Influence of Relationship Partners on Self-Efficacy for Self-Management Behaviors Among Adults With Type 2 Diabetes

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ABSTRACT

Individuals with type 2 diabetes must engage in daily self-management behaviors to prevent complications. Given that management may be shared with a person's romantic partner, we examined both patients' and their partners' perceptions of relationship characteristics that were hypothesized to affect patients' self-efficacy for diabetes management. Adults with type 2 diabetes and their partners (n = 52 couples, 104 individuals) completed measures of three aspects of relationships that are theorized to affect self-efficacy: partner investment, partner support, and relationship satisfaction. Patients reported their self-efficacy for diabetes management and weekly frequency of diabetes self-management behaviors. A common fate modeling approach in which constructs were modeled as agreement between partner reports showed that relationship factors (investment, support, and satisfaction) significantly predicted patient self-efficacy (R^2 = 0.49), which in turn predicted patient self-management behaviors. This model fit the data well [χ^2 (41) = 48.60, P = 0.19; comparative fit index (CFI) = 0.96; root mean square error of approximation = 0.06; and standardized root mean square residual = 0.07]. Interventions designed to support patients in their self-efficacy for self-management behavior may be improved through consideration of patients' romantic relationships.

Diabetes (type 1 and type 2 diabetes combined) is the seventh leading cause of death in the United States and the leading cause of kidney failure, nontraumatic lower-limb amputations, and new cases of blindness. In 2017, more than 9% of the adult population in the United States had diabetes (1). People with diabetes are two to four times more likely than people without diabetes to die of heart disease or stroke, and ~70% of people with diabetes have high blood pressure (1). In addition, the prevalence of depression is almost twice as high in people with type 2 diabetes compared to the general population (2). One reason people with type 2 diabetes often suffer from poor health outcomes is that they lack self-efficacy to engage in necessary daily self-management behaviors such as engaging in physical activity, adhering to diet recommendations, testing blood glucose, and checking feet (3).

Consistent with Bandura's unified theory of self-efficacy (4), self-efficacy (or a person's belief about his or her personal capability to accomplish a task) is a leading predictor of diabetes self-management behaviors. For example, previous research indicates that behavior-specific self-efficacy relates to healthy eating and energy expenditure from physical activity (5). In addition, Gao et al. (6) report that self-efficacy is related to performing diabetes self-management behaviors, including following a healthful diet, eating fruits/a low-fat diet, performing foot care, testing blood glucose, taking medication,

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and exercising and that engaging in these behaviors was directly related to improved glycemic control. Studies have consistently found a relationship between self-efficacy for diabetes management and engagement in diabetes self-management behaviors. These results have been stable across racial/ethnic groups and across varying levels of health literacy (7). To develop potential intervention targets, researchers must identify correlates of self-efficacy for diabetes self-management.

Within health behavior research generally, there is growing recognition that an understanding of a person's interpersonal environment is crucial for encouraging behavior initiation and particularly maintenance of behavior habits (8). Within the diabetes literature specifically, there is evidence of improved outcomes for partnered individuals. Identifying interpersonal processes to encourage behavior change provides crucial information about potential intervention targets for practitioners working with people to manage type 2 diabetes. However, few studies have examined the influence of romantic partners on self-efficacy for diabetes self-management.

Previous research indicates that being married or cohabitating predicts better adherence to medical recommendations (9). Further, for married people, their romantic partner is likely to be a primary source of support (10). Given that management of a chronic illness is often shared with a person's romantic partner (11–13), the quality of one's romantic relationship and partner interactions are important. Partners' behaviors may influence patients' self-efficacy for performing self-management behaviors and ultimately their health outcomes. Based on the dyadic coping model by Bodenmann et al. (14), we considered three constructs that represent ways relationship partners are theorized to affect health through changing a person's perception of his or her ability to pursue healthy behaviors. In this way, relationship satisfaction, health-related social support, and diabetes-related partner investment were all conceptualized as predictors of a patient's self-efficacy for diabetes self-management. Satisfaction reflects general relationship quality and functioning, investment reflects how partners view management of the disease (specifically within their relationship), and support reflects health-related resources provided by partners (15–24). Importantly, in the current study, all relationship constructs were assessed from both members of the couple so that measures of the constructs reflected both members' perspectives.

