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Diabetes Self-Management and Glycemic Control: The Role of Autonomy Support from Informal Health Supporters

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Abstract

Objective: Effective diabetes self-management can prevent long-term health complications but is often complex and difficult to achieve. Health care professionals' support for patients' autonomy (autonomy support) in managing their diabetes contributes to better diabetes self-care and glycemic control. Most adults with diabetes also receive self-management support from informal health supporters. Yet, the role of autonomy support from these informal health supporters has not been explored. We examined patients' perceived autonomy support from their main health supporter (family member or friend) in relation to their diabetes distress, self-efficacy, self-monitoring of blood glucose (SMBG), medication adherence, and hemoglobin A1c (HbA1c).

Methods: 326 Veterans with type 2 diabetes at high risk for complications, who identified a main health supporter, were surveyed using self-report measures of social support, diabetes distress, self-efficacy, and self-care. HbA1c and prescription fill data were extracted from VA electronic records for the 12-months before and after the survey. Linear regression and linear mixed models examined the associations of autonomy support with diabetes distress, self-efficacy, SMBG, medication adherence, and glycemic control, controlling for participant-supporter relationship characteristics and patient-factors.

Results: In adjusted models, greater autonomy support was associated with lower diabetes distress ($B=-.323$, $SE=.098$, $p=.001$), greater self-efficacy ($B=.819$, $SE=.148$, $p<.001$), more frequent SMBG ($B=.297$, $SE=.082$, $p<.001$), and better subsequent 12-month glycemic control ($B=.257$, $SE=.085$, $p=.003$) but not with medication adherence ($B=.001$, $SE=.020$, $p=.994$).

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Author Note: This study was conducted when Ann-Marie Rosland was a faculty member at the University of Michigan. Dr. Rosland is currently affiliated with the VA Center for Health Equity Research and Promotion in Pittsburgh, PA, and the University of Pittsburgh School of Medicine.

Conclusions: Autonomy support from main health supporters is significantly associated better diabetes related attitudes, self-care, and glycemic control after adjusting relationship and patient characteristics.

Keywords

autonomy support; self-management; glycemic control; social support; care partners

Effective diabetes self-management can delay or prevent the development of diabetic complications (Beck et al., 2017; Shrivastava, Shrivastava, & Ramasamy, 2013), which are associated with higher risk of depression (De Groot, Anderson, Freedland, Clouse, & Lustman, 2001) and disability (Von Korff et al., 2005), poorer quality of life (Glasgow, Ruggiero, Eakin, Dryfoos, & Chobanian, 1997; Lloyd, Sawyer, & Hopkinson, 2001), greater medical costs (Chang, Weiner, Richards, Bleich, & Segal, 2012), and increased risk of mortality (Young et al., 2008). However, diabetes self-care activities (e.g., self-monitoring of blood glucose, diet, and medication adherence) can be complex and many people fail to meet self-management goals (Safford, Russell, Suh, Roman, & Pogach, 2005). Notably, research based on Self Determination Theory indicates that an autonomy supportive environment increases individuals’ intrinsic motivation for sustained self-regulation of health behavior (Ng et al., 2012; Ryan, Patrick, Deci, & Williams, 2008). Within health care environments, autonomy support reflects the extent to which health care professionals (e.g., physicians, nurse educators, or dieticians) acknowledge individuals’ perspectives, provide a meaningful rationale for self-care behaviors, use non-controlling language, help provide and support individual choices, and foster internal sources of motivation (Su & Reeve, 2011; Williams et al., 2006). For adults with diabetes, autonomy support from health care professionals is associated with lower diabetes distress (Williams, Lynch, & Glasgow, 2007), greater perceived confidence for diabetes self-management (Williams, McGregor, King, Nelson, & Glasgow, 2005), and better medication adherence (Williams et al., 2009). Further, perceived autonomy support from health care professionals has been shown to contribute to improvements in glycemic control both directly and indirectly via increases in autonomous motivation and perceived competence for self-care (Williams, Freedman, & Deci, 1998; Williams et al., 2007; Williams, McGregor, Zeldman, Freedman, & Deci, 2004; Williams et al., 2009).

Like health care professionals, unpaid informal supporters, such as family members and friends, play an important role in the management type 2 diabetes (Bouldin et al., 2017; Miller & DiMatteo, 2013; Rosland et al., 2008; Strom & Egede, 2012; Tang, Brown, Funnell, & Anderson, 2008). However, unlike health care professionals, informal supporters are imbedded within patients’ daily environments and may therefore be best able to leverage autonomy supportive interactions to affect positive and sustainable changes in patients’ day to day diabetes self-management. For example, most adults with type 2 diabetes receive support with diabetes self-management from family members (Rosland, Heisler, Choi, Silveira, & Piette, 2010; Silliman, Bhatti, Khan, Dukes, & Sullivan, 1996). Community-dwelling older adults with diabetes receive between ten and fourteen hours of assistance from these informal caregivers per week (Langa et al., 2002). Moreover, health supporters frequently assist patients before and during medical visits (Janevic, Piette, Ratz, Kim, &

Rosland, 2016), communicate with patients' health care providers, and help coordinate patient care (Lee et al., 2017).

