

With a Little Help from Strangers: Social Support and Smoking Cessation in Online Communities

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Abstract

In this study we investigate how social support provided through an online virtual community influences its members' smoking cessation behaviors. Despite a robust body of empirical research examining the effects of social support from family members and significant others on reducing the stress associated with quitting smoking, there is limited evidence on the effectiveness of social support provided by online "strangers" through Internet-delivered cessation programs. Given the proliferation of interactive technologies for connecting individuals in electronically mediated environments, it is important to investigate behaviors in these contexts. We examine two structural and three functional dimensions of online social support. Survey data from 411 online community members of Quitnet.com are used to empirically test predictions about the role of social support in positive smoking cessation outcomes. Implications for theory and the design of preventive interventions are discussed.

Keywords: Smoking cessation, online social support, social learning, online community, questionnaire survey

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Introduction

Social support from friends, family, co-workers, and significant others' has long been acknowledged as a key factor in helping individuals cope with stressful situations (Dormann & Zapf, 1999; Ganster & Fusilier, 1986; McIntosh, 1991). Such support provides positive interaction experiences and enhances both self-worth and self-esteem (Cohen, Mermelstein, Kamarck, & Hoberman, 1985; Dierendonck, Schaufeli, & Buunk, 1998), thereby mitigating negative emotions in the form of helplessness, anxiety, and depression. A review of published work in social support (Cohen, 1985) reveals that social support is strongly related to psychological outcomes. In recent work, in addition to emotional well-being, the presence of social support has been implicated in alleviating the negative effects of several physical and health-related ailments (Russell, Altmaier, & Van Velzen, 1987; Zellars & Perrewe, 2001).

Social support is typically provided by significant "others" that an individual interacts with, in both personal and professional life domains. However, while there is strong evidence to suggest that the social network of an individual plays a key role in reducing stress and inducing appropriate coping strategies, most studies of social support have examined networks comprised of people with whom the focal individual has close, face-to-face relationships and frequent interactions in physical space. For example, Deelstra et al. (2003) use "interpersonal relationships at work" as the boundary for the relevant social network. Our purpose in this paper is to study the effects of social support from a unique and emerging reference group, online

“strangers,” on an individual’s ability to successfully execute what has been characterized as a highly stressful activity: quitting smoking.

Nicotine is one of the most heavily used addictive drugs in the United States. Statistics from the Centers for Disease Control and Prevention (CDC) indicate that cigarette smoking remains the leading preventable cause of death in the United States, accounting for approximately one of every five deaths (440,000 people) every year, and resulting in more than 75 billion dollars in direct medical costs annually (CDC, 2003). It is estimated that 22.5% of all adults (46 million people) smoke cigarettes in the United States (CDC, 2004). The health benefits of cessation have been documented in numerous studies, including greatly reducing the risk of dying prematurely, lowering the risk for lung and other types of cancer, heart disease, stroke, and peripheral vascular disease, and reducing respiratory ailments. Women who stop smoking before or during pregnancy significantly reduce their risk for adverse reproductive outcomes ¹.

In spite of the well documented and highly publicized risks associated with smoking, because of the highly addictive nature of nicotine, cessation is difficult. The addiction results in withdrawal symptoms when a person tries to stop smoking and creates acute stress. Research has found that when chronic smokers are deprived of cigarettes, they exhibit significantly amplified anger and stress, and a wide range of psychological and cognitive functions are impaired¹. Not surprisingly then, even though seventy percent of current U.S adult smokers reportedly want to quit completely (CDC, 2004), cigarette smoking remains a very difficult addiction to conquer, with the average success rates in most cessation program at only around fifteen to twenty-five percent (Carlson, Goodey, Bennett, Taenzer, & Koopmans, 2002).

¹ National Institute on Drug Abuse: www.drugabuse.gov

Several studies have examined the effectiveness of various smoking cessation methods, such as instructional programs, self-care methods, and aversive techniques. A meta-analysis by Viswesvaran and Schmidt (1992) concluded that cessation programs incorporating social support, social norms, and self-esteem enhancement were more effective than those that ignored such elements. As noted earlier, there is a robust body of empirical research on the positive effect of social support from family members and significant others on buffering work or non-work related stress in general (Adams, King, & King, 1996; Cortina & Wasti, 2005; Dierendonck et al., 1998; Ganster & Fusilier, 1986) and quitting smoking in particular (Digiusto & Bird, 1995; Gruder et al., 1993; Mermelstein, Cohen, Lichtenstein, Baer, & Kamarck, 1986). But there is little evidence on the effectiveness of social support provided by online “strangers” via technology-mediated communication.

With the proliferating availability and use of the Internet, especially online interactive technology, the potential contribution of this medium to preventive health care has captured the attention of health care providers, consumers, and researchers. In contrast to traditional smoking cessation programs, the Internet-delivered cessation program provides 24/7 social support to smokers struggling with the quitting process. A number of web sites, such as QuitNet.com and QuitSmoking.com, are available today, providing support from both peers and experts. Although such sites have attracted a large number of smokers and ex-smokers, their effectiveness has not been studied and tested. In this study, we examine how the technology-mediated social support provided by an online virtual community influences its members’ smoking cessation behaviors.