Relationship satisfaction refers to the affect (positive versus negative) experienced in a relationship as well as the extent to which a partner fulfills the individual's most important needs. Individuals with high relationship satisfaction report lower systolic blood pressure (15), lower ambulatory blood pressure, lower stress, less depression, and higher satisfaction with life (16). Relationship satisfaction also relates to health outcomes in the context of diabetes. For example, there is some evidence of an association between marital quality and blood glucose control (16,17). In a prospective study, individuals with higher levels of relationship satisfaction reported greater satisfaction with their diabetes care regimen. Relationship satisfaction has also been related to engaging in self-management behaviors (17) as well as having greater satisfaction with diabetes self-care (25).

Health-related social support refers to a partner's availability to provide aid for a variety of health-related stressors (26). When romantic partners of people with chronic illnesses provide social support, patients report more engagement in self-management behaviors and improved health outcomes. For example, health-related social support predicted patient self-efficacy for performing skin examinations among people at risk for melanoma (18). Specific to couples in which one member has type 2 diabetes, an intervention targeting the partner's support behavior demonstrated improvements in medical outcomes (19). In another sample of couples facing type 2 diabetes, when spouses engaged in both social support and control actions, patients had higher energy expenditure from physical activity and greater self-efficacy for engaging in physical activity the following day (27).

Another construct that takes into account the influence of a romantic partner is diabetes-related partner investment, or the degree to which a person's partner feels a shared responsibility for diabetes management and takes action to support diabetes management goals. We developed items to assess diabetes-related partner investment based on the communal coping (21,28,29) and dyadic coping literature (14,30). Diabetes-related partner investment has yet to be validated in a sample of patients with type 2 diabetes. Lyons et al. (31) defines this construct as threefold: *1*) one or both couple members hold beliefs that joint effort is advantageous, needed, or useful; *2*) couple members communicate about the situation; and *3*) the couple engages in cooperative action to solve problems.

Couples who view chronic illness as a shared responsibility generally have improved health outcomes compared to couples who view illness as an individual responsibility. For example, common dyadic coping in regard to general life stress has been related to higher levels of patient and partner diabetes self-efficacy (32). One measure employed to assess this construct is referred to as "we-talk," which is a linguistic analysis that quantifies the extent to which partners discuss a problem using third-person plural pronouns (e.g., we) versus singular pronouns (e.g., he/she). This "we-talk" measure of partner investment/communal coping relates to better smoking cessation rates and improved health outcomes after congestive heart failure (21,22).

In addition, a focus group of 30 couples revealed that couples who felt they were "in this together" were better able to communicate and support each other and were more likely to engage in diabetes self-management behaviors (23). Helgeson et al. (33) found that implicit communal coping, as measured by first-person plural pronoun usage during a diabetes discussion, related to a reduction in patient distress and improved diabetes self-care behaviors. Although these findings suggest a relationship between partner investment and health behaviors, more research is needed to examine the extent to which this process is mediated by self-efficacy (34).

Taken together, these three relationship factors represent what we believe are the important aspects of a relationship that affect self-efficacy. Relationship partners may encourage health behaviors, compliment their partners for engaging in health behaviors, model health behaviors, and provide motivation for engaging in health behaviors. Partners may influence patients' confidence that they can manage diabetes. Social support and relationship satisfaction have been widely studied and conceptualized as predictors of a person's self-efficacy beliefs, both within a diabetes population and more broadly. Partner investment is a newer construct that may capture unique aspects of couples' interactions and beliefs about health behaviors. Consistent with the cognitive-transaction model of Badr and Acitelli (34), when both partners view an illness as a shared responsibility, they may be more likely to support each other and their relationship and thereby improve self-efficacy.

