a general sense, goes against some previous online research but can be rationalized in terms of differences in types of trust and characteristics of the internet and cancer-related online support groups. Future research should apply multi-step models to different populations and topical areas, including those related to other illnesses, as well as topics outside of the realm of public health. Additional research is needed involving the roles

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of different measures of online trust, including those specific to online users, online social structures and online support groups.

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APPENDIX

Internet information-seeking by information type

In the last month, about how often have you searched online for general information regarding cancer?

In the last month, about how often have you searched online for information related to specific types of cancer?

In the last month, about how often have you searched online for information regarding cancer prevention?

In the last month, about how often have you searched online for information regarding cancer detection or diagnosis?

In the last month, about how often have you searched online for information regarding cancer treatment?

In the last month, about how often have you searched online for information regarding how to deal with cancer?

Responses were as follows: never (1), almost never (2), sometimes (3), fairly often (4), and very often (5).

Internet information-seeking by medium type

During the last month, about how many days per week have you browsed online health sites for cancer–related purposes?

During the last month, about how many days per week have you visited online news sites (such as New York Times and CNN) for cancer–related purposes?

During the last month, about how many days per week have you used portals or search engines (such as Yahoo and Google) to look for cancer–related information?

During the last month, about how many days per week have you browsed weblogs for cancer–related purposes?

Synchronous online communication

During the last month, about how many times have you communicated via instant messenger with other people for cancer–related purposes?

During the last month, about how many times have you chatted online with other people for cancer–related purposes?

Asynchronous online communication

In the last month, about how many days per week have you browsed an online cancer–related discussion group?

During the last month, about how many times have you posted questions in an online cancer–related discussion group?

During the last month, about how many times have you posted messages to answer others' questions in an online cancer–related discussion group?

During the last month, about how many times have you posted messages to spread health-related information in an online cancer-related discussion group?

During the last month, about how many times have you written e-mails to other people for cancer-related purposes?

Offline communication stimulated by online communication

During the last month, about how many times have you communicated via telephone with people you met online for cancer-related purposes?

During the last month, about how many times have you communicated in person with people you met online for cancer-related purposes?

Social support

In the last month, I've been getting emotional support from other people whom I have met online.

In the last month, I've been getting comfort and understanding from other people whom I have met online.

In the last month, I've been getting help and advice from other people whom I have met online.

Social interaction

During the last month, about how many people from the Internet have you communicated with for cancer-related purposes?

During the last month, about how many friends have you made from the Internet for cancer-related purposes?

Interpersonal trust

I trust most people whom I've interacted with in online cancer-related discussion groups.

I trust most people whom I've interacted with on the Internet for cancer-related purposes.

Most people are honest whom I've interacted with in online cancer-related discussion groups.

Most people are honest whom I've interacted with on the Internet for cancer-related purposes.

Responses were as follows: strongly disagree (1), disagree (2), agree (3), and strongly agree (4).

Stress

In the last month, how often have you been upset because of something that happened unexpectedly?

In the last month, how often have you dealt successfully with irritating life hassles?

In the last month, how often have you felt that you were unable to control the important things in you life?

In the last month, how often have you felt confident about your ability to handle your personal problems?

In the last month, how often have you felt nervous or stressed?

In the last month, how often have you been able to control the way you spend your time?

In the last month, how often have you been angered because of things that happened that were outside of your control?

In the last month, how often have you felt that you were on the top of things?

Responses were as follows: never (1), almost never (2), sometimes (3), fairly often (4), and very often (5).

Depression

In the last month, I was happy.

In the last month, I felt depressed.

In the last month, I enjoyed life.

In the last month, I felt sad.

In the last month, I felt that I was just as good as other people.

In the last month, I thought my life had been a failure.

In the last month, I felt relaxed.

In the last month, I talked less than usual.

Responses were as follows: never (1), almost never (2), sometimes (3), fairly often (4), and very often (5).