

Differential Effects of Social Support and Social Network on Physiological and Social Outcomes in Men and Women With Type II Diabetes Mellitus

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Patients with non-insulin-dependent diabetes mellitus (NIDDM) were advised to comply with a complex behavioral regimen of diet and exercise. The relationship between social support satisfaction and social support network size was evaluated using the Social Support Questionnaire for 32 men and 44 women with a confirmed diagnosis of NIDDM. Control of diabetes, as measured by the glycosylated hemoglobin assay, was significantly correlated with social support satisfaction for women but negatively correlated with social support satisfaction for men. Social support network size differentially predicted success in a program for men and women. For women, network size was significantly correlated with failure to attend sessions and with failure to complete a diary. For these women, network size was not significantly correlated with weight loss, which was the goal of the program. For men, network size was correlated with increases in weight, cholesterol, and triglycerides over an 18-month period. We conclude that social support network size and satisfaction have different functions for men and women faced with a serious chronic illness. Network size adversely affects success in a program, whereas social support satisfaction has some benefits for women. The direction of the influence of social network may be determined by the similarity or dissimilarity of network norms to the desired behavior.

Key words: social support, diabetes mellitus, sex differences, social learning theory

Social support is receiving considerable attention as a mediator of health outcomes (Berkman, 1985) and as a target of intervention (Gottlieb, 1985). Current research suggests that the global notion of social support includes several related concepts. Several lines of evidence reveal the importance of separating social support from social network size (Sarason & Sarason, 1985; Wellman, 1985). For the purposes of this article, we consider two separate but related processes. *Social network* refers to a web of social relationships and social linkages. It is best measured through enumeration. *Social support* is defined by the satisfaction or instrumental function achieved through social connections. This is best measured through indices of satisfaction. As several authors have noted, not all social support networks are equally helpful. Indeed, there is evidence that social support can have negative as well as positive effects (Kaplan, Chadwick, & Schimmel, 1985; Wortman & Lehman, 1985).

In this article we describe the role of social support for adults who, because of illness, are required to make major alterations in their behavior. Before describing the study, it is useful to provide a brief overview of non-insulin-dependent diabetes mellitus (NIDDM).

TYPE II DIABETES

All participants in this study were afflicted with NIDDM (also known as Type II diabetes mellitus). This condition provides an excellent model for studies in behavior change. Diabetes mellitus is a major public health problem that affects between 8 and 12 million Americans. Approximately 90% of these individuals are in the Type II or NIDDM category. Although insulin or oral hypoglycemic medications may be used in the management of this condition, they are not necessary for survival in most cases. The American Diabetes Association (1984) now recommends diet and exercise as the primary treatment for the condition. More than 80% of patients with Type II diabetes are overweight, and reduction of obesity results in improvement of the condition in a significant number of cases (Kaplan & Atkins, 1985). The consequences of poor management for the diabetic patient can be severe. Complications of diabetes include blindness, amputations, and diseases of the kidneys, heart, and central nervous system.

In current medical practice, virtually all patients with Type II diabetes are advised to make life style changes. These include reduction in calories, increase in exercise, and, in some cases, adherence to a regimen of insulin or oral hypoglycemic drugs. Because the condition typically has its onset in the fifth decade of life or later, achievement of life style changes is often difficult. The role of social relationships in the predisposition toward obesity (and toward diabetes) and in the achievement of life style change is of considerable theoretical and practical importance.

DIABETES, SOCIAL SUPPORT, AND SEX DIFFERENCES

As Thoits (1985) argued, the direct effects of social support have often been neglected. Social support clearly has some functional components (Cohen, Mermelstein, Kamar, & Hoberman, 1985). Some social environments may be satisfactory, but they may reinforce detrimental behaviors. For example, teenagers with insulin-dependent diabetes mellitus must adhere to a very strict regimen of diet, exercise, and insulin injections. Yet, teenage diabetics who are highly satisfied with their social support system tend to be in very poor control of their condition (Kaplan, Chadwick, & Schimmel, 1983). In effect, the enjoyable social life of a teenager provides interpersonal satisfaction but may be in conflict with the strict diabetic regimen.

Our previous data suggest that satisfaction with peer group is correlated with compliance to peer norms. Thus, social support should predict compliance with a health behavior when the behavior is practiced by the peer group. However, satisfaction with social support may predict noncompliance when the required health behavior varies from peer expectations. The diabetic regimen may vary from the behaviors common to other peers. Further, peer norms may vary between men and women.

Several investigators have noted that social support has differential effects for men and for women (Antonucci, 1985; Kessler, McLeod, & Wethington, 1985). In an earlier study, we observed that adult women were in better control of Type II diabetes when they were satisfied with their social support network. In contrast, men were in poorer control when they had high social support satisfaction scores (Heitzmann & Kaplan, 1984). This finding may reflect the differential impact of social environment for men and women. A satisfactory environment for women may contribute to self care, whereas a satisfactory social environment for men may emphasize task accomplishment and recreation.