In the current study, we tested whether relationship factors, as reported by both partners, were related to patient self-efficacy for diabetes management. We conceptualized relationship factors as a construct comprised of these three overlapping but distinct variables and thus modeled it as a single latent relationship factor comprised of both couple members' perceptions of relationship satisfaction, social support, and partner investment. We used a common fate modeling (CFM [35]) approach that assumes that both partners' reports reflect a shared underlying characteristic of the relationship. Hence, the relationship factors construct reflects shared variance on the part of both partners. Rather than examine differences between partner reports, as is done in the more commonly used actor-partner interdependence models, our focus was to examine the effect of agreed-on relationship factors on self-efficacy. An additional benefit of this approach to dyadic data analysis is the ability to estimate models with relatively smaller sample sizes because of the smaller number of parameters being estimated. Further, we examined how well patient self-efficacy for diabetes management was related to engagement in diabetes self-management behaviors. We hypothesized that relationship factors would be positively related to patient self-efficacy and that higher levels of patient self-efficacy would be related to more engagement in diabetes self-management behaviors.

Research Design and Methods

Procedure

Couples were recruited through Qualtrics survey response panels (Qualtrics, Provo, Utah), an online panel of individuals with interest in online surveys (36). We asked participants who agreed to participate in our study to complete the survey alone in a quiet location. Participants were compensated up to $4.50 (per couple) upon completing the survey. On average, it took couples ~1.5 hours to complete the online Qualtrics survey. Participants did not have access to their partner's answers. Informed consent was obtained from all individual participants in the study. This study was approved by the Colorado Multiple Institution Review Board (COMIRB; protocol 15-0427).

Participants

Participants were adults who had been diagnosed with type 2 diabetes and their relationship partners (n = 52 couples; Table 1). Both partners in the couple had to be willing to participate to be included in the study. Participants were required to be married or currently living with a romantic partner, at least 18 years of age, and able to read and understand English.

Measures

Demographic and Medical Questions

Patients and partners indicated their sex, race, and ethnicity. In addition, patients self-reported their diabetes status, age, length of marriage, approximate date of type 2 diabetes diagnosis, A1C, and medical conditions using the Charlson Comorbidity Index (37). This index classifies comorbidities of patients based on the International Classification of Diseases (ICD) diagnosis codes (38). Each comorbidity was assigned a weight (from 1 to 6) based on the condition's associated risk of mortality. A comorbidity score was created by calculating the sum of all weights for a patient. Higher scores indicate a higher probability of mortality (38).

Relationship Satisfaction

Relationship satisfaction was measured from patients and partners using the 10-item satisfaction subscale from the Investment Model Scale (39). This measure assesses the positive versus negative affect experienced in a relationship as well as the extent to which a partner fulfills an individual's most important needs. Example items include, "I feel satisfied with our relationship" and "My relationship is close to ideal." This measure has been deemed as reliable and valid for assessing relationship satisfaction in ongoing close relationships (39). The scale score was computed by averaging the 10 items, with higher scores indicating higher levels of relationship satisfaction. The internal consistency in

TABLE 1. Demographic Characteristics of the Sample (*n* = 52)

	Patient	Partner
Age, years, mean (SD)	50.60 (10.82)	
Sex, %		
Female	67.3	26.9
Male	32.7	71.2
Heterosexual couples, %	90.39	
LGBT couples, %	9.62	
Race/ethnicity (%)		
White	82.7	75.0
Black	11.5	13.5
Asian/Pacific Islander	3.8	3.8
Native American	0.0	1.9
Multiracial	0.0	1.9
Other	1.9	3.8
Hispanic*	7.7	7.7
Self-reported A1C, %, mean (SD)	7.21 (2.58)	
Comorbidity index, mean (SD)	1.44 (0.67)	
Length of marriage, years, mean (SD)	22.03 (13.64)	
Partner diagnosed with type 2 diabetes, %	17.3	
Time since diagnosis, years, mean (SD)	8.40 (7.62)	

**Refers to the percentage of participants across all races who identified as Hispanic. LGBT, lesbian, gay, bisexual, and transgender.*

our sample was high for both patients (α = 0.94) and partners (α = 0.96).

