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Family involvement is helpful and harmful to patients' self-care and glycemic control

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Abstract

Objective—We assessed the relationships between supportive and obstructive family behaviors and patients' diabetes self-care activities and HbA_{1C}, and potential interaction effects and differences by demographic characteristics.

Methods—In a cross-sectional study, 192 adults with type 2 diabetes completed the Diabetes Family Behavior Checklist-II, the Summary of Diabetes Self-Care Activities, and a glycemic control (HbA_{1C}) test.

Results—Participants reported similar rates of supportive and obstructive behaviors that were positively correlated (*rho*=0.61, *p*<.001). In adjusted analyses, supportive family behaviors were associated with adherence to different self-care behaviors (β=0.20–0.50, *p*<.05), whereas obstructive family behaviors were associated with less adherence to self-care behaviors (β=−0.28–−0.39, *p*<.01) and worse HbA_{1C} (β=0.18, *p*<.05). Supportive behaviors protected against the detrimental effect of obstructive behaviors on HbA_{1C} (interaction β=−0.22, *p*<.001). Non-Whites reported more supportive and obstructive behaviors than Whites, but race did not affect the relationships between family behaviors and self-care or HbA_{1C}.

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[1]We also collected the most recent lab HbA_{1C} value and its associated collection date from participants' medical charts. A substantial proportion of participants either had an out of date (i.e., >90 days from study participation) lab HbA_{1C} value in their medical chart (n=29) or did not have an HbA_{1C} value in their medical chart (n=4). The point-of-care HbA_{1C} values demonstrated good convergent validity with lab HbA_{1C} values among participants with <90 days between the tests (Spearman's rho = .87, p<.001). Time between test dates explained why six participants had a >1.0% discrepancy between the two HbA_{1C} values (all six had >90 days between values and three had >1 year between values).

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Both authors contributed to the development of the analyses and manuscript.

Conclusion—Involving family members in patients' diabetes management may compromise patients' self-care and glycemic control unless family members are taught to avoid obstructive behaviors.

Practice Implications—Our findings endorse interventions that help family members develop actionable plans to support patients' self-care and train them to communicate productively about diabetes management.

Keywords

family; social support; type 2 diabetes; self-care; glycemic control; HbA1C

1. Introduction

For adults with type 2 diabetes mellitus (T2DM), performing recommended self-care is essential for avoiding complications, yet patient adherence remains challenging [1, 2]. Self-care interventions have largely focused on 'the individual patient', giving less attention to the socioecological conditions (e.g., families, communities) in which patients perform self-care [3]. Across chronic disease contexts, including diabetes, disease-specific instrumental support from significant others (i.e., family members' practical actions that make self-care easier/possible) has been more strongly associated with patients' adherence than other types of support (i.e., emotional, informational, or appraisal)[4, 5]. Family members provide instrumental support by attending medical appointments [6], reminding/helping patients to perform a behavior [7, 8], and creating an environment to reinforce adherence (e.g., preparing healthy meals)[9]. Furthermore, such instrumental support has been associated with adults' adherence to diet [10], exercise [7, 11], blood glucose testing [11, 12], diabetes medications [10], and general self-care [13, 14].

Family members' involvement in diabetes care can also be harmful [11, 15-18]. Family members may sabotage or undermine patients' self-care efforts by planning unhealthy meals, tempting patients to eat unhealthy foods, or questioning the need for medications [15-17]. Family members may also nag or argue with patients in an attempt to 'support' adherence [16] only to undermine patients' self-efficacy and create family conflict [19]. Among adults with T2DM, family members' obstructive behaviors have been associated with patients having less adherence-related motivation and self-efficacy [13], and less adherence to diet recommendations [8, 11] and medications [7, 16].

