

# **Do Internet-Based Support Interventions Change Perceptions of Social Support?: An Experimental Trial of Approaches for Supporting Diabetes Self-Management<sup>1</sup>**

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*Internet-based support groups are a rapidly growing segment of mutual aid programs for individuals with chronic illnesses and other challenges. Previous studies have informed us about the content of online exchanges between support group members, but we know little about the ability of these interventions to change participants' perceptions of support. A randomized trial of 160 adult Type 2 diabetes patients provided novice Internet users with computers and Internet access to 1 of 4 conditions: (a) diabetes information only, (b) a personal self-management coach, (c) a social support intervention, or (d) a personal self-management coach and the support intervention. After 3 months, individuals in the 2 support conditions reported significant increases in support on a diabetes-specific support measure and a general support scale. Participants' age was significantly related to change in social support, but intervention*

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*effects were still significant after accounting for this relationship. This report is a critical first step in evaluating the long-term effects of Internet-based support for diabetes self-management. The discussion identifies directions for future research.*

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There is a new technological twist to the long-standing practices of bringing people together in peer-led social support groups. Along with the advances in promoting and evaluating conventional mutual aid self-help groups (Humphreys, 1997) has come a surging interest in using computer technology to link people who share similar life circumstances, personal challenges, or illnesses (Madara, 1997; Salem, Bogat, & Reid, 1997). The creation of virtual communities through online groups is one important element of a larger effort to use computer technology to address problems and improve life (Burnett, Taylor, & Agras, 1992; Gackebach, 1998; Street, Gold, & Manning, 1997).

There are many attractive features to Internet-based support groups. As Madara (1997) noted, people search for a sense of community when they recognize that community is something that is chosen rather than something into which they are born. He argued that community "is more easily found, chosen, or started online" (p. 23). Furthermore, individuals with chronic illnesses or disabilities might find it more convenient to participate in online support groups than participating in person. Proponents of virtual support groups have speculated that participants in virtual support groups find comfort in the anonymity of the group and its faceless quality that allows them to be valued for the strength of their contributions rather than being evaluated on their physical appearance or disabilities (Madara, 1997; Weinberg, Schmale, Uken, & Wessel, 1995). Online support groups require access to computer hardware and technical assistance, but they are not limited by a local community's size, geography, or social services. If Internet-based support groups are found to be feasible and effective, they are practices that should be expanded to increase the availability and diversity of communities from which individuals can choose. These practices also could help efforts to eliminate disparities in health that exist because of inequities in people's access to resources (U.S. Department of Health and Human Services, 1991).

Thus far, much of the literature on Internet-based support groups has elaborated on the reasons for their growth, their structure, and their advantages and disadvantages (Finn, 1996; King & Moreggi, 1998; Weinberg et al., 1995). Some studies have provided content analyses of the actual exchanges

that took place between members of online support groups (Salem et al., 1997; Weinberg, Schmale, Uken, & Wessel, 1996; Winzelberg, 1997). Those descriptive studies showed that the supportive statements made in computer-mediated interactions are similar to those made between support group members in face-to-face interactions.

Internet-based support groups fit into a broader effort to develop interventions that make use of social support concepts (King & Moreggi, 1998). Support groups are a prominent form of social support interventions (Barrera & Prelow, 2000; Gottlieb, 1988; Heller, Price, & Hogg, 1990; Vaux, 1988), as are mentoring interventions that sometimes include the use of professionals such as visiting nurses (e.g., Olds & Kitzman, 1993). What is common to both support groups and mentoring interventions is that they involve the introduction of new people, people who were strangers prior to the intervention, but who were expected nevertheless to provide support that would be helpful and relevant.