Health-Related Social Support (Given/Received)

Health-related social support was assessed from both patients and partners. Items responded to by patients were identical to those used in the study by Franks et al. (26) and reflected health-related emotional and instrumental support that they receive from their partner. Items responded to by partners were adapted to reflect the same support measures, but with the partner as the provider of the support. This way, both partners rated the same behaviors related to support provided to the patient from the partner. Participants responded on a five-point scale from 0 (never) to 4 (every day) to four items pertaining to support provided to the patient during the past month. For example, patients were asked, "During the past month, how often has your spouse (or significant other) listened to your concerns about protecting your health?" Partners were asked, "During the past month, how often have you listened to your spouse's concerns about protecting her or his health?" The scale score was computed by averaging the four items; higher scores indicated higher levels of health-related social support. The internal consistency in our sample was good for patients (α = 0.85) and partners (α = 0.90).

Partner Investment

Diabetes-related partner investment was reported by both partners. Items used to measure partner investment in smoking cessation (40) were adapted for diabetes management. This scale assessed the degree to which the partner considers management of the patient's diabetes as a shared responsibility as well as the degree to which the partner takes action to help the patient engage in management behaviors. Participants rated their agreement to five items on a scale from 1 (strongly disagree) to 7 (strongly agree). An example item reported by patients was, "The responsibility of managing my diabetes is mine alone." The corresponding item for partners was, "The responsibility of managing my partner's diabetes is his or hers alone." Disagreement with these items would indicate high partner investment. Another item was, "My partner and I are able to work together toward helping me manage diabetes," as responded to by patients, and "My partner and I are able to work together toward helping my partner manage diabetes," as reported by partners. The scale score is computed by averaging the five items, with higher scores indicating higher levels of partner investment. This scale captures a unique aspect of how partners view each other's role in diabetes management. It has not been previously validated in this population; the internal consistency in our sample was satisfactory for patients (α = 0.67) and partners (α = 0.84).

Self-Efficacy for Diabetes Management

The Self-Efficacy for Diabetes Scale (41) is an eight-item scale in which participants indicate how confident they feel from 1 (not at all confident) to 10 (totally confident) that they can engage in diabetes self-management behaviors. Only patients in our study were assessed on self-efficacy. Example items include, "How confident are you that you can choose the appropriate foods to eat when you are hungry?" and "How confident are you that you can do something to prevent your blood glucose level from dropping when you exercise?" The scale score was computed by taking the average of eight items, with higher scores indicating greater self-efficacy. The self-efficacy for diabetes scale has been demonstrated to have good internal consistency (α = 0.85) and a test-retest validity of 0.80 (41). In our sample, this scale had a satisfactory internal consistency (α = 0.69).

Diabetes Self-Management Behaviors

The Summary of Diabetes Self-Care Activities (SDSCA) measure (42) was used to assess self-management behaviors. The SDSCA has been established as a valid measure for research purposes and assesses general diet (e.g., follow a diet plan), specific diet (e.g., eat five or more servings of fruits and vegetables), exercise, blood glucose testing, and foot care (41). The SDSCA also assesses medication adherence; however, these items were omitted from data collection to reduce participant burden and because they do not differentiate between insulin injections, pumps, and oral medications used commonly by people with diabetes. Items were averaged to compute each two-item scale. Higher scores indicated higher frequency of engaging in the self-management behavior. Each question uses the stem "On how many of the past 7 days…?" to assess the frequency of each self-management behavior.

Analyses

Data cleaning and descriptive statistics were conducted using SPSS 23 (IBM Corp., Armonk, N.Y.). The primary research questions were evaluated in Mplus 6 (Muthen & Muthen, Los Angeles, Calif.). A pure CFM approach was used; covariances among error terms of the latent indicators were not allowed (35). The common fate model implies that dyad members are similar to one another on a given variable due to a shared or dyadic latent variable (34). This approach takes into consideration both partners' perceptions and considers the couple to be the unit of analysis. Each partner's response on the construct is used as an indicator of the latent variable representing the construct. We used this approach to examine relationship variables that correspond to responses from both relationship partners. In addition, this approach estimates fewer parameters than alternative dyadic analyses and thus requires a smaller sample size. Missing data within these models were handled using full information maximum likelihood estimation within Mplus 6 to use all available data. Fewer than 5% of responses were missing for any individual model variable.