Supportive and obstructive family behaviors have been studied separately, but examining one form of family involvement without the other may misrepresent the lived experiences of patients and their families. Often supportive and obstructive family behaviors co-occur and are positively correlated [11, 15, 16, 18, 20] and providing no support (i.e., being inactive) is different from actively sabotaging or nagging a patient [15]. Typically, family involvement is conceptualized as a unidimensional construct (e.g., more is better). However, the literature suggests that a complete conceptualization of family involvement in diabetes care is two-dimensional, consisting of the degree of involvement in the patient's care and the type of involvement (i.e., helpful vs. harmful; Figure 1). To date, quantitative studies often operationalize "family support" as a unidimensional construct, either by assessing only the

helpful aspects of family involvement [14, 21] or by subtracting harmful family involvement from helpful family involvement and treating what's left as a single variable [8, 12, 22]. Both approaches preclude examination of the independent and co-occurring role of supportive and obstructive family involvement. For example, supportive involvement may protect patients from the detrimental effects of obstructive involvement. However, to our knowledge, studies have not yet explored how these factors may interact to affect adults' diabetes outcomes.

Studies of family involvement in adults' diabetes management have largely used racially homogenous samples [7, 8, 11-13, 16, 22], limiting our knowledge of racial/ethnic variation in the amount of helpful and harmful family behaviors patients experience and their consequences. This is worthy of exploration, given what we do know about racial/ethnic variation in both family household composition and family dynamics. For instance, older African Americans (AA)/Blacks are more likely to live with children/grandchildren and have stronger expectations for intergenerational co-residence than Whites [23], but report receiving less help with self-care[24]. Moreover, Hispanics report more assistance from adult children than AA/Blacks or Whites, and may view diabetes as the family's responsibility rather than the individual's responsibility[25]. Thus, studies focusing only on spouse/partner involvement [15, 18, 26] may be less relevant for patients living in intergenerational households. While the research on racial/ethnic variation has been sparse, gender differences in family involvement have been identified, with men experiencing and benefiting more from helpful family behaviors than women [12, 13, 26].

In an effort to fill some of the aforementioned gaps in the literature, we sampled from a racially/ethnically diverse patient population of adults with T2DM and low socioeconomic statuts (SES) to: (1) explore whether both supportive and obstructive family behaviors predict patients' diabetes self-care activities and glycemic control; (2) assess whether the type (supportive versus obstructive) of family involvement matters more than simply having family members who are involved in the patients' self-care, regardless of the type of their involvement; (3) test whether supportive family behaviors buffer the effects of obstructive family behaviors; (4) and examine whether there are racial/ethnic, gender, and living alone versus living with others differences in the amount of supportive and obstructive behaviors experienced and subsequent effects on patients' self-care and glycemic control.

2. Methods

After identifying the importance of diabetes-specific family behaviors in our previous mixed-methods study [16], we added a measure assessing these family behaviors to a crosssectional study examining modifiable determinants of diabetes medication adherence. The parent study consecutively recruited patients arriving for medical appointments at a Federally Qualified Health Center in Nashville, TN from June 2010 to November 2012, and this measure was added in June 2011. English- or Spanish-speaking adults (age≥18 years) diagnosed with T2DM and prescribed diabetes medications were eligible. Exclusion criteria included not having a social security number required for compensation, unintelligible speech, delirium/dementia or other cognitive impairment, severe hearing impairment, and administration of all medications by a caregiver as determined by RAs in collaboration with

clinic personnel. For the larger study, 588 patients with T2DM arrived for a clinic appointment and 83.3% of the eligible patients (314 out of 377) were enrolled [27]. Of these 314 participants, 192 were enrolled after the measure of family behaviors was added to the study protocol and therefore were included in these analyses.

Interested and eligible participants were taken to a private room at the clinic before/after their clinic appointment to provide informed consent and complete an research assistant (RA)-administered survey. RAs read all items and response options in participants' preferred language, and provided a copy of each set of response options printed in large font for participants' reference. Materials were translated using the forward-backward technique [28] by licensed translators. Clinic nurses administered a point-of-care HbA_{1C} test, and RAs collected information from the medical record. Participation took approximately 1 hour and participants were compensated $20. The Vanderbilt University Institutional Review Board approved all study procedures.

2.1. Measures

We collected self-reported age, gender, race, ethnicity, income, education, insurance status, living alone versus living with others, and diabetes duration (time since diabetes diagnosis in years and months). RAs collected the number and type of diabetes medication(s) from participants' medical record.