There are some indications that the way in which family and friends provide support may impact patients' self-management and health outcomes. Evidence suggests that negative communication from family members (e.g., criticisms, nagging, or arguing) is associated with lower adherence to diabetes self-care and worse glycemic control (Mayberry, Egede, Wagner, & Osborn, 2015; Mayberry & Osborn, 2012; Mayberry & Osborn, 2014; Rosland et al., 2010; Tang et al., 2008). A review by Rosland and colleagues (2012) found that, for adults with chronic disease, family behaviors and communication strategies which emphasized self-reliance, personal success, encouragement, and attentive responses to symptoms were linked with positive health outcomes. At least one study has found that greater perceived autonomy support from important others (i.e., family members and friends) was associated with smoking abstinence and healthy diet among smokers (Williams et al., 2006). To our knowledge, no studies have directly assessed the impact of autonomy support from informal health supporters (i.e., unpaid family members and friends) on the diabetes self-management attitudes, behaviors, and glycemic control.

Among adults with Type 2 diabetes, adequate diabetes self-management can forestall development of disease related complications (Beck et al., 2017; Shrivastava et al., 2013). Individuals who are at higher risk for diabetes complications often have more complex self-management regimens and greater need for effective diabetes self-management support from family members and friends (Powers et al., 2015). Consequently, adults at risk for diabetes complications may benefit from greater autonomy support in their relationship with important health supporters (i.e., family members and friends).

The purpose of this study was to examine the relationship between perceived autonomy support and diabetes distress, self-efficacy for diabetes management, diabetes self-care behaviors, and subsequent glycemic control among adults with type 2 diabetes at elevated risk for diabetic complications. We hypothesized that greater perceived autonomy support from a key health supporter would be associated with lower diabetes distress, greater diabetes management self-efficacy, and better self-care behavior (i.e., self-monitoring of blood glucose and medication adherence), independent individual patient factors (i.e., age, race, insulin use, and health literacy status) and patient-supporter relationship characteristics including support satisfaction and patients' respect for their support. Further, we hypothesized that greater perceived autonomy support would be associated with better glycemic control over a following 12-month period, while controlling for patient factors, relationship characteristics, and prior glycemic control.

Methods

Sample

The present study included adults with a history of poor glycemic control, hypertension, and diabetes related ulcers and amputations who have increased risk for microvascular (e.g., retinopathy, neuropathy) and macrovascular (e.g., heart attack or stroke) complications (Brownrigg et al., 2012; Chammas, Hill, & Edmonds, 2016; Emdin et al., 2015; Mostafa et al., 2018). Participants were included in the sample if they had (1) poor glycemic control (most recent HbA1c within 6 months > 8.0 among participants < 55 years old, or HbA1c > 9.0 for participants >=55 years); or (2) poor blood pressure control (most recent blood pressure reading within 6 months >160/100 mmHg or average blood pressure over the prior 6 months > 150/90 mmHg); or (3) a prior diagnosis of lower extremity ulcer or amputation. Differences in age-based HbA1c criteria correspond to current clinical guidelines which suggest setting higher HbA1c goals for older patients with type 2 diabetes (American Diabetes Association, 2017; Du, Ou, Beverly, & Chiu, 2014).

One thousand Veterans were randomly selected from those meeting these criteria and were mailed a survey and release of information form for a review of their electronic medical record (EMR) data. See Janevic et al. (2016) for additional details regarding sample recruitment. 588 surveys were returned and 478 (81.3%) included signed EMR release forms. There were no significant differences in the demographics or in variables included in the current analyses (e.g., autonomy support, diabetes distress, self-efficacy, SMBG) between respondents with and without signed EMR release forms. Among respondents who provided signed release forms, 427 (89.3%) had at least one HbA1c test result in the 12 months following the date of the survey. Insulin users were more likely to have at least one HbA1c test in the 12 months before or after the survey and therefore, more likely to be included in this study sample ($\chi^2 = 7.83$, $p = .005$). However, there were no other significant differences in any demographic or study variables between participants with and without at least one HbA1c test within 12 months after the survey.

