Self-Efficacy, Problem Solving, and Social-Environmental Support Are Associated With Diabetes Self-Management Behaviors

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OBJECTIVE — To evaluate associations between psychosocial and social-environmental variables and diabetes self-management, and diabetes control.

RESEARCH DESIGN AND METHODS — Baseline data from a type 2 diabetes self-management randomized trial with 463 adults having elevated BMI ($M = 34.8$ kg/m^2) were used to investigate relations among demographic, psychosocial, and social-environmental variables; dietary, exercise, and medication-taking behaviors; and biologic outcomes.

RESULTS — Self-efficacy, problem solving, and social-environmental support were independently associated with diet and exercise, increasing the variance accounted for by 23 and 19%, respectively. Only diet contributed to explained variance in BMI ($\beta = -0.17$, $P = 0.0003$) and self-rated health status ($\beta = 0.25$, $P < 0.0001$); and only medication-taking behaviors contributed to lipid ratio (total–to–HDL) ($\beta = -0.20$, $P = 0.0001$) and A1C ($\beta = -0.21$, $P < 0.0001$).

CONCLUSIONS — Interventions should focus on enhancing self-efficacy, problem solving, and social-environmental support to improve self-management of diabetes.

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Diabetes management requires coordination between the patient and the primary care team. Given the lifestyle changes required for self-management success, patient, social, and environmental factors, including health care (1) and community support (2), are increasingly recognized as important. Understanding relations among demographic, psychosocial, and social-environmental variables, and multiple health risk behaviors is critical to developing interventions that will sustain health behavior changes.

RESEARCH DESIGN AND METHODS

— Baseline data were collected as part of a patient randomized trial to evaluate the impact of an interactive, multimedia diabetes self-management program relative to "enhanced" usual care (Glasgow RE, Christiansen S, Kurz D, King D, Woolley T, Faber A, Estabrooks P, Strycker L, Toobert D, Dickinson J, unpublished data). Recruitment details are also described elsewhere (3). Briefly, participants between 25 and 75 years old were recruited from five Kaiser Permanente Colorado primary care clinics in the Denver metropolitan area. Eligibility criteria included: diagnosis of type 2 diabetes for at least 1 year, BMI of 25 kg/m^2 or greater, at least one other risk factor for heart disease (i.e., hypertension, LDL >100 mg/dl or on a lipid-lowering agent, A1C >7%, or cigarette smoking), and willingness to participate in a computer-assisted diabetes self-management study.

Data were collected during a recruitment call and baseline study visit. Self-management behaviors were measured using self-report surveys. Fat intake was measured by the National Cancer Institute's Percent Energy from Fat (PFAT) screener (4). Eating behaviors, such as consumption of sugary beverages and fast food, were assessed with the Starting the Conversation scale (5). Physical activity was assessed by the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire (6), calculated as total weekly caloric expenditure.

Adherence to diabetes, blood pressure, and cholesterol medication regimens was assessed by the medication-taking items of the Hill-Bone Compliance Scale (7). Biologic outcomes included the UK Prospective Diabetes Study (UKPDS) 10-year heart disease risk score (8). BMI was calculated from electronic medical records and measurement during the baseline visit. Hemoglobin A1C and lipids were collected at Kaiser Permanente Colorado clinics. General health status was measured using the visual analog scale from the EuroQol instrument (9).

Self-efficacy was assessed with Lorig's 8-item Diabetes Self-Efficacy Scale (10). Six additional, similarly constructed self-efficacy items recommended by Bandura (11) were added to measure confidence regarding taking diabetes medications, exercising, and limiting high-fat foods. Self-efficacy subscales were calculated for healthy eating, physical activity, and medication-taking behaviors. Problem-solving skill was assessed with the Positive Transfer of Past Experience from the Diabetes Problem-Solving Scale of Hill-Briggs (12).

The social and environmental context in which patient self-management takes place was assessed at the health care and community resource levels. Support from the health care team was measured using 11 items from the Patient Assessment of Chronic Illness Care (PACIC) (13) survey; support from the broader community was assessed with nine items on the use of healthy eating and physical activity

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resources from the Chronic Illness Resources Survey (CIRS) (14).

Analyses

Hierarchical multiple regression analyses examined the extent to which psychosocial factors accounted for variance in self-management variables. Demographic variables that were significantly correlated with self-management variables were entered in step 1 (sex, ethnicity, age) and psychosocial factors were entered in step 2. Additional hierarchical multiple regression analyses were conducted to determine the extent to which self-management variables accounted for variances in clinical indicators.

RESULTS — Participants averaged 60 years of age, had elevated BMI ($M = 34.8$ kg/m^2), and had a mean A1C of 8.1%. Fifty percent of participants were female and 21% were Latino. About 20% of participants had less than a high-school education, and 44% reported an annual family income of less than $50,000. Self-efficacy scores revealed moderate confidence and large variability. Participants reported high levels of medication adherence, moderate amounts and high variability of physical activity, high-fat intake, and low fruit and vegetable intake. Demographic factors were not associated with either psychosocial variables or self-management behaviors in bivariate analyses.

Regression results revealed that self-efficacy, problem-solving, and social-ecological factors increased the variance accounted for in all self-management variables (Table 1), and self-efficacy and problem-solving factors were independently associated with three self-management outcomes. Healthy eating patterns and physical activity were especially related to behavioral-specific self-efficacy and social-environmental support variables, increasing the percentage of the variance accounted for by 23 and 19%, respectively. Community support scores were independently associated with diet and physical activity self-management variables, but not medication adherence. Support from the health care team was not associated with behavioral or clinical outcomes.