Our previous work examined only current social support and current control of diabetes. In this article, we report data from an independent group of NIDDM patients. The contribution of social support network and satisfaction to changes in diabetes control over the course of time are considered.

METHOD

Participants

Thirty-two men and 44 women participated in the study. Some were referred to the study by their personal physicians, whereas others responded to public service announcements or newspaper notices. All the participants obtained a letter from their personal physicians certifying that they had been

diagnosed with NIDDM. In addition, independent tests were performed to confirm that each participant had a fasting blood glucose value greater than 140 mg/dl. This value meets the diagnostic criteria of the American Diabetes Association (1984).

Measures

Social Support Questionnaire (SSQ). Participants completed the SSQ when they entered the study. Although many current theories identify different ingredients of social support, few have provided measures to tap each component of these multidimensional constructs. After reviewing the social support literature, Sarason, Levine, Basham, and Sarason (1983) concluded that different conceptualizations of social support all seem to include two common elements: availability of social resources and degree of satisfaction with the available support. Following this conceptualization, Sarason et al. developed the SSQ to measure both these dimensions. The questionnaire includes 27 two-part items. The first part of each item asks the respondents to list the people on whom they can depend in particular circumstances. The second part of the item asks how satisfied the respondents are with these social supports on a scale ranging from *very dissatisfied* (1) to *very satisfied* (6). The SSQ yields two scores. The number score (SSQ-N) reflects the mean number of persons listed across the 27 items. The satisfaction score (SSQ-S) is the mean satisfaction rating across the 27 items. In our sample, the correlation between SSQ-N and SSQ-S was .33.

The reliability of the SSQ has been evaluated in several studies that have used sample sizes in excess of 200. The alpha reliability has consistently been .94 or higher. Sarason et al. (1983) provided considerable validity data for the SSQ. Through a series of studies, they have demonstrated that (a) the SSQ is not biased by social desirability, (b) SSQ scores are negatively correlated with the experience of anxiety, depression, and hostility, (c) high SSQ scores are associated with more positive life events, (d) high SSQ scores are predictive of a positive outlook on life, and (e) those with high SSQ scores are more likely to persist on a difficult or frustrating task than those with low SSQ scores. In sum, these studies suggest that the SSQ is reliable, and data relevant to construct validity are beginning to accumulate.

Glycosylated hemoglobin and blood glucose. The control of diabetes is typically measured using two biochemical indicators. Blood glucose indicates the concentration of glucose (sugar) in blood. Following a 12-hr fast, healthy individuals typically have blood glucose concentrations between 80 and 110 mg/dl. Levels in excess of 140 mg/dl are diagnostic for diabetes. Beyond this criterion, higher levels reflect poorer control. The average concentration of blood glucose over a 4- to 8-week period can be objectively as-

essed retrospectively through the measurement of glycosylated hemoglobin HbA₁ (Boden, Master, Gordon, Shuman, & Owen, 1980; Gabbay et al., 1977). Nathan, Singer, Hurxthal, and Goodson (1984) had 21 diabetic patients perform four blood glucose self-monitoring tests per day over a 2-month period. The authors were able to demonstrate a linear correlation between the HbA₁ assay results and the mean blood glucose level obtained in frequent self-monitoring tests. They concluded that the glycosylated hemoglobin assay is the most informative single assessment of long-term metabolic control of diabetes currently in use. Blood glucose and glycosylated hemoglobin were assessed for each patient from a single venous blood sample.

Lipids. Adults with diabetes have significantly elevated risks for heart disease. In addition, they are characterized by blood lipid profiles that are also predictive of heart disease. This profile includes high levels of low-density lipoprotein cholesterol (LDL) and low levels of high-density lipoprotein cholesterol (HDL). In addition, adults with diabetes tend to have high levels of total cholesterol and of triglycerides. Due to this pattern, medical and behavioral interventions are designed to modify this lipid pattern. To assess cholesterol, venous blood was drawn from the antecubital vein (30 ml—part was used in the HbA₁ assay). Lipids were analyzed by the staff at the Lipid Research Clinic laboratory at the University of California at San Diego. The laboratory is certified by the Centers for Disease Control and is regularly reviewed for standardization.

Body weight. Each participant was weighed on a standard laboratory calibrated scale and while submerged in water. Body fat was estimated using hydrostatic (underwater) weighing.

Group Interventions

All participants were asked to make life style changes that may improve their management of Type II diabetes. The participants were randomly assigned to one of four groups: diet, exercise, diet plus exercise, and diabetes education. Descriptions of these programs are provided elsewhere (Kaplan, Wilson, Hartwell, Merino, & Wallace, 1985). This article considers changes in outcome independent of group assignment.