Participants' perceptions of family members' supportive and obstructive behaviors were assessed with the supportive and nonsupportive subscales from the Diabetes Family Behavior Checklist-II (DFBC-II) [11]. The 16-item DFBC-II asks respondents how often their family members have performed specific behaviors in the past month on a scale from 1=never to 5=at least once a day. The instruments' developers characterize certain items as supportive or nonsupportive (i.e., obstructive). Each item asks "How often do your family members…" perform a certain behavior with response options from 1=never to 5=once a day. Items for each subscale are shown in Figure 2. We averaged the 9 supportive items and 7 nonsupportive items to create two subscales ranging from 1–5, with higher scores indicating more supportive or obstructive behaviors, respectively [11]. Schafer et al.[20] reported test-retest reliability and good convergent validity with family member-reported scores. In our sample, the supportive and nonsupportive subscales had internal consistency reliability (Cronbach's α) of 0.85 and 0.78, respectively.

We used the Summary of Diabetes Self-Care Activities (SDSCA) subscales to assess participants' adherence to different self-care behaviors over the last 7 days [29]. Each SDSCA subscale ranges from 0-7, with higher scores indicating greater adherence. Glycemic control was assessed with a valid and reliable point-of-care HbA_{1C} (%) test [30] administered by a clinic nurse on the day of participation.[1]

2.2. Analyses

Using Stata 12, we conducted a series of regression models to test the relationships between family members' supportive and, separately, obstructive behaviors and participants' diabetes self-care and HbA_{1C}. First, we examined unadjusted associations between supportive and obstructive behaviors and self-care and glycemic control. Next, to answer the question "Is it

simply *family involvement* that matters, or does the type of involvement matter?" we conducted partially adjusted regression models with both supportive and obstructive family behaviors as predictors in each model. Including both variables adjusted for the overlap between supportive and obstructive behaviors, representing the degree of family involvement, to allow for an understanding of how supportive and obstructive family behaviors were associated with self-care and glycemic control, over and beyond that involvement. Collinearity was not problematic (tolerance=0.64). Fully adjusted models included apriori covariates – participants' age, gender, race (White, Black, or other), education, insurance status (uninsured, public, or private), diabetes duration, and insulin status. To assess if the effects of obstructive behaviors were weaker at high levels of supportive behaviors, we conducted unadjusted and adjusted regression models with an interaction term.

We used analysis of variance/covariance models with a Bonferroni correction for multiple comparisons to assess if racial/ethnic minorities reported more supportive and/or obstructive family behaviors than Whites, and to explore differences by gender and living alone versus living with others. Adjusted models included both supportive and obstructive behaviors and the aforementioned apriori covariates. Finally, to assess if relationships between supportive and obstructive behaviors and self-care and Hb_{A1C} were consistent across race and gender, we assessed interactions between supportive and obstructive behaviors and race (White versus non-White due to insufficient number of "other" race participants) and, separately, gender in regression models. Because of the small number of participants living alone, we could not assess effect modification with this variable.

3. Results

3.1. Participant Characteristics

Most participants (70%) were women; 56% were AA/Black, 34% were White, and 10% reported another race. Of the 20 other race participants, 80% reported Hispanic ethnicity and 11 interviews were conducted in Spanish. Most (71%) reported incomes <$15,000, 30% had <a high school degree and 47% were uninsured. Only 28% were married/partnered, but 74% did not live alone, suggesting at least half (48%) lived with someone other than a spouse/partner. Participants had an average age of 51.6±10.9 and had been diagnosed with diabetes for an average of 7.7±7.2 years. Given that the majority of the sample had low SES and 66% were members of a racial/ethnic group, the young age of our sample is consistent with the younger age of racial/ethnic minorities diagnosed with diabetes in the U.S. [31]. On average, participants reported experiencing each supportive and obstructive family behavior at least twice per month (Table 1). Average frequencies and standard errors for each family behavior are depicted in Figure 2. Listwise deletion was used to handle missing data on diabetes duration (*n*=3) and the DFBC-II (*n*=2).