Transforming strangers into supporters is not an easy process or one that carries guarantees for success. There have been well-conceptualized, carefully implemented support interventions that have failed to change participants' perceptions of social support or the size of their social networks (see Barrera & Prelow, 2000; Lichtenstein, Glasgow, & Abrams, 1986). A telephone-based social support intervention for linking low-income, elderly women became the target article for nine invited commentaries in a special issue of the *American Journal of Community Psychology* (Heller, Thompson, Trueba, Hogg, & Vlachos-Weber, 1991). This research was notable because the intervention was well-conceived and carefully designed, but was unsuccessful in changing perceived social support or mental health (Heller et al., 1991). It pointed out the need for developing social support interventions that are effective in improving individuals' perceptions that support is available to them.

Commonly, researchers do not evaluate if support interventions actually change participants' perceptions of social support, network size, or actual provisions of support (Barrera & Prelow, 2000; Bogat, Sullivan, & Grober, 1993). In their review of support interventions, Bogat et al. (1993) pointed out several shortcomings of the research literature. Their first criticism was that "the integrity of the interventions was often compromised by the absence of manipulation checks, to determine whether social support was actually enhanced or created" (p. 212). Failing to determine if support interventions actually change social support limits both theory and applications. Experimental trials of support interventions can provide tests of the theoretical mechanisms underlying social support effects.

Cohen and colleagues proposed that social support affects health and mortality through a number of mechanisms that include (a) improved health

behaviors (i.e., people who have social support take care of themselves better than those who are socially isolated), (b) decreased negative affect, and (c) improved immune system functioning (which might be tied to affect regulation; Cohen, 1988; Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997). In his review, Cohen (1988) drew a distinction between studies that used measures of social integration (e.g., marital status, relationships with close family and friends, religious affiliations) and those that used measures of perceived social support. Measures of social integration played a role in epidemiological research on mortality, whereas perceived social support measures were seen as most appropriate in studies on disease processes, neuroendocrine response, and stress buffering. It is highly unlikely that computer-mediated interventions could change social integration, but it is quite possible that such interventions could change the perceived availability of support that would influence health through affect-mediated neuroendocrine responses. The question of whether support interventions can actually change perceptions of social support is particularly compelling for Internet-based support interventions that rely exclusively on interactions that are not face-to-face.

Perhaps the most extensive experimental evaluation of a computer-mediated intervention was reported by Gustafson et al. (1999). They evaluated the Comprehensive Health Enhancement Support System or CHEADS for HIV-positive patients who were randomly assigned to this multifaceted computer-mediated intervention or a no-treatment control. Patients in the CHEADS intervention received a home computer and access to 11 treatment components that included facilitated online support groups, interactions with health experts, decision-making aids, a library of information, and other forms of assistance. The control group received standard medical care and did not receive computers. Five months after the start of the intervention, the CHEADS group was significantly different from the controls on three of the eight dependent variables: social support from friends, having an active lifestyle, and participation in health care. Because there was a large number of separate components to this comprehensive intervention, it was not possible to attribute the changes in social support to the support group component alone. A design that provided a more focused evaluation of the support intervention components would help clarify their role in changing perceptions of support.

A randomized control trial of a computer-mediated intervention was conducted with the caregivers of Alzheimer patients (Brennan, Moore, & Smyth, 1995). Like the study by Gustafson et al. (1999), it compared a multifaceted Internet-based intervention with a control group that did not receive computer equipment or Internet access. Results showed a significant intervention effect on caregivers' confidence in decision making, but not on decision-making skill or social support as measured by the Instrumental

and Expressive Social Support Scale (Ensel & Woelfel, 1986). Brennan et al. (1995) indicated that the lack of a significant effect on their measure of social support was inconsistent with their impressions of the messages that were posted and exit interviews of ComputerLink participants. They suggested that their measure of social support was too heavily focused on perceived support from existing support network members to be sensitive to changes that occurred with the introduction of new members. This proposed explanation suggests the need for social support measures that are appropriate for evaluating the changes in support that result from Internet-based support group interactions.