Drawing upon prior work in social support and social learning, we propose that online social support can be conceptualized as consisting of two dimensions: structural support and functional support. We then study the effects of these two dimensions on success in coping with

the stress associated with quitting smoking. This is an important extension to extant research, given that even in the well-studied offline settings, not only have structural support and functional support been found to have different effects, the findings have not been conclusive. We further investigate two sub-dimensions of structural support: length and size of social support, and three sub-dimensions of functional support: informational support, group identification, and identity consonance. Because of the uniqueness of our online context, some of these dimensions are being studied for the first time in the literature.

The remainder of this article proceeds as follows. In the next section, we review current literature on social support as a smoking cessation intervention and its effectiveness, and social learning theory. We then propose our research model and hypotheses. Empirical data were collected from Quitnet.com, an Internet-delivered quitting program with a large number of members all over the world. Quitnet.com also provides employer sponsored online cessation programs that are personalized for particular employers who want to help employees quit smoking. We use multinomial regression to analyze the influence of online community tenure, size of online social network, group identification, information need fulfillment, and identity consonance on cessation outcomes. The overall findings are likely to be of value not only for research, but also for online cessation program designers and providers, physicians, and employers.

Theoretical Background

Two streams of literature are relevant for our analysis of social support in online communities. We review key findings from each below, and then present the specific hypotheses tested in this study.

Social support for smoking cessation

Although most smokers want to quit, the success rate of smoking cessation is still low (Britt, Curry, McBride, & Louie, 1994; May & West, 2000). Social support is defined as the resource that is given by other persons (Cohen et al., 1985; House, 1981). More specifically, Leavy (1983 p.5) defined social support as “the availability of helping relationships and the quality of those relationships”. Among various smoking cessation interventions (such as pharmacological and behavioral treatments), social support has been proposed as a key factor that may facilitate quitting behavior, though the effects of social support on reducing strains in general and changing smoking behavior in particular are still inconclusive (Britt et al., 1994; Deelstra, Peeters, & Zijlstra, 2003; Dormann & Zapf, 1999; Kaufmann & Beehr, 1986).

It has been suggested that the lack of conclusive evidence supporting the role of social support in stress reduction may be due to the different types of social support and their quality (Cohen et al., 1985; Ganster & Fusilier, 1986). Extant research has examined both structural and functional aspect of social support (e.g., Feil, Noell, Lichtenstein, Boles, & McKay, 2003). Structural support refers to whether family, friends, or other social networks exist for an individual smoker. Functional support refers to the quality of such social networks (Cohen et al., 1985; Dobkin, Civita, Paraherakis, & Gill, 2002). Functional support includes emotional support and informational support. Studies have found low correlation between functional support and structural support, and observed that the two types of support may affect individual behavior and well-being through different processes (Cohen et al., 1985).

There is evidence that online communication provides meaningful social support (Eastin & LaRose, 2004; Parks & Floyd, 1996; Tichon, 2003). Researchers have found that the same types of social support that exist in the physical world can also be created online, including

structural, social, and informational support (Eastin & LaRose, 2004). Of particular relevance are the findings of Turner et al. (2001) who determined that online support was especially important when off-line support was less available. Computer-mediated social networks provide a variety of relationship types, including both weak ties and strong ties that connect individual smokers with each other (Wright & Bell, 2003). Strong ties are those based on friendship and frequent interactions and generally have an emotional component, while weak ties reflect mere acquaintance and a peripheral relationship (Granovetter, 1973). Wellman (1998) argued that many on-line relationships facilitate frequent, reciprocal, and supportive interaction, and thus satisfy the criteria for strong ties. Online community members can become close friends even though they may never meet each other in person. The lack of social cues online (Walther, 1992; 1997) is likely to lead a dominance of weak tie contacts. To the extent that weak ties may be even more desirable in the case of smoking cessation because people want to avoid the embarrassment of disclosing their problems and the incapability to control their addictive use of nicotine to a strong tie contact, there is reason to hypothesize that social support can be delivered effectively by virtual acquaintances.