3.2. Family Behaviors and Self-care

Family members' supportive and obstructive behaviors were more strongly related to participants' self-care and explained more variation (increase in incremental R^2) in the outcomes when both were included in regression models (Table 2). Adjusting for covariates

typically decreases the coefficient of the predictor, so reciprocal suppression is indicated if both predictors have a stronger association when included in a single model [32]. By "suppressing" the effects of family involvement (represented by Spearman's *rho*=0.61, $p<.001$ between supportive and obstructive behaviors), we can examine the unique contributions of supportive and obstructive family behaviors on the outcomes of interest.

Family members' supportive and obstructive behaviors were positively and negatively associated, respectively, with participants' adherence to general diet, specific diet, exercise, and medications. In fully adjusted models, these associations were maintained. As shown in Table 2, in fully adjusted models supportive and obstructive behaviors demonstrated moderate associations with self-care behaviors. Combined, supportive and obstructive behaviors explained a substantial and significant percent of variance in self-care behaviors over and above the variance explained by apriori covariates: 22.9% in adherence to exercise, 21.2% in adherence to general diet, 9.7% in adherence to medications, and 8.6% in adherence to specific diet.

Supportive behaviors were associated with blood glucose self-monitoring in fully adjusted models, but explained a negligible percent of variance in this outcome. There was a significant interaction between supportive and obstructive behaviors on adherence to general diet ($\beta=0.17$, $p<.001$), but this interaction was nonsignificant when adjusted for covariates ($\beta=0.13$, $p=.06$).

3.3. Family Behaviors and HbA_{1C}

When family members' supportive and obstructive behaviors were included in a single model predicting HbA_{1C}, supportive behaviors acted as a suppressor variable for obstructive behaviors, which had a stronger association with the outcome when the shared error variance was suppressed (i.e., classical suppression [33]). Obstructive behaviors were associated with worse HbA_{1C} in the unadjusted model ($\beta=0.27$, $p<.001$), after adjusting for supportive behaviors ($\beta=0.33$, $p<.001$) and in the fully adjusted model ($\beta=0.18$, $p<.05$). Supportive behaviors were not associated with HbA_{1C}, but moderated the effect of obstructive behaviors on Hb_{A1C}(partially adjusted interaction $\beta=-0.22$, $p<.05$; fully adjusted interaction $\beta=-0.22$, $p<.001$). As shown in Figure 3, for participants reporting low supportive behaviors, obstructive behaviors were significantly associated with worse HbA_{1C} (simple slope $\beta=0.47$, $p=.001$), whereas obstructive behaviors were not associated with HbA_{1C} for participants reporting high supportive behaviors. When the interaction effect was included (Table 2), family behaviors explained 9.7% of the variance in HbA_{1C} over and above the variance explained by apriori covariates.

3.4. Race, Gender, and Living Alone versus Living with Others

Supportive family behaviors differed by participants' race/ethnicity in unadjusted ($F(2, 187)=13.46$, $p<.001$) and adjusted ($F(2, 176)=11.38$, $p<.001$) analyses. Other race participants reported more supportive behaviors (3.2±1.1) than AA/Blacks (2.5±1.0, $p<.001$) or Whites(1.9±0.9, $p<.01$), and AA/Blacks reported more supportive behaviors than Whites ($p<.01$). Obstructive family behaviors also differed by race/ethnicity with the same pattern in unadjusted analyses ($F(2, 187)=37.63$, $p<.001$), but these differences were nonsignificant

in adjusted analyses ($F(2, 176)=2.66$, $p=.07$). Neither supportive nor obstructive family behaviors differed by gender. Neither race (White versus non-White) nor gender moderated the relationships between supportive or obstructive family behaviors and participants' self-care or HbA_{1C}. Participants who lived alone reported less supportive behaviors than those who lived with others(2.0±1.1 versus 2.5±1.0) in unadjusted ($F(1, 188)=9.28$, $p<.01$) and adjusted ($F(1, 177)=4.62$, $p<.05$) analyses, but reported the same amount of obstructive behaviors as those who lived with others.