This study used a new measure that was designed to provide a fair evaluation of a Internet-based support group that focused on diabetes. Existing support measures were not specific to aid in managing diabetes and required either face-to-face interactions or degrees of intimacy that could not be developed realistically in relatively brief computer-mediated interventions. The scale was designed to assess perceived availability of support and support accessibility rather than received support directly. The rationale for using this outcome measure was that even if some participants were not frequent users of computer-mediated support, the intervention should be effective in making support more available and easier to use. It was these specific diabetes support perceptions that were hypothesized to eventually lead to decreases in negative affect, better self-care behaviors, and greater metabolic control.

This study is an important initial step in developing and evaluating Internet-based interventions for individuals with diabetes. Diabetes is a very common and costly chronic illness (American Diabetes Association, 1997) that has attracted considerable attention as a focus for self-help groups (cf. Humphreys, 1997). The primary purpose of this report was to determine if a computer-based intervention was successful in changing participants' perceptions of social support.

Mature adult participants having Type 2 diabetes were recruited through primary care medical practices, provided with a computer, and randomly assigned to one of four conditions that provided them with Internet access to (a) information about diabetes only; (b) information plus participation in a peer support intervention; (c) information plus access to a personal coach to assist in self-management activities; and (d) information, support intervention, and access to a personal coach. Information, peer support, and personalized guidance in self-management activities (particularly nutrition) were seen as potentially valuable components of a comprehensive diabetes management supplement to medical care.

After 3 months of intervention, participants were assessed on social support measures. Our primary hypothesis was that individuals who participated

in one of the two conditions that contained the support intervention would report a greater increase in perceived support than individuals who received information only. The study was not designed to compare the effectiveness of support groups and personal coaches in changing perceptions of social support. Unlike mentors such as home-visiting nurses (Olds & Kitzman, 1993), the personal coach in this study had a circumscribed role that was limited to advice surrounding diet and the patients' self-management goals. It was not clear if patients would experience the advice and feedback provided by the coach as sufficient to change their general sense of perceived social support.

## METHOD

### Participants

Participants were 75 men and 85 women who were diagnosed with Type 2 (noninsulin dependent) diabetes mellitus. Participants were an average of 59 years of age and had been diagnosed with diabetes an average of 11 years. These and other participant characteristics are summarized in Table I.

To be eligible for the study, participants had to be 40–75 years old, live in the local area, have a telephone, read and write English, and be diagnosed with Type 2 diabetes for at least 1 year. Furthermore, we restricted

**Table I.** Descriptive Statistics (Standard Deviations in Parentheses) on Participant Characteristics in Each Condition and the Entire Sample

Variable	Control ( <i>n</i> = 40)	Coach ( <i>n</i> = 40)	Social support ( <i>n</i> = 40)	Social support plus coach ( <i>n</i> = 40)	Total sample ( <i>n</i> = 160)
Women (%)	52.5	57.5	47.5	55.0	53.1
Education <sup>a</sup>	4.8 (1.2)	5.0 (1.2)	4.7 (1.4)	4.9 (1.3)	4.8 (1.3)
Income <sup>b</sup>	2.9 (1.5)	2.7 (1.4)	3.1 (1.6)	2.7 (1.3)	2.9 (1.4)
Number of years since initial diagnosis	11.8 (6.8)	10.0 (6.4)	11.7 (8.7)	11.6 (9.2)	11.3 (7.8)
Age	60.8 (9.1)	57.6 (9.1)	56.7 (9.2)	62.1 (9.5)	59.3 (9.4)
Physical health	38.4 (10.8)	41.4 (11.7)	41.4 (12.6)	42.1 (10.6)	40.8 (11.4)
Diabetes Support Scale – Time 1	4.2 (1.4)	4.0 (1.2)	3.7 (1.3)	4.1 (1.3)	4.0 (1.3)
ISEL – Time 1	3.5 (0.9)	3.4 (0.9)	3.4 (0.9)	3.7 (0.9)	3.5 (0.9)

*Note.* There were no statistically significant between-condition differences at Time 1 for any of these variables.