TABLE 2. Means and SDs of Study Variables

	Scale Range	Mean (SD)	
		Patient	Partner
Relationship satisfaction	1–4	3.28 (0.79)	3.45 (0.67)
Health-related social support	0–4	3.82 (1.08)	3.90 (1.04)
Diabetes-related partner investment	1–7	3.67 (1.31)	4.39 (1.46)
Self-efficacy for diabetes management	1–10	7.54 (1.86)	
Diabetes self-management behaviors			
Testing blood glucose	0–7 days	5.90 (2.47)	
Exercise	0–7 days	3.50 (2.21)	
General diet	0–7 days	5.71 (1.98)	
Specific diet	0–7 days	4.95 (1.43)	
Checking feet	0–7 days	4.98 (2.33)	

Results

A total of 52 patient and partner couples (n = 104 individuals) completed the study. Demographic information is presented in Table 1. Approximately 47% of patients reported knowing their most recent A1C. On average, these patients self-reported a mean A1C of 7.21% (55 mmol/mol) [SD 2.58% (9 mmol/mol)]. Couples had been married for ~22 years (mean 22.03, SD 13.64), and patients reported being diagnosed with type 2 diabetes for ~8 years (mean 8.40, SD 7.62). When both partners had a diagnosis of type 2 diabetes (9/52 couples), the first participant to complete the study was considered the "patient." Nonsignificant t tests suggested that there were no differences between couples where one partner was diagnosed with type 2 diabetes versus both partners being diagnosed on any of the variables included in the model.

Means and SDs of study variables are presented in Table 2. Participants in the sample generally reported high levels of relationship satisfaction, health-related social support, and diabetes-related partner investment. Patients reported engaging in self-management on most days of the week with the exception of exercise. A similar pattern of self-management activities was reported by Toobert et al. (42). Partners reported significantly higher levels of relationship satisfaction (mean 3.44) than patients (mean 3.27; t = 2.05, P <0.05). Partners also reported higher levels of diabetes-related partner investment (mean 4.38) than patients (mean 3.67; t = 4.61, P <0.05). There were no significant differences between patient- and partner-reported health-related social support.

Correlations of study variables are presented in Table 3. All of the relationship factor variables were positively related to patient-reported self-efficacy for diabetes self-management. Several covariates were considered: length of marriage (exclusive of cohabitation), age, sex, A1C, comorbidity, and time since diagnosis. No tested covariates were significantly related to self-efficacy for diabetes management; therefore, none were included in the model presented below.

Diabetes-related partner investment was carefully examined because it was a newly developed scale. It sig-

TABLE 3. Correlations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
Construct												
1. Relationship satisfaction[1]	—	0.68**	0.57**	0.36**	0.55**	0.45**	0.58**	0.11	0.28*	0.26	0.21	0.30*
2. Relationship satisfaction[2]		—	0.35*	0.36*	0.43**	0.39**	0.57**	0.19	0.29*	0.14	0.26	0.20
3. Health-related social support[1]			—	0.58**	0.58**	0.52**	0.52**	0.19	0.28*	0.09	0.15	0.25
4. Health-related social support[2]				—	0.43**	0.61**	0.44**	0.13	0.32*	0.17	0.18	–0.03
5. Diabetes-related partner investment[1]					—	0.68**	0.45**	0.14	0.11	0.15	0.15	0.33*
6. Diabetes-related partner investment[2]						—	0.30*	0.03	0.00	0.15	0.20	0.11
7. Self-efficacy for diabetes management							—	0.25	0.51**	0.15	0.31*	0.31*
8. Specific diet								—	0.29*	0.19	0.03	0.22
9. General diet									—	0.23	0.44**	0.11
10. Foot care										—	0.23	0.19
11. Testing blood glucose											—	0.18
12. Exercise												—
Covariates												
1. Length of marriage	0.05	0.16	–0.21	–0.13	–0.38**	–0.23	0.08	–0.11	0.08	0.21	0.00	–0.08
2. Age	0.03	–0.04	–0.28	–0.22	–0.29	–0.21	–0.09	–0.12	0.02	0.23	–0.18	–0.28*
3. Sex	–0.02	0.06	0.10	–0.07	0.01	0.43	0.16	0.00	–0.08	–0.21	0.09	–0.09
4. Time since diagnosis	–0.17	–0.09	–0.15	0.09	–0.14	–0.35	–0.26	–0.235	0.12	0.17	0.09	–0.29
5. A1C	–0.17	–0.08	–0.25	0.11	–0.01	–0.06	0.13	–0.26	–0.30	–0.10	–0.25	–0.02
6. Comorbidity index	–0.07	–0.08	0.11	0.28*	–0.09	–0.08	–0.12	–0.26	0.20	0.15	0.23	–0.22