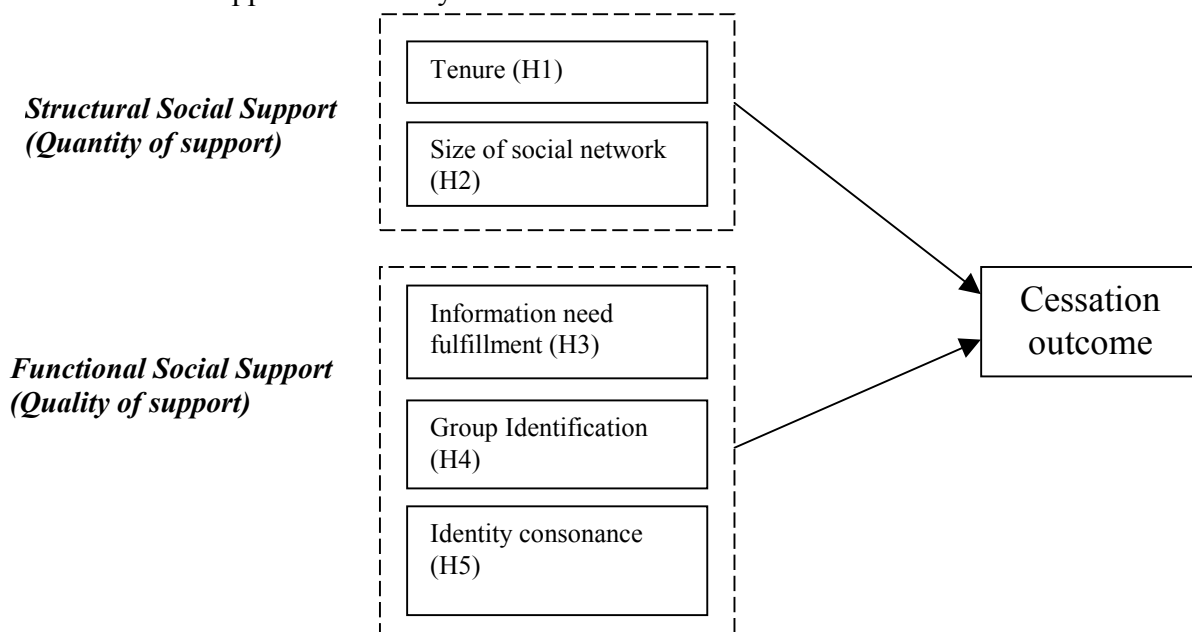
Social learning theory

Why would an individual accept help for a deeply personal addiction such as smoking from a stranger? Social learning theory provides one theoretical mechanism for explaining the relationship between social support from strangers and success in coping with stress. Bandura (1977; 1989)'s influential work in social learning proposes that humans can learn by observing others, i.e., vicarious learning. Individuals are more likely to model behavior exhibited by those with whom they identify, those that have similar personalities, social backgrounds, and experiences, and those they emotionally attach to. For example, Braaksma (2002) found that the

similarity between model and observer influenced the effectiveness of observational learning—learners learn more from similar models. Social learning theory has been applied to a wide range of health problems including smoking cessation (Thomas, Patten, Offord, & Decker, 2004). Bandura’s modeling therapy shows that if someone with certain a disorder observes somebody else dealing with the same issues in a more productive and rewarding fashion, she will learn and change her behavior by modeling (Bandura, 1969; Bandura, 1977; Bandura, 1989). Hence, in the case of smoking cessation, if a person communicates with and observes other’s quitting processes, she can model those behaviors. The effects of such behaviors on the target individual are likely to be more potent when they are enacted a similar other or somebody the target identifies with.

Research model and hypotheses

Drawing upon the literature discussed above, our research model is presented in Figure 1. We propose that structural (the existence of) and functional (the quality of) social support received online are associated with increased success in smoking cessation for a member of an online social support community.



The existence of social support

Continuing social support acts as a buffer against stress and can reduce individual anxiety and its negative consequences (Cohen et al., 1985; Koeske & Loeske, 1991; Krohne & Slangen, 2000). By implication, continued membership and participation in an online community provides social support for quitters. Viswesvaran et al. (1992) suggested that the duration of smoking cessation programs may affect success rate, i.e., a longer program should be more successful. In essence, a longer intervention allows for an amplification of behavioral reinforcement of success, more opportunities to overcome the negative effects of stress, and greater likelihood of being exposed to a larger number of successful role models. Hence, if a community member has had online support for a longer time, she is more likely to successfully quit smoking. Therefore we test:

H1: A virtual community member's tenure is positively related to her/his cessation outcome.

Previous studies in an offline setting have examined the impact of the size of social network on individual happiness and anxiety. The findings from these studies are mixed. For example, Monroe's (1983) longitudinal study found that the number of friends was negatively related to individual stress and anxiety. By contrast, McIntosh (1991) empirically tested the relationship between the amount of social support and reduction in emotional exhaustion and found that number of social support providers had a negative effect on emotional exhaustion. It was argued that too many support providers may result in additional sources of stress (Cohen et al., 1985). Imposed instrumental support at work may also elicit negative reactions (Deelstra et al., 2003) because it can lower the self-esteem of workers.

Although the exact nature of the relationship between the size of social network and positive emotional affect is inconclusive, in this study, we propose that the size of online social network is positively related to the quitting outcome. People may be unable to avoid undesirable social support from their social network in a physical world. In contrast, online community members can intentionally choose how many contacts they would like to communicate with and with whom they want to interact. They can decide when and for how long they want to interact with support providers. Terminating a conversation is as simple as walking away from the computer or turning it off. Hence, we expect that increased stress caused by too many contacts may not be a concern in an online setting.

H2: The size of the online social network of a virtual community member is positively related to her/his cessation outcome.