Respondents were asked to identify the family member (i.e., spouse/partner, adult son/daughter, sibling, parent, or other relative) or friend most involved in their health care (e.g., helping them remember to take medications, remember when they have medical appointments, help getting motivated to exercise). This individual was referred to as the respondent’s main health supporter. Respondents who indicated that they did not have a main health supporter ($n = 101$) were excluded from this analysis. Participants with ($n = 326$) and without ($n = 101$) a main health supporter did not differ by age ($t = -0.21$, $p = .837$), race/ethnicity ($\chi^2 = 2.01$, $p = .156$), insulin use ($\chi^2 = 1.57$, $p = .211$), health literacy status ($\chi^2 = 0.81$, $p = .369$), diabetes distress (t = 0.46, $p = .646$), diabetes management self-efficacy ($t = -0.55$, $p = .585$), self-monitoring of blood glucose ($t = -1.62$, $p = .107$), medication adherence ($t = -0.06$, $p = .953$), or HbA1c measurement over the 12 months following the survey ($B = -.03$, $SE = .17$, $p = .845$). The final sample for the present study was comprised of 326 adults at high risk for diabetic complications who identified a main health supporter. Informed consent was obtained from all individual participants. Study methods and procedures were approved by VA Ann Arbor Healthcare System IRB.

Measures

Principal Independent Variable.—Autonomy support from participants’ main health supporter was measured using an adapted version of the Important Others Climate Questionnaire (IOCQ; Electronic Supplementary Table) (Williams et al., 2006). Participants indicated how much they agreed with each of four statements regarding their main health supporter (e.g., “My main health supporter listens to how I would like to do things regarding my health") on a five-point Likert scale from "strongly disagree" to "strongly agree." Responses are averaged to generate a total score with higher scores reflecting greater perceived autonomy support. The IOCQ has been shown to predict short and long-term changes in health behaviors (i.e., smoking cessation and diet) (Williams et al., 2006).The IOCQ has demonstrated good reliability in prior work (α = .87 to .95) (Williams et al., 2006) and in the current study (α = .86).

Covariates.—Participants' age, race, relationship to their main health supporter (spouse/ partner vs. other family member or friend) and participant-supporter co-residence status (main health supporter living inside vs. outside the participant's home) were collected by participants' self-report. Participants' insulin use (insulin use in the year before or after the survey) was extracted from electronic pharmacy data. Similarly, each participant's HbA1c values during the 12 months before the survey were extracted and averaged to create an approximate measure of prior glycemic control. The time interval in weeks between the date of the survey and the date of each HbA1c measurement *following* the survey was calculated to measure and control for changes in in HbA1c over time. Health literacy status was determined using a single item screener (Chew, Bradley, & Boyko, 2004; Chew et al., 2008). Participants rated the screening item ("How confident are you in filling out forms by yourself?") on a Likert scale from 1 (Extremely) to 5 (Not at all). Participants who endorsed 3 (somewhat) or greater (i.e., less confidence) were determined to have inadequate health literacy (inadequate health literacy = 0, adequate health literacy = 1). This threshold has demonstrated 80% to 81% accuracy in identifying veterans with or without adequate health literacy among a large, randomly selected, multi-site sample of VA primary care patients (Chew et al., 2008).

Participants' feeling of respect for their main health supporter was measured with the four-item respect subscale of the Relationship Rating Form (Davis & Latty-Mann, 1987). Participants rated the extent to which they agreed with each item (e.g., "Does this person bring out the best in you?") on a Likert scale from 1 (not at all) to 7 (completely or extremely). Item responses were averaged with higher scores reflecting greater respect. Participants' satisfaction with the chronic disease management support provided by their main health supporter (hereafter *support satisfaction*) was assessed using two items ("I am very satisfied with the help and support I receive from my main health supporter in caring for my health condition," and "I would be worse off it wasn't for my main health supporter helping me with my health care") developed for this study. Items were rated on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). Item scores were averaged. Higher scores indicate greater support satisfaction.

Outcome Measures.—The Diabetes Distress Scale-2 (DDS2) was used to assess participants' emotional distress associated with the experience of living with diabetes (Fisher, Glasgow, Mullan, Skaff, & Polonsky, 2008). The scale contains two items (i.e., "Feeling overwhelmed by the demands of living with diabetes" and "Feeling that I am often failing with diabetes regimen"). Each item is rated on scale from 1 (not a problem) to 6 (a very serious problem). A total mean score is calculated with higher scores indicating greater diabetes distress. The DDS2 has established criterion validity with the 17-item DDS scale and higher DDS2 scores associated with worse dietary behavior and higher HbA1c (Fisher et al., 2008).

The Chronic Disease Management - Self-Efficacy Scale (SES) (Lorig et al., 1996) was used to measure participant’s self-efficacy for diabetes self-management. This scale is comprised of 5 items that assess participants’ confidence in their ability to make effective self-care decisions, reduce diabetes related emotional distress, and minimize diabetes related impairment. Item phrasing was adapted to specifically address diabetes self-management (e.g., “How confident are you that you can do all to the things necessary to manage diabetes on a regular basis?”). Likert scale response options ranged from 1 (not at all confident) to 10 (completely confident). The SES is a validated measure of participants’ confidence in their ability to manage chronic disease and has demonstrated good internal consistency (Lorig et al., 1996).