Self-management variables contributed 4–6% incremental variance beyond that explained by demographic factors for four of the five clinical indicators. The specific self-management variables related to clinical indicators differed across risk indicators. Diet and physical activity measures were related to BMI, with the

Table 1—*Associations between psychosocial and social-environmental factors and diabetes self-management and diabetes control*

	Change in R^2	β	*P*
I. Diabetes self-management outcomes			
Medicine adherence			
Step 1: demographic variables	0.08		<0.0001
Step 2: psychosocial/environmental factors	0.12		<0.0001
Health literacy		0.03	0.50
Self-efficacy medications		0.35	<0.0001
Problem solving		−0.03	0.56
CIRS total score		0.03	0.48
PACIC		−0.009	0.84
Starting the conversation total eating			
Step 1: demographic variables	0.02		0.09
Step 2: psychosocial/environmental factors	0.23		<0.0001
Health literacy		0.01	0.73
Self-efficacy for diet		0.22	<0.0001
Problem solving		0.25	<0.0001
CIRS diet		0.28	0.0002
PACIC		−0.05	0.27
Starting the conversation fruits/vegetables			
Step 1: demographic variables	0.003		0.72
Step 2: psychosocial/environmental factors	0.10		<0.0001
Health literacy		−0.05	0.26
Self-efficacy for diet		0.08	0.15
Problem solving		0.13	0.02
CIRS diet		0.17	0.001
PACIC		0.06	0.18
NCI fat screener (% fat)			
Step 1: demographic variables	0.04		0.002
Step 2: psychosocial/environmental factors	0.09		<0.0001
Health literacy		−0.09	0.06
Self-efficacy for diet		−0.08	0.16
Problem solving		−0.16	0.003
CIRS diet		−0.13	0.009
PACIC		0.11	0.02
CHAMPS (weekly calories in all activity)			
Step 1: demographic variables	0.04		0.0008
Step 2: psychosocial/environmental factors	0.19		<0.0001
Health literacy		−0.03	0.40
Self-efficacy for exercise		0.18	0.0002
Problem solving		0.06	0.32
CIRS exercise		0.32	<0.0001
PACIC		0.01	0.72
II. Diabetes control outcomes			
BMI			
Step 1: demographic variables	0.10		<0.0001
Step 2: self-management variables	0.04		0.0004
Medication adherence		0.09	0.06
Starting the conversation (diet)		−0.17	0.0003
% fat (NCI fat screener)		0.05	0.29
PA calories/week (CHAMPS)		0.09	0.051
Mean arterial pressure			
Step 1: demographic variables	0.03		0.003
Step 2: self-management variables	0.008		0.48
Medication adherence		−0.07	0.16
Starting the conversation (diet)		0.04	0.47
% fat (NCI fat screener)		−0.02	0.67
PA calories/week (CHAMPS)		0.04	0.48

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Table 1—*Continued*

	Change in R^2	β	*P*
Lipid ratio: total–to–HDL			
Step 1: demographic variables	0.05		0.0002
Step 2: self-management variables	0.04		0.0019
Medication adherence		−0.20	0.001
Starting the conversation (diet)		0.05	0.37
% fat (NCI fat screener)		0.03	0.50
PA calories/week (CHAMPS)		−0.02	0.66
Hemoglobin A1C			
Step 1: demographic variables	0.16		<0.0001
Step 2: self-management variables	0.05		0.0001
Medication adherence		−0.21	<0.0001
Starting the conversation (diet)		−0.06	0.22
% fat (NCI fat screener)		−0.02	0.56
PA calories/week (CHAMPS)		0.01	0.78
General health state			
Step 1: demographic variables	0.05		0.0001
Step 2: self-management variables	0.06		<0.0001
Medication adherence		0.05	0.33
Starting the conversation (diet)		0.25	<0.0001
% fat (NCI fat screener)		0.03	0.55
PA calories/week (CHAMPS)		0.03	0.59
UKPDS (10-year risk)			
Step 1: demographic variables	0.0002		0.79
Step 2: self-management variables	0.015		0.21
Medication adherence		0.09	0.09
Starting the conversation (diet)		0.01	0.80
% Fat (NCI fat screener)		0.05	0.36
PA calories/week (CHAMPS)		0.08	0.11

NCI, National Cancer Institute; PA, physical activity.

healthy eating measure especially strong for BMI and general health status. Medication adherence was independently related to lipid ratio (total–to–HDL) and A1C.

CONCLUSIONS— Problem solving and behavior-specific self-efficacy were associated with self-management behaviors. Self-efficacy was strongly related to healthy eating and calories expended in physical activity, as was behavior-specific support from family, friends, and community resources. Healthy eating and physical activity measures related to BMI, healthy eating related to self-reported general health, and medication adherence related to lipid ratio and A1C.

We acknowledge this study's inability to fully explore other known correlates of self-care, such as the quality of the physician/patient relationship, yet the findings that self-efficacy, problem solving, and social-environmental support are related to self-management while support from the health care team is not underscore the importance of social and community environments in promoting healthy eating, physical activity, and even medication-taking behaviors.

Analyses were limited to baseline data and the use of self-report measures of self-management behaviors, and the study was limited to a fairly educated sample in one health care organization. Nevertheless, the results demonstrated these relationships after controlling for a variety of potential confounders with a large, multiethnic sample and using validated measures that were driven by theory. These findings suggest the need to design diabetes self-care interventions that enhance problem-solving skills (e.g., activity logs to identify problems), increase self-efficacy (e.g., skill-building programs), and connect patients to community resources to support healthy eating and exercise.

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