<sup>a</sup>This was a 7-point scale where 1 = 6th grade or less, 2 = 7th to 9th grade, 3 = 10th to 11th grade, 4 = high school graduate, 5 = some college, 6 = college graduate, 7 = graduate or professional school.

<sup>b</sup>This was a 6-point scale where 1 = less than \$10,000. The other scale points represented \$20,000 increments (where 6 = greater than \$90,000).

the sample to individuals who reported that they did not have Internet access at home or work. Participants were recruited through the practices of 16 primary care physicians who sent letters describing the study to their patients who were purported to have Type 2 diabetes. The letters contained a stamped postcard that patients could use to decline any contact with the research staff. Of the 650 patients who were sent letters, 75 patients (12%) declined by returning the postcards, we could not locate 71 patients (11%), and 239 (37%) were found to be ineligible. Of the 265 patients who were eligible, 160 (61%) agreed to participate. Those who agreed to participate and those who declined differed in that the former were slightly younger (59 compared to 62 years of age) and more recently diagnosed (9.5 compared to 13.4 years since diagnosis).

In the statement of informed consent, participants were notified that they would receive access to one of several different Internet resources and that computers would be removed from their homes following the intervention.

### **Intervention Conditions**

#### *Information Only*

Participants in the Information Only condition had computer access to an extensive number of articles that concerned medical, nutritional, and lifestyle aspects of diabetes. All articles gave information only and did not systematically instruct participants in changing dietary practices or other behaviors.

#### *Personal Coach Only*

Participants in the Personal Coach condition had access to the same information as those in the Information Only group. In addition, they had computer-mediated access to a professional who had expertise in providing dietary advice to diabetes patients. Participants worked with their coach and resources on our web site to reach their dietary goals that were derived by an online assessment taken at baseline. These dietary goals were then negotiated with participants' online coach who they could access twice per week throughout the 3-month intervention period. The coach suggested strategies for overcoming barriers and provided tips, information, and encouragement to assist the participants in meeting their goals. Participants also had access to an online "Dietitian Question and Answer" conference that dealt with specific topics such as "Reading Food Labels" and "Increasing Your Intake of Fruits and Vegetables." To further support their changes in dietary

behavior, participants accessed a personal database where they could enter information on their daily intake of fruits, vegetables, and saturated fat. They also could enter their blood glucose levels for different periods of each day (e.g., breakfast, dinner, before and after exercise, etc.). All data entered could be graphically displayed in real time for feedback to participants as a way to support their dietary change efforts.

### *Social Support Only*

Individuals in the Social Support Only condition received the same information as those in the Information Only condition. In addition, they participated in several activities that provided participants with opportunities to exchange diabetes-related information, coping strategies, and emotional support. The main activity area, the Diabetes Support Conference, was a peer-directed (but professionally monitored) forum for participants to interact with one another in a safe, supportive setting where participants were encouraged to express their concerns, successes, and frustrations with their day-to-day coping with diabetes. Group members posted messages that other members could read and answer.

A structured support conference area called Focus Forums was more topic-oriented than the Diabetes Support Conference. Periodically, the research staff introduced specific diabetes-related topics to stimulate peer group discussion. For example, topics included “Getting the Best of Stress” and the “Ebb and Flow of Living With Diabetes.” In addition to these support activities, participants could also engage in real-time live-chat discussions.

### *Combined Condition*

Participants in the combined condition had access to the same resources that were available in the Personal Coach condition and the Social Support condition.