Self-monitoring of blood glucose was measured using a single Likert item (“Over the past two months, how often did you test your blood sugar exactly as your doctor recommended?”) adapted from a previous diabetes study (Heisler, Smith, Hayward, Krein, & Kerr, 2003). Response options ranged from 1 (I didn’t at all) to 5 (I got it exactly right), or “My doctor doesn’t recommend this.”

Adherence to oral diabetes medications was assessed using VA outpatient medication-fill data which was extracted from participants’ EMR over the 12-month period following the survey. Adherence was determined by calculating the quotient of gap days divided by total days for which a participant should have had medications from first fill date to discontinuation (Hess, Raebel, Conner, & Malone, 2006). Gap days were defined as the number of days when participants should have been taking oral antihyperglycemic medications, but, based on fill data, did not have the medication on hand. Medications were assumed to be discontinued after a prescription had not been filled in 180 days. Scores ranged from 0 to 1 with higher scores indicating poorer medication adherence.

Glycemic control was measured using all glycosylated HbA1c (%) laboratory test results available in participants’ electronic medical records during a 12-month period before and after the survey return date. Each participants HbA1c values during the 12-months following the survey treated as an outcome. All HbA1c assays were performed using laboratory methods certified by the National Glycohemoglobin Standardization Program (Little, 2003).

Analyses

Pearson and point-biserial correlations were first used to test the associations between autonomy support and each model covariate: participants’ relationship to their main support (spouse/partner vs. other relationship), participant-supporter co-residence, support satisfaction, participants’ feelings of respect for their supporter, as well as participant age, race, and insulin use, and health literacy status. Next, four separate three-step hierarchical linear regression models were used to examine the associations of each covariate and autonomy support with diabetes distress, diabetes self-efficacy, self-monitoring of blood glucose and medication adherence. Participant factors including age, race, insulin use, and health literacy status were entered in a first step. Participant-supporter relationship characteristics (i.e. participant-supporter co-residence, as well as participants' relationship to their main support, support satisfaction and respect for their health supporter) were entered in a second step. The main predictor of interest, autonomy support from participants' main health supporter, was added in a third step.

Three linear mixed models were used to examine the relationship of participant characteristics (i.e., age, race, insulin use, and health literacy status, participant's prior average 12-month HbA1c, and the time between the survey and each HbA1c test), participant-supporter relationship characteristics (i.e., participant-supporter co-residence as well as participants' relationship to their main support, support satisfaction, and respect for their health supporter), and autonomy support with HbA1c measurements during the 12-months following the survey. Model 1 included only participant characteristics. Model 2 included participant characteristics and participant-supporter relationship characteristics. Model 3 included participant characteristics, participant-supporter relationship characteristics, and autonomy support. Model fit was examined using both fixed and random intercepts and then compared using a −2 log likelihood ratio chi-square test for all three models. Each linear mixed model was estimated using Restricted Maximum Likelihood.

A false discovery rate (FDR) adjusted critical *p* value was used to control the probability of Type I error (Benjamini & Hochberg, 1995). False discovery rate adjustments retain greater power than family-wise error corrections while still controlling the probability of false positives (Glickman, Rao, & Schultz, 2014). Using a maximum acceptable false discovery rate of .05 for all reported tests ($n = 55$) we derived an overall critical significance level of $p < .014$. All analyses were performed using SPSS 24.0 (IBM Corp., 2016).

Results

Sample Characteristics

The sample was primarily male (98.2%), White (89.4%), and non-Latino (97.1%) with an average age of 66.70 ($SD = 10.21$) years (Table 1). Most respondents had some postsecondary education (51.5%). Spouses/partners were the most commonly-identified main health supporters (68.4%) and over half of all participants lived with their main health supporter (56.1%). Most of the sample used insulin with or without oral diabetes medication (59.5%) and approximately one-third used only oral diabetes medication (32.8%).

Participants' average HbA1c over the 12 months following the survey was 7.8(%). 39.3% of participants had an average HbA1c > 8.0%. The sample had an average of 2.35 ($SD = 1.07$) HbA1c measurements in the 12- month period following the survey. Consistent with current clinical guidelines, most participants (96.3%) had between one and four HbA1c measurements during this 12 month period (American Diabetes Association, 2017). The mean time interval between the survey and each subsequent HbA1c measurement was 26.18 weeks ($SD = 14.90$).

Preliminary Analyses

Bivariate analyses (results not shown in tables), showed that higher perceived autonomy support was significantly associated with higher rates of health literacy ($r = .18$, $p = .001$), greater support satisfaction ($r = .28$, $p < .001$), and greater feelings of respect for the participants' main health supporter ($r = .42$, $p < .001$). Autonomy support was not significantly associated with supporter-participant co-residence ($r = .04$, $p = .507$), participants' relationship to their supporter (spouse/partner vs. other; $r = .06$, $p = .267$), participant age ($r = .10$, $p = .081$), race (white vs. non-white; $r = -.10$, $p = .085$) or insulin use ($r = -.04$, $p = .438$).