Participation

Careful records were kept to document participation in all program activities. Scores were created for percentage of all program meetings attended. In addition, patients were asked to maintain daily diary records and to submit

them weekly. The percentage of diaries submitted each week was calculated for each participant.

Follow-Ups

All participants were tested at entry to the study, after 3 months, after 6 months, after 12 months, and after 18 months. Assessment of body fat was completed only at the initial evaluation and at the 6-month follow-up. The SSQ was given only at the initial evaluation. Glycosylated hemoglobin, weight, and number of symptoms reported were obtained at all follow-ups. Data for this report focus on the initial evaluation and on changes noted between the initial evaluation and the 18-month follow-up.

RESULTS

Table 1 shows comparisons between men and women for a variety of variables. Men and women did not differ significantly in their age, control of diabetes, social support network size, or social support satisfaction level. Women had significantly more body fat than men. Although there is a physiological difference between body fat in normal men and women, the level of discrepancy observed here suggests that the women were significantly more overweight than the men. Men and women showed some qualitative differences in whom they listed as supports. For each of 27 SSQ items, the respondent can list multiple persons on whom they can depend. Men listed spouses an average of 22.6 of the 27 times. Women listed spouses an average of only 11.6 of the 27 times. Children were listed by men an average of 23.78 times, whereas they were listed by women an average of 16.00 times. Friends were listed equally often by men and women.

TABLE 1
Comparison of Men and Women for Various Outcomes

Variable	Men		Women		t	p <
	M	SD	M	SD		
Age (years)	55.53	11.54	54.59	8.09	.40	.69
Attendance (percentage)	88.31	17.09	82.52	18.61	1.40	.17
Blood glucose (mg/dl)	186.71	61.40	194.64	89.91	-.45	.65
HbA _{1c} (percentage)	8.29	2.62	8.94	2.83	-1.03	.31
Body fat (percentage)	28.32	7.26	38.85	7.18	-6.05	.001
SSQ-S	5.51	.46	5.16	1.06	1.68	.10
SSQ-N	3.16	1.83	3.54	1.72	-.85	.40

Baseline Associations

Correlations between SSQ-S and other variables at the initial assessment are displayed in Table 2. Consistent with earlier data the relationship between social support satisfaction and control of diabetes differed for men and women. For men, high scores on social support satisfaction were positively correlated with blood glucose and glycosylated hemoglobin levels. High levels of blood glucose and glycosylated hemoglobin indicate *poor* control of diabetes. Thus for men, high social support satisfaction was associated with poor control of diabetes. For women, the opposite pattern was apparent. There were significant negative correlations between social support satisfaction and both blood glucose and glycosylated hemoglobin. This indicates that high levels of social support satisfaction are associated with good control of diabetes for women.

Another interesting finding displayed in Table 2 is for worry. This question concerned the extent to which diabetes had caused worry and anxiety in recent months. This scale ranged from *worry a great deal* (1) to *no worry* (4). There was a significant positive correlation with SSQ-S for men, whereas the correlation for women was nonsignificant. Thus, men who had higher satisfaction with their social support demonstrated less worry. In general, women had lower worry scores than men, suggesting that they worried more. Initial SSQ-S was uncorrelated with weight. In addition, all correlations with SSQ-N at the initial assessment were nonsignificant for men and women.

Measures of program participation tended to be associated with SSQ-N rather than SSQ-S (for which all correlations were nonsignificant). Table 3 shows correlations between SSQ-N and participation for male and female participants. For men, SSQ-N was unassociated with participation measures. For women, however, there were substantial negative correlations between SSQ-N and attendance, diary completion, and attendance at follow-up examinations. These data suggest that for women, large social networks interfere with participation in a remedial program.

TABLE 2
Baseline Correlations Between SSQ-S and Other
Variables for Men and Women

SSQ-S With	Men	Women
Blood glucose	.26	-.34*
Glycosylated hemoglobin	.36*	-.32*
Weight	.00	-.04
Worry	.49**	.13

* $p < .05$. ** $p < .01$.

TABLE 3
Correlations Between Program Participation and
SSQ-N for Men and Women

<i>SSQ-N With</i>	<i>Men</i>	<i>Women</i>
Attendance	-.01	-.45*
Diary completion	-.11	-.47*
Follow-up attendance	.03	-.44*

* $p < .01$.

Changes in Outcome Measures

Because patients with Type II diabetes are required to make behavioral changes, there is considerable interest in the value of social support measures for the prediction of successful outcomes due to life style alterations. This section considers changes in outcome measures between entry in the study and the 18-month follow-up. These changes were calculated by subtracting follow-up values from initial scores. For example, a positive score for weight change would imply weight reduction (initial minus follow-up), whereas a negative score would describe a weight gain. Several studies have shown that the test-retest reliability of the SSQ exceeds .95. We assume that SSQ scores are stable over time (Sarason et al., 1983).