## **Measures**

### *Demographic and Background Characteristics*

Information was collected on age, gender, education, income, number of years since the initial diabetes diagnosis, and degree of physical disability. Participants reported their educational attainment on a 7-point scale that ranged from 1 (*less than seventh grade*) to 7 (*graduate or professional*)

school), and their family income on a 6-point scale that ranged from 1 (*less than \$10,000*) to 6 (*greater than \$90,000*) in increments of \$20,000. Physical health was assessed with the SF-12, a 12-item short-form version of the SF-36 from the Medical Outcome Study, a general health survey (Stewart, Hays, & Ware, 1988).<sup>3</sup>

### *Interpersonal Support Evaluation List (ISEL) Items*

We administered selected items from a widely used measure of general social support, the ISEL (Cohen & Hoberman, 1983). We did not expect the ISEL items to be as sensitive to intervention effects as the DSS, but it had value as a validity criterion for the DSS. The original ISEL was a 48-item scale developed for college students. Subsequently, a 40-item version was developed for nonstudent samples. Since its development, it has been validated in numerous studies of psychological distress and physical health. In consultation with the test developer, we selected six items, two from each of the three domains of tangible, belonging, and appraisal support.<sup>4</sup> Sample items included “There was at least one person I knew whose advice I really trust” and “When I felt lonely, there were several people I could call or talk to.”

In a study of 221 individuals who participated in a preliminary version of the intervention, this six-item version of the ISEL had an internal consistency reliability of .77 (Glasgow et al., in press). It correlated in predictable ways with self-care such as blood glucose testing, adherence to recommended diabetes care guidelines, and a quality of life instrument. These relationships supported the validity of the abbreviated ISEL because Cohen (1988) argued that self-care (or “health behavior”) is one of the mechanisms by which social support influences health outcomes. In this study, the internal consistency reliability of the ISEL items at T1 was .77.

### *Diabetes Support Scale*

This research required a social support measure that was specific to diabetes care and the specialized nature of computer-mediated interventions. Furthermore, we needed a measure that was relatively brief so that it could be completed online by computer novices. Although there are many

<sup>3</sup>A variety of additional measures were administered at Time 1 and Time 2 as part of the larger project that will involve nearly 300 participants and will include two additional assessment periods over a 10-month interval. These additional assessments will evaluate the effects of the intervention components on measures of mental health, dietary changes, and metabolic control.

<sup>4</sup>Two additional items from self-esteem support were selected, but they were omitted in the final scale because they did not show strong relations to the six other items.

existing social support scales with at least some reliability and validity data (Barrera, 2000), they were inappropriate for assessing both support for diabetes care and the support exchanged in a computer-mediated intervention. Existing scales were worded in ways that required face-to-face contact or would occur primarily in long-standing, intimate relationships. A measure by Glasgow and Toobert (1988) was specific to diabetes care, but it focused on support from family members. We determined that creating a new scale, the Diabetes Support Scale (DSS), was warranted.

We used the rational-theoretical approach to develop the DSS. The emphasis was on face validity and content validity relative to three social support domains that could be delivered through computer-mediated interactions as well as face-to-face interactions: emotional support, advice, and information. To provide for content validity, four items were written for each domain.

Like the ISEL, the scale was balanced with six items worded positively (available support) and six items worded negatively (unavailable support). Six of the items referred to support that could be provided by anyone, whereas the other six referred to support provided by someone who had diabetes. Because support group interventions such as ours often facilitate the exchanges between individuals who have the same chronic illness, we felt it was important to make specific mention of support from others with diabetes. Research participants rated the support they had received over the preceding 3 months on a 7-point scale that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Sample items included "It was hard for me to find people I could contact who personally understood what it was like to have diabetes" and "I could contact people who were interested in how well I was doing with my diabetes care."

In pilot research with 221 users of a preliminary version of the intervention, we found the DSS had an internal consistency reliability of .92. It was significantly correlated with the number of times participants logged onto the site and the same short form of the ISEL used in this study (Glasgow et al., in press). Validity also was suggested by correlations with foot care, a relevant self-care health behavior for individuals with diabetes, and illness intrusiveness (Glasgow et al., in press). In this study the DSS showed an internal consistency reliability of .90 at T1.