4. Discussion and Conclusion

4.1. Discussion

In a cross-sectional study of adults with T2DM and low SES, participants reported that their family members performed actions that impeded their diabetes self-care nearly as often as their family members performed helpful actions. Both supportive and obstructive family behaviors were associated with patients' adherence to different self-care behaviors, and in the expected directions. These effect sizes were moderate and supportive and obstructive family behaviors combined explained a substantial and significant percent of the variance in adherence to each self-care behavior (with the exception of blood glucose testing). However, only obstructive behaviors were associated with worse glycemic control. Although supportive behaviors were not associated with glycemic control, they protected against the detrimental effect of obstructive behaviors on glycemic control. Because non-Whites reported significantly more supportive family behaviors, they may benefit most from this buffering effect. However, they also reported more obstructive behaviors than Whites in unadjusted analyses, and the relationships between supportive and obstructive family behaviors and diabetes self-care or glycemic control were consistent regardless of race/ethnicity or gender. We also found that participants living alone reported the same rates of obstructive behaviors as those living with others, but less supportive behaviors. Family members may find it easier to nag/argue about nonadherence from afar than to support daily self-care (e.g., prepare healthy meals).

This study contributes most to our understanding of how family members' supportive and obstructive behaviors may jointly affect adults' diabetes self-care and glycemic control. Analyzing the effects of both types of behaviors simultaneously isolated the contribution of each over and above the effect of family involvement in patients' self-care [32, 33]. These relationships were substantially stronger, suggesting that the type of interactions family members have with patients was more important than the degree of family involvement in diabetes self-care. As a result of not acknowledging and accommodating suppressor effects, prior studies have reported inconsistent findings when using the DFBC subscales, and resorted to conceptualizing family involvement as a single variable [11]. Consequently, the relationship between obstructive family behaviors and patients' glycemic control and the moderating role of supportive behaviors in this relationship, have been previously overlooked.

4.2. Limitations and Future Research

There are limitations to acknowledge. Our cross-sectional design limits conclusions about causality. Stephens et al.[18] reported spouses' diet-specific supportive behaviors affected patients' diet adherence the next day, and a longitudinal study [34] reported patients in low conflict families had better HbA_{1C} values six months later. These studies suggest family behaviors may exert a causal effect on self-care and glycemic control, but reciprocal causality is more plausible [35]. For instance, poorly controlled patients may elicit more nagging/arguing from their family members, which, in turn, may be detrimental to patients' adherence and glycemic control. Thus, in our opinion, intervention studies and studies that seek to understand the moderators and mediators of the relationships between family behaviors and patients' diabetes-management are more informative than those seeking to establish cause-effect relationships.

Our reliance on self-report measures may have introduced recall and social-desirability bias. Future studies should consider objective measures of patients' self-care activities. We also sampled from a single clinic, limiting generalizability. There was little variability with regard to gender (70% female) and SES. The type of family behaviors that matter may vary by gender in families with traditional gender roles around meal preparation. Future research should test these relationships among larger samples of male and female participants. Patients with low SES may be more vulnerable to family behaviors than patients with higher SES. Others have found that gender [12, 26] or race [9] moderated the effects of family constructs on self-care or glycemic control. Such modifying effects may exist in samples with more SES and gender heterogeneity. Although our results are likely robust with respect to Black/White differences, conclusions about Hispanic participants cannot be drawn due to a small number of Hispanic participants.

We also did not have information on participants' family composition beyond marital status and living alone versus living with others. Future studies should explore what these families look like – how many people live with the patient, how much contact does the patient have with his/her family members, and is the patient a primary family caregiver? Now that we are aware of the importance of family behaviors for this patient population, a more thorough understanding of adult patients' family context is critical. Constructs such as diabetes distress and self-efficacy for diabetes self-care should be included in future studies to clarify the mechanisms underlying the associations between family behaviors and patients' self-care and glycemic control. For instance, Rosland et al.[13] found that obstructive family behaviors were associated with decreased self-efficacy for self-care but it remains unclear if self-efficacy mediates the associations identified here. Additional research should also explore how family dynamics previously identified as important to diabetes self-management (e.g., family relationship quality and conflict resolution) [9, 35] interact with supportive and obstructive family behaviors to influence patients' self-care and glycemic control.