SSQ-S was largely uncorrelated with changes in physiological variables. However, a number of interesting correlations emerged between SSQ-N and physiological measures. These correlations are shown in Table 4. For men, SSQ-N was significantly negatively associated with changes in HbA_{1c}, cholesterol, and triglycerides. This suggests that men with large support networks experienced increases in HbA_{1c}, cholesterol, and triglycerides. There was also a trend in this direction for measures of weight and glucose. In general, these trends were not apparent for women — with the exception of measures for to-

TABLE 4
Correlations Between Social Support Network and
Changes in Physiological Measures for Men and Women

<i>SSQ-N With Changes in</i>	<i>Men</i>	<i>Women</i>
Weight	-.28	-.12
Cholesterol	-.50**	-.32*
Triglycerides	-.36*	.14
HbA _{1c}	-.33*	.19
Blood glucose	-.22	-.34*
Symptoms	.38*	-.20

* $p < .05$. ** $p < .01$.

tal cholesterol and blood glucose. There was also a sex difference for the relationship between social support and changes in symptoms. Network size was associated with an increase in the number of symptoms reported by women ($r = -.20$) and a decrease in the number of symptoms reported by men ($r = .38$).

DISCUSSION

The relationship between social support satisfaction, network size, sex, and the control of Type II diabetes is clearly complex. Several important sex differences are apparent. Replicating earlier work (Heitzmann & Kaplan, 1984), social support satisfaction appears to benefit women with Type II diabetes, whereas it serves a negative role for men. This finding suggests that the social environment is very important in control of this condition. The mechanism is unknown at this time. Surwit, Feinglos, and Scover (1983) argued that stress plays an important role in the management of Type II diabetes. Social support may serve as a more important buffer of stress for women than it does for men. According to buffering formulations, social support should have greater effects under higher levels of stress. Because women reported greater worry than men, they might be more responsive to social support. Several findings, however, complicate this interpretation. First, the benefit of social support in the control of diabetes occurs for women but not men. Yet it is unclear why support should be correlated with low worry for men but not for women. We suggest that men have a more casual disposition toward their illness and that they receive support for this posture. Our preferred explanation is that a satisfactory support system directly affects behaviors that result in good or poor control of diabetes. Networks found satisfactory to women may support behaviors that lead to good control. In contrast, networks satisfactory to men may reinforce eating, drinking, and exercise patterns that are not in the patients' best interests. It is instructive that men worry less about their illness when they are satisfied with their support system.

Perhaps the most unexpected finding was the association between social support network and poor outcomes in the program. We have reported that women lose less weight in behavioral programs for diabetic adults than do men (Heitzmann, Kaplan, Wilson, & Sandler, 1987). One explanation for this phenomenon is that social obligations hinder full participation for women. Our data suggest that women with large support networks attend meetings less often, complete their homework assignments less often, and have a lower probability of attending clinic sessions than do women with smaller support networks. Size of network did not affect participation for men. Size of network appears to have had more detrimental impacts on physiological outcomes for men than for women.

These findings highlight some of the differences between social support satisfaction and network size. A social network can buffer stress and provide a reinforcing social milieu (Sarason & Sarason, 1985). However, a large social network can also interfere with the successful alteration of health habits, particularly when the new health behaviors are at variance with those of the reference network.

Explanations for the differential effects of social network for men and women must remain highly speculative. Our participants tended to be of preretirement age ($M = 55$ years) and involved in traditional sex-role relationships that affect men and women differently. Women with large networks may miss more sessions due to their obligations to members of their families (e.g., sick children), whereas men were not burdened by these obligations. Because women may be more prone to self-care and more responsive to illness (Wingard, 1984), they may be more inclined to seek assistance for behavior change from their social network. Conversely, men, with their greater tendency toward unhealthy life styles (see Wingard, 1984), might seek support for not conforming to the prescribed regimen. It is interesting that women select spouses as supports only half as often as men do—suggesting that women require extrafamilial help to make changes. Men, who make fewer changes, may seek support from spouses to disobey the regimen.

One of the problems with our study was that we used general social support measures. Cohen et al. (1985) argued that there are many different functions of social support and that these functions must be evaluated separately. Had we used separate measures for social support functions, we may have been able to determine which aspect of social support benefits men and women. However, Sarason, Shearin, Pierce, and Sarason (in press) recently studied the correlations between Cohen's various function measures. They found that the different scales were highly correlated with one another and with the SSQ scores. Thus, it is unclear whether more differentiated support scales would have yielded different results.

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