## Procedures

A stratified randomization procedure was used to balance the experimental conditions on two factors, general computer experience and insulin use. Following randomization, participants were visited by research staff members, who installed personal computers in participants' homes. Each

participant received training in using the features of the computer that would allow them to access and navigate the web site. Access was restricted to just the resources in the condition to which they had been assigned. Participants completed assessment instruments at two time periods, prior to receiving the intervention and 3 months later.

## RESULTS

Of the 160 participants who were randomized (40 to each condition), 37 failed to complete the 3-month (T2) DSS and ISEL assessment. The number of missing cases was comparable across the four conditions (10 in the support group condition and 9 in each of the 3 other conditions). An analysis was conducted to determine if there was differential attrition across conditions that might threaten the internal validity of the study. A 2 (missing/not missing)  $\times$  4 (condition) ANOVA was conducted on four background characteristics (age, education, income, and number of years since the initial diagnosis of diabetes) and the two T1 social support measures. Logistic regression was conducted on the dichotomous variable of gender. Results for all of these analyses showed no significant effects for condition, missingness, or their interaction. They showed that participants in the four conditions were comparable, those who dropped out were comparable to those who were assessed at T2, and there was not differential attrition across the four conditions.

The DSS and the ISEL were the criterion measures for analyses of intervention effects; they were correlated .46 ( $p < .001$ ). To determine if the interventions affected social support, change scores were computed for both the DSS and the ISEL by subtracting T1 scores from T2 scores, and so a positive score reflected an increase in support.

Six background variables were explored as possible covariates: age, gender, education, income, years since initial diagnosis, and physical health. Only one variable, age, met the assumptions underlying analysis of covariance.<sup>5</sup> Age was significantly related to change on the DSS,  $r(123) = -.22$ ,  $p < .05$ , and did not show interactions with condition. When age was the covariate and DSS change scores were the criterion, an analysis of covariance showed significant effects for both age,  $F(1, 118) = 6.46$ ,  $p < .05$ , and condition,  $F(3, 118) = 4.88$ ,  $p < .01$ ,  $f = .33$ . The means for the four conditions are shown in Table II. Participants in the Social Support Only condition experienced the greatest increase in perceived social support followed by

<sup>5</sup>Income,  $r(123) = -.25$ ,  $p < .01$ , and health,  $r(120) = -.26$ ,  $p < .01$ , were significantly correlated with change on the ISEL items, but they interacted with condition that violated the assumption of homogeneity of regression. However, the effect for condition was significant, and the pattern of means was the same with or without the inclusion of covariates.

**Table II.** Means and Standard Deviations of Social Support Criteria (Time 1/Time 2 Change) for Each Condition

Criterion	Control	Coach	Social support	Social support plus coach
Diabetes Support Scale	0.10 (1.14)	0.90 (1.46)	1.39 (1.44)	1.20 (1.49)
ISEL items	-0.08 (0.52)	0.08 (0.68)	0.45 (0.82)	0.19 (0.74)

*Note.* Post hoc comparisons for both criteria showed that the contrasts between the control condition and the two conditions that included social support were statistically significant.

the Combined Support and Coach condition, the Coach Only condition, and finally Information Only controls.

Three contrasts were tested to compare the different conditions: (a) Information controls contrasted with the Social Support Only and the Combined conditions, (b) Information controls contrasted with the Personal Coach Only condition, and (c) Personal Coach Only condition contrasted with the Social Support Only and the Combined conditions. A significance level of  $p < .017$  (i.e.,  $.05/3$ ) was established for testing these contrasts. Only the first test that contrasted controls with the two conditions that contained Internet-based social support was significant,  $t(119) = -3.82, p < .001$ .

A one-way ANOVA of T1–T2 change scores on the ISEL showed a statistically significant effect for condition,  $F(3, 119) = 3.05, p < .05, f = .27$ , and showed the same pattern of means found for the DSS. Participants in the Social Support Only condition experienced the greatest increase in perceived social support followed by the Combined condition, the Coach Only condition, and finally the Information Only control group. The same contrasts used for the DSS were also used for the ISEL items. Only the contrast between the information control and the two support group conditions was statistically significant,  $t(119) = -2.57, p < .01$ .