*[1]Patient report. [2]Partner report. *P <0.05. **P <0.001.*

TABLE 4. Diabetes-Related Partner Investment Items

Item	Mean (SD)
Patient report (*n* = 52)	
1. The responsibility of managing my diabetes is mine alone.*	5.73 (1.82)
2. When I think about negative consequences of not following the recommended diabetes management treatment (diet, medication, blood glucose testing, exercise), I view this as "our" problem (shared by my partner and me equally) rather than just my problem.	3.71 (2.17)
3. Ultimately, I must face the challenges of managing my diabetes, as an individual, rather than depending on my partner.*	5.54 (1.78)
4. My partner and I have useful discussions about how to manage my diabetes.	4.77 (2.08)
5. My partner and I are able to work together toward helping me manage diabetes.	5.13 (1.95)
Partner report (*n* = 50)	
1. The responsibility of managing my partner's diabetes is his or hers alone.*	4.30 (2.33)
2. When I think about the negative consequences of my partner not following the recommended diabetes management treatment (diet, medication, blood glucose testing, exercise), I view this as "our" problem (shared by my partner and me equally) rather than just his or her problem.	4.96 (2.08)
3. Ultimately, my partner must face the challenges of managing his or her diabetes, as an individual, rather than depending on me.*	4.63 (2.25)
4. My partner and I have useful discussions about how to manage his or her diabetes.	4.92 (2.08)
5. My partner and I are able to work together toward helping my partner manage diabetes.	4.98 (1.98)

*Range for all items is 1–7. *Items were reverse-scored when computing mean scale scores.*

nificantly and positively correlated with relationship satisfaction and health-related social support, as reported by both partners (Table 2). Further, patient reports were significantly correlated with partner reports for diabetes-related partner investment (r = 0.681, P <0.001). Means for all items are presented in Table 4.

The main model fit the data well [χ^2 (41) = 48.60, P = 0.19; comparitive fit index (CFI) = 0.960; root mean square error of approximation = 0.060; and standardized root mean residual = 0.068; Figure 1]. In this model, an overall relationship factor was estimated with both partners' responses to all three relationship constructs as indicators. This latent factor was modeled as a predictor of patient self-efficacy for diabetes management, which was modeled as a predictor of patient health outcomes. All covariances among error terms of the latent indicators were not allowed, but covariances among residuals of the behavior measures were allowed. All factor loadings were significant and of acceptable strength, which supported the estimation of latent relationship factors driving the judgments of both partners. In other words, partners' reports were sufficiently correlated to support a CFM characterization of relationship factors. Standardized estimates are shown.

Effects of Relationship Factors on Patient Self-Efficacy for Diabetes Management

Higher levels of relationship factors (relationship satisfaction, social support, and partner investment) were related to higher self-efficacy for diabetes management. The latent relationship factors' variable explained a substantial proportion of variability in self-efficacy for diabetes management (β = 0.70, R^2 = 0.49, P <0.001).

Effects of Patient's Diabetes Self-Efficacy on Self-Management Behaviors

A patient's self-efficacy for diabetes management was significantly associated with the patient's self-reported blood glucose testing (β = 0.31, R^2 = 0.09, P<0.05), exercise (β = 0.31, R^2 = 0.09, P<0.05), and adherence to a healthy diet (β = 0.51, R^2 = 0.26, P <0.001). We observed nonsignificant effects on adherence to diabetes-specific diet recommendations (β = 0.25, R^2 = 0.06, P = 0.052) and checking feet (β = 0.16, R^2 = 0.02, P = 0.59).