Association of Autonomy Support with Diabetes Distress and Self-Efficacy

A hierarchical linear regression model examined predictors of diabetes distress (Table 2). Participant characteristics (i.e., age, race, insulin use, and health literacy status), added in the first step, accounted for a significant amount of variance in diabetes distress ($R^2 = .063$, $p < .001$). Specifically, older age and health literacy were associated with lower diabetes distress ($B = -.023$, $SE = .007$, $p < .001$) and insulin use was associated with greater diabetes distress ($B = .334$, $SE = .133$, $p = .013$). Characteristics of participant-supporter relationships, added in the second step, accounted for a significant increase in explained variance in diabetes distress ($\Delta R^2 = .044$, $p = .006$). Within the second step, participant's feelings of respect for the supporter ($B = -.207$, $SE = .073$, $p = .004$) was significantly associated lower diabetes distress. Autonomy support, added in the third step, was significantly associated with lower diabetes distress ($B = -.323$, $SE = .098$, $\Delta R^2 = .031$, $p < .001$), controlling for all other model variables.

A second hierarchical regression model examined predictors of self-efficacy for diabetes management (Table 2). Participant characteristics (i.e., age, race, insulin use, and health literacy status), added in the first step, accounted for a significant amount of variance in self-efficacy ($R^2 = .077$, $p < .001$). Only health literacy status was significantly associated with self-efficacy for diabetes self-management ($B = 1.098$, $SE = .218$, $p < .001$). Characteristics of participant-supporter relationships, added in the second step, accounted for a significant increase in explained variance in diabetes self-efficacy ($\Delta R^2 = .059$, $p = .001$). Within the second step, only feelings of respect for the supporter ($B = .493$, $SE = .113$, $p < .001$) was significantly associated greater self-efficacy. Autonomy support, added in the third step, was significantly associated with greater self-efficacy ($B = .819$, $SE = .148$, $\Delta R^2 = .081$, $p < .001$), controlling for all other model variables.

Association of Autonomy Support with Self-Management Behaviors

A third hierarchical regression model examined predictors of blood glucose self-monitoring (Table 3). Participant characteristics (i.e., age, race, insulin use, and health literacy status), added in the first step, accounted for a significant amount of variance in SMBG ($R^2 = .086$, $p < .001$). Only insulin use was significantly associated with SMBG ($B = .574$, $SE = .114$, $p < .001$). Characteristics of participant-supporter relationships, added in the second step, did not account for a significant increase in explained variance in SMBG ($\Delta R^2 = .025$, $p = .096$). Autonomy support, added in the third step, was significantly associated with more frequent SMBG ($B = .297$, $SE = .082$, $\Delta R^2 = .039$, $p < .001$), controlling for all other model variables.

A fourth hierarchical regression model examined predictors of medication adherence (Table 3). Participant characteristics did not predict a significant amount of variance in medication adherence when entered in the first step (R^2 = .029, p = .147). No individual predictors were significantly associated with medication adherence. Characteristics of participant-supporter relationships, added in the second step, did not account for a significant increase in explained variance in medication adherence (ΔR^2 = .018, p = .316). No individual predictors were significantly associated with medication adherence. Autonomy support, added in the third step, was not significantly associated with medication adherence (B = .003, SE = .021, ΔR^2 < .001, p = .871), controlling for all other model variables.

Association Between Autonomy Support and Subsequent Glycemic Control

Prior to examining each model, we tested the comparative fit of fixed vs. random intercepts models. Random intercepts yielded significantly better fit compared to fixed intercepts for Model 1 (χ^2 = 116.31, p < .001), Model 2 (χ^2 = 109.81, p < .001), and Model 3 (χ^2 = 101.65, p < .001). Consequently, each linear mixed model was tested using random intercepts. Between participant variance accounted for over 40% of the total variance in subsequent 12-month HbA1c measurements for Model 1 (ICC = .442), Model 2 (ICC = .451), and Model 3 (ICC = .424).

Among the participant characteristics included in Model 1, insulin use (B = .418, SE = .125, p < .001) and prior average 12-month HbA1c (B = .555, SE = .039, p < .001) were significantly associated with higher subsequent HbA1c measurements (Table 4). Age (B = −.004, SE = .006, p = .522), race (B = −.199, SE = .155, p = .201), and health literacy status (B = −.020, SE = .122, p = .874) were not significantly associated with subsequent HbA1c measurements. There was no significant trend between time and HbA1c measurements over the following 12-months (B = .001, SE = .010, p = .997).

Patient supporter relationship characteristics, added in Model 2, including participant-supporter co-residence (B = −.123, SE = .130, p = .347), participants' type of relation to their main support (i.e., spouse/partner vs. other; B = .132, SE = .140, p = .348), support satisfaction (B = −.053, SE = .071 , p = .456), and participants' respect for their health supporter (B = .021, SE = .064, p = .742) were not significantly associated subsequent HbA1c measurements when controlling for the variables entered in Model 1.