The quality of social support

Functional support has at least three dimensions (Cohen et al., 1985; House, 1981). First, informational support is informational help in defining, understanding, and coping with a problem, such as suggestions, personal experiences, and guidelines (Cohen et al., 1985). Empirical research in psychology and healthcare has found that informational support can increase individual welfare and reduce stress (Cohen & Hoberman, 1983; Schaefer, Coyne, & Lazarus, 1981). A key aspect of coping with a new symptom or any new situation (such as the withdrawal caused by quitting smoking) is knowing and anticipating how one will feel in the new situation, and seeking advice from experts or trusted others on how to manage (e.g., Cortina & Wasti, 2005). In smoking cessation communities, a vast quantity of informational support is available. For instance, Quitnet.com provides counselor support, quitting guides, medication advice and shopping help, tobacco news, and successful stories from other members. It also

organizes and announces local programs for people who need help offline. QuitSmoking.com, another online smoking cessation community, provides quitting articles, product reviews, and news. Thus, we propose that informational support will help individual smokers quit smoking by reducing stress and providing constructive and practical knowledge and information. Hence,

H3: The extent to which a virtual community member obtains information from the smoking cessation site is positively related to her/his cessation outcome.

A second dimension of functional support is social companionship, which is defined as spending time with others (Cohen et al., 1985). This dimension has also been referred to as social belongingness. When individuals feel such affiliation and identification with others, they can be distracted from their physical and emotional problems and have more positive moods. Further, according to social cognitive and social learning theory (Bandura, 1977; Bandura, 1989; Grusec, 1992), several components are involved in the process of modeling. First, the observer must pay attention to what should be modeled. Attention is determined by various factors, including the observers' social attachment to the model. Second, the observation must be converted into actions similar to the modeled behavior, and third, there must be sufficient motivation for the observer to perform the modeled behavior. This process can also be influenced by individuals' attachment to the model. In the context of smoking cessation, individuals are more likely to model quitters' behavior when they identify themselves with a virtual community whose members have a common cessation goal. In other words, they are more likely to model and imitate other's successful cessation behavior when they have higher group identification. Hence, we propose,

H4: A virtual community member's group identification is positively related to her/his cessation outcome.

The third and final dimension of functional support studied here is emotional support, which is also called esteem support (Cohen et al., 1985). Individuals need identity confirmation and acceptance from others to increase their self-esteem (Swann, 1983; Swann, Pelham, & Krull, 1989; Swann, Polzer, Seyle, & Ko, 2004). Identity is “the individual’s self-appraisal of a variety of attributes along the dimensions of physical and cognitive abilities, personal traits and motives, and the multiplicity of social roles including worker, family member, and community citizen” (Whitbourne & Connolly, 1999: 28). Ma (2004) defined identity consonance as the perceived fit between a focal person’s belief about his or her identity and the acknowledgement of that identity by other community members. Identity consonance increases member self-esteem by providing confirmation and affirmation of an individual’s self worth.

In addition to its positive effects on self-esteem, identity consonance serves several other important functions in an online community. When an individual’s identity is understood by other community members with greater fidelity, the emotional support is likely to involve more empathetic understanding and be more helpful. Further, identity consonance may also help individuals obtain more personalized advice and information (high quality informational support) based on their social roles, experience, personalities, etc. Finally, mutual understanding of identity can help individual community members find similar others who they can identify with and develop emotional attachment. According to social cognitive theory, relationships with similar others, such as those with similar a social background, experience, interests, and personality facilitate social learning and behavioral change. Hence, we propose,

H5: A virtual community member’s identity consonance is positively related to her/his cessation outcome.

To summarize, drawing upon prior research on the dimensions of social support, our research model focuses on two types of social support: structural social support and functional social support. In contrast to extant research, we are interested in if and how these various types of social support can be effectively delivered online via an online social support community.

Method

Research setting and data collection procedure

The context for our study is QuitNet.com, an online support community for people who want to quit smoking. It was first launched on the web in 1995 by a smoking cessation counselor, and later was supported by the Boston University School of Public Health. About 3,000 messages are posted on QuitNet everyday. According to the site, it has over sixty thousand smokers and ex-smokers all over the world who congregate online each month to provide support to each other. Quitnet.com provides all the desirable components of an online quitting program summarized and recommended by Feil et al. (2003), including a personalized quitting plan, a social support component with forums, chat rooms, and private message systems, and information resources. The personalized quitting plan is designed as a quitting wizard. Users are encouraged to set a specific quitting date with a personalized agenda. The “Quit Anniversary” is celebrated site wide. The social support component encourages interactions between smokers and ex-smokers. As shown later, there are a large number of ex-smokers in the community, whose support could be especially effective and informative (Podsakoff & Organ, 1986). Finally, the information resources available include expert support, medication support, news, guides, successful stories, and local events related to smoking cessation.

Data were collected via surveys of members of Quitnet. To minimize common method variance, we conducted the survey in two stages. Previous research has suggested that collecting measures at different time is one effective procedural method to reduce common method variance (Couper, 2001; Read, 1991). In our study, the first survey included questions measuring the independent variables--tenure, size of social network, group identification, information need fulfillment, and identity consonance. The follow-up survey, which was conducted two weeks later, included the measurement of quitting outcomes.