4.3. Conclusions

Our findings extend the current understanding of how families are involved in adults' diabetes self-care and the ramifications of harmful family involvement for diabetes

outcomes. Research efforts should assess both positive and negative aspects of family involvement, and not make the assumption that more family involvement is beneficial. The positive association between supportive and obstructive family behaviors suggests family members are involved in patients' self-care, but may not know how to best help and not hinder patients' efforts. In the recent international Diabetes Attitudes Wishes and Needs 2 study, nearly 40% of family members of an adult with diabetes reported wanting to be more involved in the patients' diabetes management, but did not know how to help [36]. However, educating family members about diabetes and/or involving families in patients' care without working to reduce obstructive family behaviors may actually evoke less patient adherence. In one study [16], participants reported that family members' knowledge about diabetes management was associated with more supportive but not with less obstructive family behaviors. Future work should determine what intervention content effectively reduces obstructive family behaviors while increasing supportive behaviors.

4.4. Practice Implications

This study has implications for behavioral interventions and not directly for clinical practice; future work is necessary to determine recommendations for patient-provider interactions. Family-based interventions for adults with diabetes are relatively new, have tried various approaches, and have not been effective at reducing HbA_{1C} [37]. While complex family characteristics affect adults' diabetes management (e.g., family relationship quality and conflict resolution) [9, 35], these constructs are relatively stable and resistant to health behavior interventions. Interventions may be able to redirect family members' efforts to "help" from nagging/arguing to supportive behaviors, without addressing underlying relationship issues.

Recent interventions involving families in adults' disease management have focused on either (1) guiding family members to set specific goals to support patients' self-care, (2) training family members in supportive communication techniques around disease management, or (3) giving family members helpful roles in the clinical care process (e.g., tracking clinical data, communicating with providers) [6]. Applied individually, these approaches have had mixed success in improving patient outcomes [6]. Interventions incorporating all of these approaches may address both the helpful and harmful aspects of family involvement. Our findings endorse interventions that help family members develop actionable plans to support patients' self-care goals and train them to communicate productively about diabetes management. In the event obstructive behaviors cannot be successfully reduced due to the complexities inherent to families (e.g., personalities, contentious family environments), increasing the amount of diabetes-specific family support may offset the detrimental effect of obstructive family behaviors on patients' glycemic control.

We confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

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Highlights

- Family involvement in adult' diabetes management can be both helpful and harmful.
- Both supportive and obstructive behaviors were associated with patients' self-care.
- *Type* mattered more than *degree* of family involvement for patients' self-care.
- Obstructive behaviors were associated with worse HbA_{1C}.
- Supportive behaviors buffered this deleterious effect on HbA_{1C}.