Autonomy support, added in Model 3, predicted lower subsequent HbA1c (B = −.257, SE = .085, p = .003) after controlling for variables entered in Model 1 and 2. Every one-unit decrease in IOCQ score (i.e., autonomy support) at the time of the survey corresponded to 0.26(%) higher overall HbA1c measurements during the following 12-month period, adjusting for all control variables.

Discussion

As hypothesized, perceived autonomy support from participants' main, informal health supporter was associated with lower diabetes distress, greater diabetes management self-efficacy, and better self-monitoring of blood glucose, when controlling for participant characteristics (i.e., age, race, and insulin status) and participant-supporter relationship characteristics (i.e., support satisfaction, participants' respect for their supporter, participant-supporter relationship, and participant-supporter co-residence). Importantly, perceived autonomy support was associated with lower HbA1c during the subsequent 12-month period while controlling for patient factors, including glycemic control, and patient- health supporter relationship characteristics. These results suggest that autonomy support from family and friends may play an important role in individuals' success in managing and controlling diabetes, above and beyond even that of patient's satisfaction with the general support received from those family and friends.

Prior studies show that greater perceived autonomy support for disease self-management from patients' professional health care providers (e.g., physician, nurse practitioner, etc.) is associated with lower diabetes distress (Mohn et al., 2015; Williams et al., 2007), higher perceived competence for diabetes self-management (Koponen, Simonsen, Laamanen, & Suominen, 2015; Williams, Freedman, et al., 1998; Williams et al., 2007; Williams et al., 2005; Williams et al., 2004), and better adherence to self-care behaviors such as self-monitoring of blood glucose (Julien, Senécal, & Guay, 2009; Koponen, Simonsen, & Suominen, 2017; Nouwen et al., 2011; Raaijmakers et al., 2015; Zoffmann & Lauritzen, 2006). However, this study is the first to demonstrate associations between perceived autonomy support from an *informal* main health supporter (i.e., family member or friend) and diabetes related distress, self-efficacy, and self-monitoring of blood glucose. Many biological and psychosocial factors are known to affect patients' diabetes self-management. In this study, patients' perceived autonomy support from a single main health supporter accounted for a small to moderate amount of variance in diabetes distress, self-efficacy, and self-monitoring of blood glucose, after controlling for patient characteristics and other patient-supporter relationship characteristics. Additional research is needed to corroborate these findings; however, main health supporters' provision of autonomy support for patients' diabetes self-management may have a positive influence multiple self-care related beliefs, attitudes, and behaviors.

Previous clinical intervention studies based on Self-Determination Theory have shown that greater perceived autonomy support from professional health care providers predicts better glycemic control (Williams, Freedman, et al., 1998; Williams et al., 2007; Williams et al., 2005; Williams et al., 2004; Williams et al., 2009). Our findings build on this research by indicating that greater autonomy support from a key informal supporter is similarly associated with better subsequent measures of patients glycemic control after controlling for variance in participants' prior glycemic control. Taken together, the overall pattern of findings suggests that autonomy support from patients' main-health supporter may contribute to better glycemic control via more positive diabetes related attitudes (i.e., lower diabetes related distress, greater self-efficacy) and self-management behaviors (i.e., self-monitoring of blood glucose). However, future research using longitudinal or experimental methods is needed to directly assess potential mediators of the relationship between patients' perceived autonomy support from informal health supporters and glycemic control. Additionally, future research could directly compare the impact of autonomy support from health care professionals and informal supporters on patient outcomes to determine the relative importance for these sources of self-management support.

Of note, analyses showed that higher levels of autonomy support from participants' main health supporters were associated with higher support satisfaction, suggesting that adults with diabetes prefer support that emphasizes their personal choice and self-initiative in disease self-management. This finding is mirrored by prior research showing an association between greater perceived autonomy support from health care professionals and greater perceived provider support satisfaction (Williams et al., 2007; Williams et al., 2005). Perceived autonomy support was also associated with participants' respect for their supporter. Greater autonomy support may contribute to greater feelings of respect for supporters or, conversely, greater autonomy support may be a consequence of greater patient-supporter relationship quality. Interestingly, participants' perception of autonomy support did not differ by supporters' location (in-home vs. out-of-home) or by their relationship to the participant (spouse or partner vs. other family), suggesting that spouses/partners and other types of health supporters may provide equivalent levels of autonomy support for disease self-management.