To speed data collection for researchers and reduce participation costs for respondents (Boyer, Olson, Calantone, & Jackson, 2002), we used a web-based survey. The online survey method does not appear to create response bias (Bhattacharjee, 2001; Fulk, Heino, Flanagin, Monge, & Bar, 2004) and is gaining acceptance in various research disciplines (Gabriel & Gardner, 1999). QuitNet has a private message system that administrators can use to make announcements. Community members also use it to contact each other. Our study was announced via QuitNet's private message system on March 15, 2005 and the announcement was online for one week. The study was only broadcast to Quitnet's US users so that variance caused by other factors such as language and culture could be minimized. Two weeks after the first survey, we sent the link to the follow-up survey to users who completed the first survey. After another one week, a reminder was sent to those who had not filled out the follow-up. In total, 500 complete responses were received. According to the QuitNet administrator, there were 3769 unique US users who logged onto QuitNet during the week of the first round survey. Because there is no easy way to find out if those users actually checked their private messages during their online session, the response rate should be 13.3% or higher.

Eighty-three respondents who had been QuitNet members for less than one month and claimed that they had quit smoking were deleted from the sample because previous research shows very high relapse rate during the first few weeks of cessation, when withdrawal symptoms are strongest (Bergen & Caporaso, 1999). We deleted another 6 responses due to missing values, yielding a final sample size of 411.

Table 1 presents the demographic information of the respondents in terms of gender, age, education, Internet experience, and community tenure. There are more female respondents (78.8%) than male respondents. It is possible that females are more likely to participate in emotional support communities and seek and provide support to a greater degree than men. Research in psychology has shown that women are generally more relational interdependent (Day & Livingstone, 2003; Feil et al., 2003). Other studies on smoking cessation programs show similar percentage of women participants (Oppenheim, 1966). Most users of QuitNet release their gender in their personal profiles. We randomly checked a hundred users and there were more females than males at QuitNet. Approximately 75% of the respondents have some college education, indicating a well-educated sample.

Table 1: Demographic Profile of Respondents (N=411)

Gender	Male	87 (21.2%)
	Female	324 (78.8%)
Age	18-25	21 (5.1%)
	26-35	98 (23.8%)
	36-45	109 (26.5%)
	46-55	126 (30.7%)
	>55	57 (13.9%)
Education	2 years high school	6 (1.5%)
	4 yrs high school	101 (24.6%)
	2 years college	128 (31.1%)
	4 years college	78 (19.4%)
	> 4 years college	98 (23.8%)
Internet Experience (years)		8.31 (S.D.= 3.91)
Tenure (months)		14.67 (S.D. =16.35)

We compared means for all the major variables and demographics for early respondents and late respondents to test for possible non-response bias (Duffy, Shaw, & Stark, 2000). The results of t-tests for the demographic profiles, Internet experience, community tenure, group identification, identity consonance, etc. are not significant, indicating non-response bias is not likely to be a threat to our findings.

Measurement

Dependent Variable: To capture cessation outcome, the respondents were asked to identify if they had successfully quit smoking after joining QuitNet, if they had quit before joining, or if they were non-smokers.

Independent Variables: We measured five independent variables: tenure, size of social network, group identification, information need fulfillment, and identity consonance. Tenure was measured by asking “how many months have you been a member of this community?” The size of social network was measured by asking “how many people do you interact with in this community?” The group identification instrument was derived from Mael and Tetrick’s (1992) scale for organizational identification, which was later adapted by Polzer et al. (2004) to measure group identification. The 6 items are “when someone criticizes this community, it feels like a personal insult”; “this community’s successes are my successes”; “when someone praises this community, it feels like a personal compliment”; “I’m very interested in what others think about this community”; “when I talk about this community, I usually say ‘we’ rather than ‘they’”; and “if stories in the media criticize this community, I would feel bad”. This study measured information need fulfillment with items adapted from Dholakia, Bagozzi and Pearo (2004). The respondents were asked to rate the extent to which their online community helped them: get information; learn how to do things; generate ideas; solve problems; and make decisions.

Finally, we adopt Ma's (2005) instrument of identity consonance. First, a modified Twenty Statements Test (TST) introduced by Kuhn (1954) was used to capture salient identities of respondents. TST asks respondents to fill in the blank for 20 statements like "I am ____". It is an open-ended identity measurement that has been adapted and used in many studies (e.g., Hong, Lp, Chiu, Morris, & Menon, 2001; Rhee, Uleman, Lee, & Roman, 1995) and validated by Kuhn (1954) and Driver (1969) using independent criteria. An individual has multiple identities and in different contexts, different identities may become dominant. In other words, salient identities may be distinct in different communities. As has been done in many previous studies (Hong et al., 2001; Rhee et al., 1995), we captured salient identities in a specific context using a modified Twenty Statements Test, which asks respondents to complete statements like "In Quitnet.com, I am _____". Also similar to previous studies, we reduced the number of items from 20 to 5 to minimize the effects of fatigue. Following Ma (2005), the respondents were asked to rate their perception of other community members' recognition and verification of those salient identities after completing the TST.