Discussion

The most novel aspect of our study is that relationship factors reported by both partners predicted a substantial proportion of variability in patients' self-efficacy for diabetes management. A previous meta-analysis of couple-oriented interventions for people with chronic illness revealed that intervention effects could be strengthened by targeting partners' influences on patients' health behaviors and indicated a need for dyadic research specifically in the area of type 2 diabetes (43). Our work supports this suggestion given the high association observed between relationship functioning and self-efficacy for diabetes self-management. For comparison, a previous study found that health literacy, diabetes education, and being employed together explained about 12% of the variance in diabetes self-efficacy (44). In our study, relationship factors explained 49% of the variance in di-

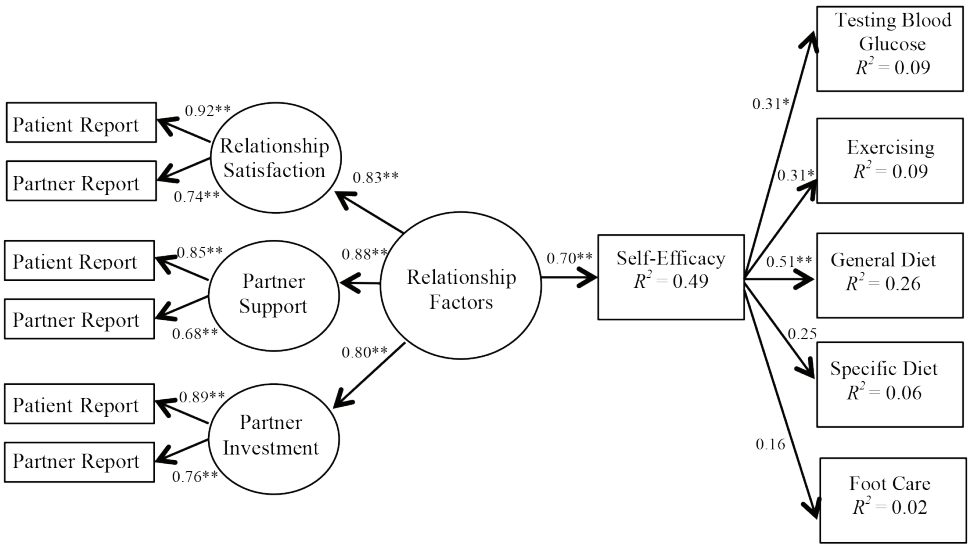

FIGURE 1. Common fate model. *P <0.05; **P <0.001. Partner Investment, diabetes-related partner investment; Partner Support, health-related social support; Self-Efficacy, self-efficacy for diabetes management. Standardized estimates are shown.

abetes self-efficacy. This large effect is notable and suggests that relationship factors should not be overlooked as future studies continue to refine our understanding of the development of self-efficacy for self-management behaviors among patients with type 2 diabetes. Further, the association between relationship factors and self-efficacy may be an underestimate given that other unmeasured relationship constructs may also contribute to a person's feelings of self-efficacy.

Our findings that patients' self-efficacy for diabetes management predicted patients' self-reported blood glucose testing, exercising, and adherence to a healthy diet is consistent with previous research (5–7). Somewhat surprising was the less strong association found between patients' self-efficacy for diabetes management and adherence to diabetes-specific diet recommendations. One explanation for this is that the specific diet items refer to eating a low-fat diet. More recent recommendations for diabetes focus more on a balance of carbohydrates and healthy fats (45). Further, patient self-efficacy for diabetes management was not related to patients' self-reported frequency of engaging in foot care. This result may be because the self-efficacy for diabetes scale does not include items specific to foot care, although previous research has shown a relationship between diabetes self-efficacy and foot care (7). It is also possible that, although participants were engaging in foot care, they did not consider it a part of diabetes management when rating their self-efficacy. In addition, the internal consistency reliability for self-efficacy for diabetes management was somewhat low ($\alpha = 0.69$), which may have contributed to this nonsignificant finding.