Contrary to our hypothesis, participants' perception of autonomy support from their main health supporter was not significantly associated with medication adherence in the 12-months following the survey. This finding was unexpected given existing evidence linking greater perceived autonomy support from health care professionals with greater medication adherence (Graffigna, Barello, Bonanomi, & Menichetti, 2016; Williams et al., 2009; Williams, Rodin, Ryan, Grolnick, & Deci, 1998). At least one other study found that participants' overall perceived support from family and friends was not significantly associated with their oral diabetic medication adherence (Rosland et al., 2014). Further research is needed to corroborate the null relationship we observed between autonomy support and medication adherence. Medication adherence represents a complex set of behaviors which is likely driven by multiple factors. It is not clear to what extent main-health supporters provided autonomy support for medication adherence. Measures of medication adherence based on pharmacy records are only a proxy for actual daily medication taking behavior. For example, patients with a low percentage of medication gap days (i.e., timely filling of prescriptions) could miss doses of daily medications despite filling the prescription on time. Greater autonomy support may be associated with better daily medication adherence but not with timely filling of diabetes medications – which was the measure of medication adherence used in this study.

The present findings should be interpreted in the context of several limitations. First, given the observational nature of the data, it is not possible to draw conclusions about the causal relationships among the study variables. However, randomized trials of interventions to increase autonomy support from health care providers have yielded significant improvement in participants' confidence and self-care behavior (Ryan et al., 2008), suggesting that perceived autonomy support has positive effects on diabetes attitudes (e.g., diabetes distress and self-efficacy), self-care behaviors, and glycemic control. Second, we were not able assess the relationship between perceived autonomy support and other potentially important self-care activities such as diet and exercise. Third, self-monitoring of blood glucose was assessed by participant recall. Fourth, medication adherence, which was measured using electronic VA pharmacy data, may be inaccurate for participants who obtain diabetes medications from a non-VA pharmacy. Fifth, the sample used in this study was predominantly male, non-Latino, and White. Thus, it is not clear whether these findings generalize to more racially diverse groups or to women with diabetes. Sixth, we assessed patients' perceptions of autonomy support from a specific, self-identified, main health supporter rather than from all potential sources of informal health support (i.e., all family members and friends who provide any level of disease management support). As a result, we are not able to examine the role of autonomy support in the context of participants' broader social networks. Perceived autonomy support from multiple informal health supporters may account for greater variance in self-management outcomes. Moreover, inclusion of only patients with a self-identified health supporter may have contributed to a selection bias. Analyses indicated that patients with and without a main health supporter did not differ on any of the demographic characteristics or outcome variables (i.e., diabetes distress, self-efficacy, self-monitoring of blood glucose, medication adherence, or subsequent glycemic control). However, we did not ask participants about autonomy support from other sources, so it was not possible to compare perceptions of autonomy support among participants with and without a main health supporter in this study. Participants who are not able to identify a main health supporter may tend to have lower overall levels of perceived support. Thus, the study sample may include individuals with higher than average levels of autonomy support. Seventh, patients' perceptions of their main-health supporter as autonomy supportive may overlap with other important types of perceived functional support (e.g., emotional or informational support) from their main health supporters which have also been shown to be associated with disease processes and health outcomes (Uchino, 2004, 2009), but were not assessed in this study.

Adults who have more informal support from their family and friends are more successful in diabetes management and have more favorable health outcomes compared to those with less informal support (Bouldin et al., 2017; Miller & DiMatteo, 2013; Rosland et al., 2008; Strom & Egede, 2012). Findings from this study indicate that greater autonomy supportiveness from an important family member or friend is associated with better diabetes outcomes – above and beyond variance attributable to patient factors and other important functional and structural support characteristics. Specifically, providing support in a way that highlights intrinsic sources of motivation and promotes personal agency and patient control may yield positive effects in terms of disease related distress, self-efficacy, self-management, and glycemic control.

Future studies should test whether adding training for patients' supporters in autonomy supportive communication strategies increases the effectiveness of existing programs, delivered by diabetes educators or other professionals, in improving diabetes self-management and health outcomes. Self-management programs that already include patients' family and friends should consider whether emphasizing use of autonomy supportive communication strategies by supporters boosts improvements in patients' self-management and glycemic control. Finally, health care professionals could consider counseling patients and their health supporters during routine health encounters on the potential health benefits of autonomy support as well on ways to increase autonomy supportive communication around managing health. Future research could examine the effectiveness of programs to train health care professionals in the use of brief interventions to promote autonomy supportive communication between patients and their health supporters.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Participant characteristics, *N* = 326

Variable	*n* (%) or *M* (*SD*)
Age (years)	66.70 (10.21)
Male	320 (98.2)
Education (*n* = 318)	
Less than high school diploma	41 (12.6)
High school diploma	109 (33.4)
More than high school	168 (51.5)
Race/Ethnicity	
White (*n* = 320)	285 (89.1)
Non-Latino	303 (92.9)
Diabetes Medication Use	
Insulin (+/− oral)	194 (59.5)
Oral medication only (*n* = 301)	107 (32.8)
Distance from MHS (*n* = 323)	
Co-residence	183 (56.1)
<1 to 9 miles	48 (14.8)
10 to 20 miles	20 (6.2)
>21 miles	72 (22.3)
MHS relationship to participant	
Spouse/partner	223 (68.4)
Adult child	49 (15.0)
Sibling	19 (5.8)
Other family	18 (5.5)
Friend	17 (5.2)
Autonomy support (range 1–5)	3.88 (0.75)
Diabetes distress (range 1–6)	4.79 (1.21)
Diabetes self-efficacy (range 1–10)	7.96 (1.89)
SMBG (range 1–5)	4.08 (0.97)
Medication adherence (range 0–1)	0.20 (0.22)
12-month average HbA1C (%)	7.84 (1.42)

Note. MHS = Main health supporter, SMBG = Self-monitoring of blood glucose, HbA1c = Glycosylated Hemoglobin A1c.