Results

Measurement reliability and validity

Cronbach's α was computed to validate the reliability of the measures. Discriminant validity and convergent validity were evaluated by examining item to factor loadings in a principal component factor analysis with varimax rotation. Table 2 shows the number of items used in the survey, the number of items after factor analysis, descriptive statistics for major variables, and Cronbach's α . Overall, the reliability of the measurement scales is good (Nunnally & Bernstein, 1994), with all α s being greater than 0.7.

Identity consonance is slightly below neutral (less than 4 on a 1-7 likert scale). Five identities were solicited from the respondents and two items were used to measure consonance for each identity. Hence, there are 10 items in total for identity consonance. Factor analysis showed that the consonance measures for the last two identities did not load on the same factor as the first three identities. It is possible that the first three identities provided by a respondent are the most salient identities. Therefore, only the consonance measures for the first three identities are maintained for later analysis. The average group identification is above neutral (mean=4.90), while information need fulfillment is slightly below neutral (mean=3.97).

Table 2. Descriptive Statistics of Independent Variables (N=411)

Independent Variables	No. of Items (before PCA)	No. of Items (after PCA)	Mean	S.D.	Cronbach's α
Identity Consonance (IC)	10	6	3.84	0.89	0.89
Group identification (GI)	6	6	4.90	1.33	0.88
Information Need (INF)	5	5	3.97	0.88	0.86
Tenure	1	1	14.67	16.35	NA
Size of social network	1	1	60.11	106.23	NA

Table 3 provides the rotated (Varimax) loadings from a principal components factor analysis. The results indicate that indicators load more strongly on their corresponding construct ($>.68$) than on other factors in the model ($<.30$). Correlations are provided in Table 4. As expected, identity consonance and tenure are significantly correlated with quitting outcome. However, information need fulfillment is negatively related to quitting outcome, indicating that people who received more information from the community are less likely to quit. We discuss possible explanations for this unexpected finding in the next section.

Table 3: Factor Analysis

	1	2	3
INF1	.717	.083	-.033
INF2	.848	.202	.024
INF3	.848	.131	.051
INF4	.835	.265	.073
INF5	.783	.288	.049
GI1	.138	.821	.074
GI2	.229	.777	.022
GI3	.165	.875	.057
GI4	.138	.794	.118
GI5	.183	.686	.237
GI6	.166	.766	.084
IC11	-.033	.113	.761
IC21	.040	.130	.833
IC31	.097	.010	.767
IC12	-.052	.143	.749
IC22	-.013	.117	.798
IC32	.141	.007	.741

INF = Information Need Fulfillment; GI= Group Identification; IC= Identity Consonance;
Total Variance Explained: 68.24%

Table 4: Correlation Matrix

	1	2	3	4	5	6
1. Tenure	-					
2. Size of Social Network	.249(**)	-				
3. Information Need Fulfillment	-.087	-.059	-			
4. Group Identification	.008	-.008	.444(**)	-		
5. Identity Consonance	.136(**)	.131(**)	.114(*)	.246(**)	-	
6. Quit or not Quit	.112(*)	.071	-.152(**)	-.021	.148(**)	-

*N=411; **: $p < .001$; *: $p < .01$*

Online identity

Recall that to measure identity consonance, the respondents were asked “In Quitnet, who are you?” The responses surfaced both personal identities and social identities. Sample personal

identities are “helpful”, “quiet”, “happy”, “scared”, “encouraging”, “knowledgeable”, “funny”, “healthy”, and “active”. Examples of social identities include “woman”, “teacher”, “student”, “lurker”, “democrat”, “mother”, “daughter”, “non-smoker”, etc. “Smoker”, “ex-smoker”, or other smoking related identities were not the most frequently mentioned self-concepts given by the subjects. Previous research has found that people bring their social and personal identities to the work and the confirmation of those identities is important for employee satisfaction and performance (Swann, 1983; Swann et al., 2004). Similarly, we find that in an online community, users assume multiple identities, the verification of which may be associated with the quality of social support.

Hypotheses testing

Multinomial regression analysis was performed using SPSS to assess prediction of membership in one of 4 categories of quitting status (non-smoker, quit before becoming a community member, quit after becoming a community member, and not quit). For the rest of the paper, these four categories are labeled as “non-smoker”, “quit before”, “quit after”, and “not quit”. Logistic regression assumes a linear relationship between continuous predictors and the logit transform of the dependent variable (Tabachnick & Fidell, 2001). The Box-Tidwell approach (Hosmer & Lemeshow, 1989) was adopted to test this assumption. The products of continuous predictors (tenure, size of social network, information need fulfillment, group identification, and identity consonance) and their natural logarithm were added to the multinomial regression model and none of the interaction terms were found to be statistically significant. Therefore, the assumption of the linearity in the logit is satisfied. In addition, multinomial regression may produce extremely large parameter estimates when there are too few cases relative to the categorical variables. The goodness-of-fit test will also become unreliable if

the adequacy of expected frequencies for categorical predictors is not satisfied. None of our independent variables is categorical, hence, there is no need to restrict model goodness-of-fit tests.