This is the first study to examine partner investment in a diabetes population. On average, partners' responses were highly concordant. Positive correlations with other relationship variables indicated that partner investment is related to other relationship constructs. Among all scale items, patients reported the highest mean for the item, "The responsibility of managing my diabetes is mine alone"; however, the corresponding item for partners was rated the lowest. Similarly, patients reported a lower total scale mean than partners for diabetes partner investment. This result suggests that partners may view diabetes management as a responsibility they share with their partner more so than patients. This dynamic deserves future consideration because it could inform how diabetes education messages should be framed for couples. Internal reliability was somewhat low for patient reports on this new measure, suggesting future validation work may focus on revising some items or creating additional items to more fully capture this construct.

Several limitations should be addressed. The study was cross-sectional and observational, and therefore future studies are needed for stronger evidence of causal relationships. Although we theorize that aspects of patients' relationships affect their ability to manage diabetes, this association may be the result of other causal pathways. For example, it is possible that people who are having problems managing their diabetes may also be having problems managing their relationship or may be more likely to be partnered with someone who does not have the necessary resources to adequately support their diabetes management. Still, establishing the correlational associations in the present study is a first step in establishing these constructs as potential intervention targets.

Further, the study relied on self-reported health behaviors, which are limited by artifacts such as recall bias and social desirability bias. About half of the participants did not know their most recent A1C, and the other half

self-reported it. Participants may not have accurately reported A1C, and those who did not know their most recent value may have had less well controlled diabetes. Future research should consider participants' glycemic control. Also, self-reported diabetes status is not as ideal as having clinical data; however, several studies have shown that self-reported diabetes status is highly accurate compared to fasting blood glucose and A1C measurement (46–48).

It is also possible that an online sample is not representative of all individuals with type 2 diabetes; however, the demographics of our sample were similar to those of people with type 2 diabetes in general. Additionally, in 17.3% of couples, both partners were diagnosed with type 2 diabetes, similar to what has been reported among larger samples (49). Health-related social support and diabetes-related partner investment may have had a different meaning to partners who also had diabetes. We did not find evidence of these couples being distinct on study constructs, but those tests were underpowered. Future studies should consider the unique situation of couples in which both partners have diabetes. Further, only participants whose partner was willing to participate were included; it is possible that partners who are less supportive or less satisfied with their relationship were underrepresented. Of note, couples in the current study reported being diagnosed with type 2 diabetes for ~8 years. Results may differ in couples facing a new diagnosis. Similarly, couples in this study were in long-term marriages (an average of ~22 years), and relationship dynamics may be different for individuals in younger relationships.

Conclusion

We found support for an association between relationship factors and diabetes self-management behaviors. Relationship factor constructs such as relationship satisfaction, health-related social support, and diabetes-related partner investment provide potential targets to be tested within a diabetes management intervention. In this way, relationship factors may serve as useful ways to strengthen and sustain self-efficacy for diabetes management. In addition, future research should examine the relationship between social control and diabetes self-management behaviors because some evidence suggests that social control is helpful for improved self-management in combination with social support. For example, among couples in which one member has type 2 diabetes, when spouses engage in both social support and control actions, patients have higher energy expenditure from physical activity and greater self-efficacy for engaging in physical activity the following day (27). A systematic review by Arden-Close and McGarth (50) found that couple-focused interventions may be more effective than individual interventions but that more three-armed studies are needed to assess the added benefits of partner involvement. In addition to intervention development, future research should consider relationship dynamics closer to the diabetes diagnosis and examine more extensively couples in which both partners have diabetes. The current study suggests that close relationship partners are important to consider when helping people manage a chronic condition.

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Duality of Interest

No potential conflicts of interest relevant to this article were reported.

Author Contributions

J.S.W. planned the study, collected the data, analyzed the data, and drafted the manuscript. K.W.R. advised on study design and analyses and contributed to manuscript preparation. J.S.W. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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