Table 2.

Hierarchical linear regression models examining the associations between autonomy support and diabetes-related psychosocial variables

	Diabetes Distress				Diabetes Self-Efficacy			
	n = 309				*n* = 307			
	B	*SE*	*p*	ΔR^2	*B*	*SE*	*p*	ΔR^2
Step 1				.075				.077
Age	−.023	.006	**<.001**		.021	.010	.042	
Race[a]	−.098	.180	.585		.070	.014	.805	
Insulin use	.334	.133	**.013**		.083	.209	.691	
Health literacy	−.390	.139	**.005**		1.098	.218	**<.001**	
Step 2				.044				.059
Relation to MHS[b]	.035	.156	.822		−.107	.244	.662	
MHS co-residence[c]	−.297	.146	.042		.147	.229	.521	
Respect for MHS	−.211	.072	**.004**		.493	.113	**<.001**	
Support satisfaction	.042	.080	.604		−.106	.126	.397	
Step 3				.031				.081
Autonomy support	−.323	.098	**.001**		.819	.148	**<.001**	
Total R^2				.150				.217

Note. MHS = Main Health Supporter. Results of each step reported while controlling for variables entered in the previous step. Bold typeface indicates significant associations using the False Discovery Rate corrected critical *p* value ($p < .014$).

[a]White = 1 vs. other race = 0.

[b]Spouse or partner = 1 vs. other family member or friend = 0.

[c]MHS lives inside of participant's home = 1 vs. MHS lives outside of the participant's home = 0.

Table 3.

Hierarchical linear regression models examining the associations between autonomy support and diabetes self-management behaviors

	Self-Monitoring Blood Glucose *n* = 296				Medication Adherence *n* = 282			
	B	***SE***	***p***	**ΔR^2**	***B***	***SE***	***p***	**ΔR^2**
Step 1				.086				.029
Age	.006	.006	.277		−.001	.001	.538	
Race[a]	−.053	.151	.727		.055	.036	.125	
Insulin use	.574	.114	**<.001**		.053	.026	.046	
Health literacy	.113	.117	.334		.029	.027	.285	
Step 2				.025				.018
Relation to MHS[b]	−.131	.132	.319		−.016	.031	.594	
MHS co-residence[c]	.282	.123	.022		−.006	.028	.843	
Respect for MHS	.075	.060	.218		.029	.014	.037	
Support satisfaction	−.102	.068	.132		−.018	.015	.243	
Step 3				.039				<.001
Autonomy support	.297	.082	**<.001**		.001	.020	.994	
Total R^2				.150				.046

Note. MHS = Main Health Supporter. Results of each step reported while controlling for variables entered in the previous step. Bold typeface indicates significant associations using the False Discovery Rate corrected critical *p* value ($p < .014$).

[a]White = 1 vs. other race = 0.

[b]Spouse or partner = 1 vs. other family member or friend = 0.

[c]MHS lives inside of participant's home = 1 vs. MHS lives outside of the participant's home = 0.

Table 4.

Linear mixed models with nested fixed effects examining predictors of HbA1c measurements during the subsequent 12-month period.

	12-Month HbA1c[a]		
	n = 301		
	B	**SE**	**p**
Model 1			
Age	−.004	.006	.522
Race[b]	−.199	.155	.201
Insulin use	.418	.125	**<.001**
Prior glycemic control	.555	.039	**<.001**
Time	.001	.010	.997
Health literacy	−.020	.122	.874
Model 2			
Relation to MHS[c]	.132	.140	.348
MHS co-residence[d]	−.123	.130	.347
Respect for MHS	.021	.064	.742
Support satisfaction	−.053	.071	.456
Model 3			
Autonomy support	−.257	.085	**.003**

Note. MHS = Main Health Supporter. Results of each model reported while controlling for variables entered in the previous model. Bold typeface indicates significant associations using the False Discovery Rate corrected critical *p* value ($p < .014$).

[a] 713 HbA1c measurement over the 12-months following the survey clustered within 301 participants

[b] White = 1 vs. other race = 0.

[c] Spouse or partner = 1 vs. other family member or friend = 0.

[d] MHS lives inside of participant's home = 1 vs. MHS lives outside of the participant's home = 0.