A test of the full model with all five independent variables against a constant-only model is statistically significant. The overall model fit is good, $\chi^2 = 71.7$ and $p = .000$. Nagelkerke $R^2 = .19$. On the basis of 5 independent variables, correct classification rates were 0% for “non-smokers”, 99.1% for “quit after”, 0% for “quit before”, and 14.3% for “not quit”. The overall correct classification rate was 60.0%. Clearly, cases were over-classified into the largest group—quit after.

Table 4 shows the contribution of the individual independent variables to the model by comparing the models with and without each independent variable. Four independent variables (tenure, size of social network, information need fulfillment, and identity consonance) are significantly related to quitting outcome.

Table 4: Chi-square change after each independent variable is removed from the full model

Variables	$\Delta\chi^2$ (full model $\chi^2=71.7$)	Δdf
Tenure	32.8***	3
Size of social network	9.2*	3
Information need fulfillment	16.1**	3
Group identification	.8	3
Identity Consonance	8.0*	3

*N=411; ***: $p < .001$, **: $p < .01$, *: $p < .05$*

Table 5 shows the average tenure, size of social network, information need fulfillment, group identification, and identity consonance for the four outcome categories. Community members who had not quit smoking (“not quit”) had lower identity consonance (H5 supported), shorter tenure (H1 supported), smaller size of social network (H2 supported), and obtained more

information (contrary to H3) from the community compared to those in other behavioral groups. H4 is not supported.

Table 5: Differences in Independent Variables for Outcome Categories (N=411)

	Non-smoker	Quit after	Quit before	Not quit	F test
N	57	257	76	21	411
Tenure	10.28 (14.3)	18.45 (17.39)	12.61 (14.63)	5.07 (6.75)	6.22 ***
Size of Social network	55.18 (10.1)	74.53 (8.2)	64.78 (11.3)	28.24 (14.3)	NA ⁺
Information need fulfillment	4.03 (.77)	3.88 (.95)	3.68 (.90)	4.57 (.60)	5.79**
Group identification	4.85 (1.18)	4.92 (1.39)	4.70 (1.39)	5.05(1.26)	.70
Identity Consonance	3.86 (.90)	3.94 (.84)	3.79 (.88)	3.32 (.94)	NA ⁺

***: $p < .001$, **: $p < .01$, *: $p < .05$

⁺: Because homogeneity of variance assumption is violated and the sample sizes in each category are unequal, the standard F test is not inappropriate (Tabachnick & Fidell, 2001). Tamhane Post Hoc test is conducted in SPSS, which shows significant difference of size of social network between “quit after” and “not quit” categories, and significant difference of identity consonance between all four categories;

Discussion

Key findings

Social support serves as a buffer for stress (Cohen et al., 1985) and social support from those with similar experience promotes social learning. In our context, the learning is about successful smoking cessation. In contrast to much extant research that has focused on social support provided by co-workers or family members, this study provides empirical support for the valuable and powerful effects of social support from other online community members, i.e., virtual “strangers”. We tested the effect of the quantity and quality of social support provided by an individual’s social network in a virtual community on smoking cessation outcomes.

In H1, we proposed that community tenure positively relates to cessation outcome. It is supported by our data, indicating that as with offline programs, the duration of Internet-delivered cessation program is important. H2 proposed that the size of social network relates to quitting outcome. Survey results confirm H2 and show that the quantity of social support (i.e., size of

social network) is positively related to successful quitting. This finding is striking in light of the fact that research in offline settings has pointed to the potentially negative effects of larger social networks (Deelstra et al., 2003; McIntosh, 1991). As argued earlier, the key difference in the online environment is that the individual has greater control over who she chooses to associate with.

We also find support for H5 proposing the positive influence of identity consonance. H5 indicates that the verification of self-concept by other community members may increase individual self-esteem and serve as a high quality emotional support. Because others in the community view the individual as she views herself, it is likely that their support will be of higher quality, i.e., more empathetic in nature. As expected, such support will reduce stress caused by cessation and improve the chances of successful quitting.

Surprisingly, we found that members who had not quit smoking on average obtained more information from the community (contrary to H3). This finding is possibly caused by the fact that searching and receiving information from the site is no longer a primary goal for respondents who had quit smoking and who are non-smokers. Also, group identification does not influence cessation outcome. A plausible explanation for its non-significance is that the efficacy of dyadic ties is far superior to a generalized feeling of belonging to the group. Interesting future research can be conducted to explore this possible explanation. Extant studies on relationships usually investigate dyadic ties and community connectedness separately without comparing the relative strength of their effects on individual attitude and behavior (Laursen, 2005). Because the online community includes successful and unsuccessful smokers, their role model effects may essentially negate each other, thereby producing a non-significant influence on cessation outcomes.

Overall, these findings are consistent with prior studies on social support in offline settings where some dimensions of social support appear to facilitate smoking cessation, whereas other dimensions do not. Importantly, our findings indicate the importance of taking into account the salience of specific dimensions of social support when exploring its impact on smoking cessation. When designing a successful and helpful online smoking cessation program, we need to emphasize on providing those types or dimensions of social support that are more effective.