## DISCUSSION

After 3 months of intervention, individuals who participated in Internet-based social support interventions significantly increased their perceived availability of social support relative to participants who only had computer access to information about diabetes. These effects were found for general perceptions of support as well as with a measure of support that was designed specifically for individuals who participated in a computer-mediated intervention.

Social support interventions have often failed to show or test for changes in social support (Barrera & Prelow, 2000; Bogat et al., 1993). The present results are notable in that some interventions that have used telephone calls (e.g., Heller et al., 1991) or face-to-face group interactions (e.g., Eggert,

Thompson, Herting, & Nicholas, 1995) did not find evidence that the interventions altered participants' experience of social support. In contrast, the present intervention that relied exclusively on Internet-based interactions was able to show relative gains in support perceptions. It is also remarkable that these effects were achieved over just 3 months with a group of people who were novice users of the Internet. As in the study by Brennan et al. (1995), we were prepared to find that the general measure of social support (the ISEL items) was not as sensitive to intervention effects as was the measure (the DSS) developed specifically for this project. Results indicated that both measures showed intervention effects ( $f = .34$  for the DSS and  $f = .27$  for the ISEL items).

Gustafson et al. (1999) showed changes in social support after 5 months of participation in a multifaceted intervention that included many components in addition to social support. The results of our study are consistent with the conclusion that the social support components were responsible for the changes in perceived social support. The combination of the personal coach and social support did not result in greater changes in social support than the support condition alone, yet both groups were superior to the information control condition. In every instance, the support group alone experienced the greatest increase in perceived support followed by the combined condition.

Demonstrating that social support can be manipulated is the first important step in studying changes in health that might be mediated by changes in social support. Cohen identified several mechanisms whereby social support alters health outcomes (Cohen, 1988; Cohen et al., 1997). In the case of chronic illnesses, we might expect meaningful changes in health outcomes to require long intervention periods in which lifestyle changes are in place for many months or years. There is merit in creating interventions that improve patients' perceptions of social support and decrease their sense of isolation; these are legitimate outcomes by themselves. However, in applications to people with chronic illnesses we would hope that changes in social support would also lead to other improvements in quality of life and health. Because there is now evidence that Internet-based interventions can change perceptions of social support, these interventions become suitable vehicles for studying social support as a mediator of health outcomes. As Bogat et al. (1993) noted,

Interventions seeking to manipulate social support could complement the cross-sectional studies on which much of the theoretical literature is based. Experimental manipulation of social support could yield a more accurate understanding of the causal relationship between support and adjustment as well as elucidate the potency of social support in these relationships. (p. 207)

We certainly agree with this assertion.

Future research with this Internet-based intervention will determine if support group participants are able to achieve benefits beyond enhanced social support on such measures as depression, quality of life, and health care behaviors that are relevant to diabetes management and the prevention of disease complications. Although support groups for diabetes hold great promise as community resources for extending health care, more research is needed to determine how effective they are in assisting people to achieve improved health and well-being.

There were several limitations to this research. Over 20% of the original 160 participants did not complete social support measures at the 3-month assessment. This dropout appears to be sizable, yet there are few benchmarks to determine if this was unusually large for a sample of older adult computer novices. Fortunately, there was not differential dropout across conditions. Nevertheless, if Internet-based interventions are to achieve their promise as programs that expand the availability of resources to new consumers, we should determine who is reached by them (Glasgow, Vogt, & Boles, 1999).

Our 3-month assessment interval was relatively short. The Computer-Link program by Brennan et al. (1995) lasted for 1 year. Gustafson et al. (1999) did not observe effects on social support until their 5-month assessment. With a longer duration of participation, support group members might achieve even greater gains in perceived support. Because we do not know the trajectories of change that result from Internet-based support interventions, perceived support should be assessed at various intervals beyond the 3-month duration of this study.