Limitations

Prior to discussing the implications of the findings, we acknowledge limitations that imply interesting and fruitful future research. First, only members from one online smoking cessation community were surveyed. Hence, some of the findings reported here may not extend to other online support communities. Further investigation with other online support communities is necessary to generate more robust and generalizable findings. Second, because of the cross-sectional design of this study, no causation can be determined. The significant findings can only be interpreted as correlation and the causal inferences are solely based on theoretical argumentation. Further studies employing longitudinal or experimental designs may provide even more convincing evidence for the critical role played by the quality and existence of online social support on smoking cessation.

In addition, because all the constructs were collected from the same respondents, the results presented may be subject to common method variance. Our study adopts two methods to overcome and detect this problem. First, as noted before, the data were collected at two different periods of time. Predictors were collected at time zero and outcomes were collected two weeks

later. Podsakoff and Organ (1986) have recommended this method as one efficient procedural method to reduce common method variance. Second, Harman's one-factor test was applied and we did not detect any serious problem. Nonetheless, although this study makes these efforts to detect and reduce common method variance, it may still be a noteworthy issue in interpreting the results.

Implications

Understanding the effects of online social support is of practical as well as theoretical relevance. For the research literature, this study provides empirical support for the effectiveness of computer-mediated social support. Extant research on the effectiveness of Internet delivered social support is far from conclusive. By discovering the significant positive impact of online social support (both structural and functional) on smoking cessation, we fill a gap of current research on online social support. We empirically testified that online community tenure and size of online social network were positively linked to successful smoking cessation. We also found that identity confirmation from others helped with smoking cessation.

Second, this study integrates new constructs, such as group identification and identity consonance, into the social support framework. These constructs have not been studied directly before as dimensions of social support. In contrast to much extant experimental research that has manipulated the availability of social support, this study further investigates the quality of social support in terms of online self-esteem support (i.e., identity consonance) and virtual social companionship.

Finally, this study also integrates Bandura's social learning theory and examines the effectiveness of peer-to-peer social support. While supervisors and family members' support has

been found to be helpful for relieving job-related stress, peer smokers or ex-smokers sharing similar physical and emotional experiences may be easier to associate with by support seekers, and be more persuasive and helpful for smoking cessation processes.

For practice, this study provides guidelines and insights for those seeking to develop online smoking cessation programs or other social support programs (such as cancer, domestic violence, etc.). Online social support provided by peers may serve as a complementary treatment together with medication and professional consultation. Further, according to this study, healthcare practitioners can also develop a more effective online social support community by focusing on helping community members expand their social network online and facilitating mutual understanding. The inclusion of design feature such as individual profiles, interaction archives, and self-expression tools may be useful for the above purposes. New community features can also be designed to facilitate social network building and better interaction.

Future research

Computer-mediated communication is becoming increasingly popular, along with the advanced telecommunication technologies. The use of Internet-delivered health programs become more prevalent and the effectiveness of such programs is still not well studied. For future research, it would be necessary to investigate the positive influence of online social support on other types of support programs, such as cancer, diabetes, etc. We believe that social support provided by online “strangers” has similar positive consequences to support provided by offline friends and family members. An interesting question to explore through experimental research is which source of social support, significant others or online friends, is more effective? Ruehlman and Wolchik (1988) found that support from intimate others played a more critical role than did support from distant social ties. However, prior research on cyber relationships

also suggests that online relationships can be intimate and strong. Hence, fruitful future research can be conducted to compare the effectiveness of social support by significant others offline and quality online contacts.

Current research on coping has investigated several possible relationships between social support and individual well-being, including direct effects, mediating effects, and moderating effects (Dormann & Zapf, 1999). While we theorized about and tested for the direct positive impact of social support in our study, it would also be interesting to explore the other two types of relationships. For example, perceived stress may mediate the link between social support and smoking cessation outcomes. Individuals receiving more and better social support may perceive less stress, which thereafter promotes successful cessation. Similarly, social support may strengthen (i.e., moderate) the relationship between individual intention to quit and cessation outcomes. The possible multiple impacts of online social support on individual well-being in general, and smoking cessation in particular, imply interesting future research.

Although we find evidence that the number of social support providers matters, it would be interesting to explore a support seeker's position in a social network together with network characteristics and its impact on cessation outcome. Support seekers closer to the center of the social network may benefit from more informational and emotional resource. Analyzing conversations between online community members may also reveal precisely what content of social support facilitates smoking cessation. Zellars and Perrewe (2001) found that positive and negative content of emotional support has different consequences in regard to job burnout. Hence, instead of the amount of social support, the specific content of support may also influence its impact. Whether a smoking cessation related topic or a general sympathetic conversation is more helpful deserves further investigation.

Future work is also required to design new community functions, tools, or features for supporting identity communication and for facilitating the expansion of an online social network, both of which have been shown to improve quitting outcomes. From a normative perspective, our results show that cessation communities should be designed to retain members for a longer time, and promote high quality social interaction between members. These design features may increase the sustainability of an online community and thereafter the effectiveness of internet-delivered healthcare programs. Some human-computer interaction researchers are developing new community tools that can visualize social networks and promote mutual understanding online, and much more valuable research remains to be done in this area.

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