Although we did not expect the ISEL items to be as sensitive to the support intervention as the DSS, nearly identical effect sizes were found for those two outcome variables. On the one hand, this might be a cause for skepticism if it is interpreted as evidence that the intervention had a non-specific effect, altering global perceptions of support without truly changing diabetes-related support. However, in retrospect, we should not have been surprised by the ISEL's sensitivity to intervention effects because the ISEL items were not focused exclusively on family and close friends, or forms of support that required face-to-face transactions.<sup>6</sup> Furthermore, the ISEL items were included to help establish the validity of the DSS, and therefore the two measures were expected to be correlated. In the future, it would be of interest to assess the sources of support to determine if, in fact, Internet-based support interventions affect support from preexisting relationships as well as the new relationships that are formed as part of the

<sup>6</sup>Three of the six ISEL items did not require face-to-face interactions with intimate friends or family members: "there is at least one person I know whose advice I really trust," "when I feel lonely, there are several people I could call and talk to," and "when I need suggestions for how to deal with a personal problem I know there is someone I can turn to."

interventions. Some fear that Internet use might detract from social involvement with family and friends (Kraut et al., 1998). Alternatively, Internet-based interventions might facilitate support seeking from new and preexisting sources of support.

The sample size was too small to determine with confidence the features of participants who benefitted most from each intervention condition. Although we are optimistic about the value of Internet-based support activities for a broad range of consumers, we do not regard them as a panacea. With additional outcome research, we hope that online groups will be items in a menu of validated resources that can be offered to the public. Knowing more about the characteristics of people who benefit from Internet-based support groups would add to our understanding of these interventions and would help inform potential consumers.

**APPENDIX: DIABETES SUPPORT SCALE**

**Instructions**

We would like you to think about the people who provide you with different kinds of help with your diabetes. They are people with whom you can communicate about your diabetes. They give you advice and information about managing your diabetes. These people could be your spouse, children, other family members, friends, other people with diabetes or health professionals. They also could be people who you seldom or never see in person such as people you contact on the telephone, with letters, or with computer messages.

Consider the contacts you have had with people *during the past three months* and then tell us how much you agree or disagree with the statements below:

**EMOTIONAL SUPPORT<sup>7</sup>**

- 1. I could contact people who were interested in how well I was doing with my diabetes care. (General)
- 7. I could contact people who have diabetes just to express some of the concerns I had about my own illness. (Peer)
- 4. It was hard for me to find people I could contact who personally understood what it's like to have diabetes. (Peer; Reverse)
- 10. I didn't really have people I could contact to express some of my personal feelings about my diabetes. (General; Reverse)

<sup>7</sup>Words in parentheses did not appear on the questionnaire. Item numbers indicate the order in which items appeared in the actual questionnaire.

## ADVICE

5. I could contact people who could give me good advice about managing my diabetes. (General)
11. It was easy for me to find people who could make personal suggestions about what has worked for them in handling their own diabetes. (Peer)
2. It was difficult for me to reach people to get advice about diabetes care. (General; Reverse)
8. When I wanted advice from someone who has diabetes, I found that I didn't have people I could contact. (Peer; Reverse)

## INFORMATION

9. I had people I could contact to get information about understanding diabetes as an illness. (General)
3. It was convenient for me to reach people who could give me personal information about what they did to improve their health. (Peer)
12. I didn't have access to other people with diabetes who had current information about good diabetes management practices. (Peer; Reverse)
6. I found it difficult to contact people who could give me the facts about diabetes. (General; Reverse)

Response Scale: Each item was rated on the following response scale that appeared with each item: 1 = *strongly disagree*, 2 = *disagree*, 3 = *slightly disagree*, 4 = *neither agree nor disagree*, 5 = *slightly agree*, 6 = *agree*, 7 = *strongly agree*.

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