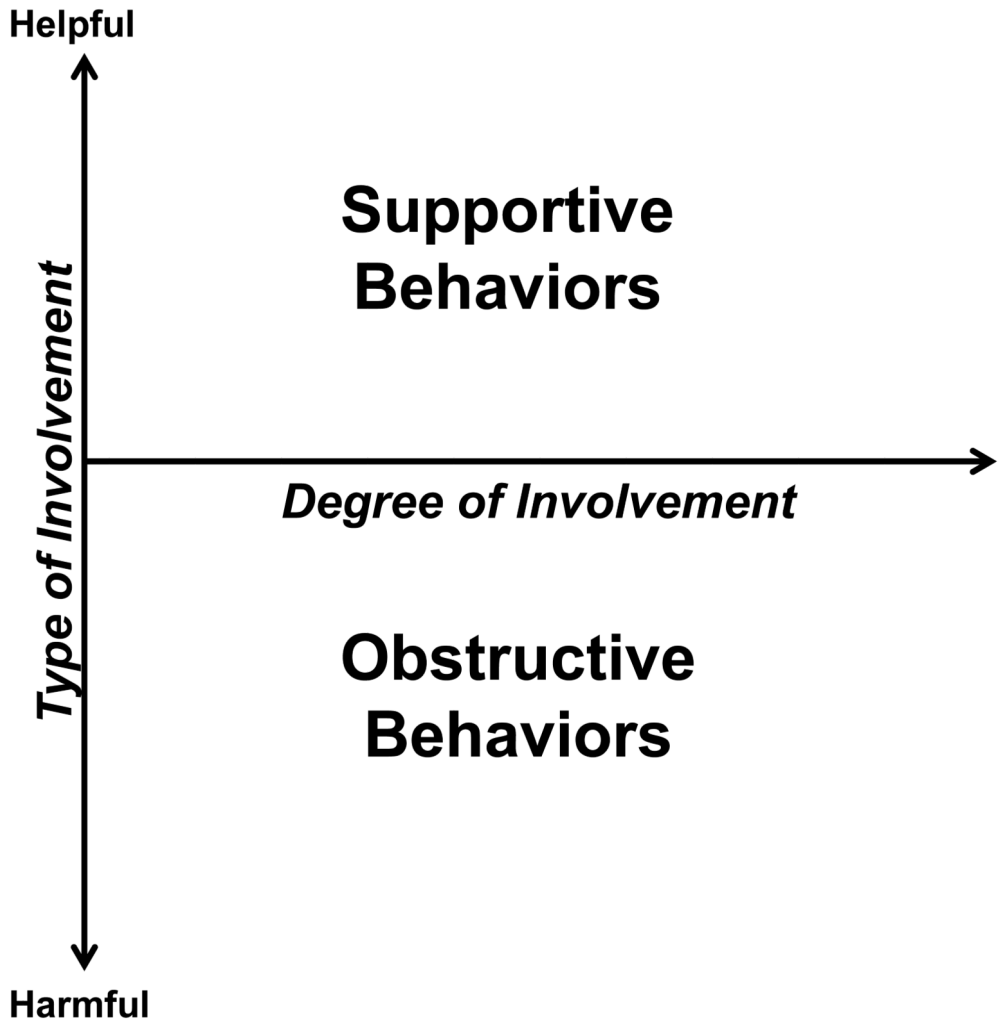

Figure1.

Family involvement in adults' diabetes management is a two-dimensional construct. Family involvement is a function of degree (uninvolved to involved) and type (helpful to harmful).

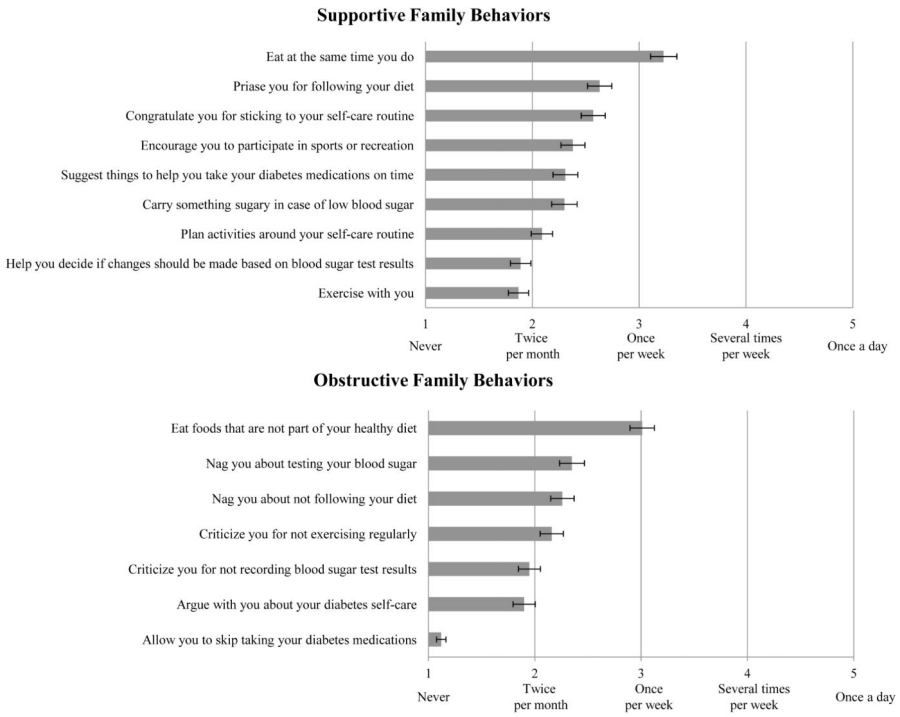

Figure 2.

Average frequency and standard error for each family behavior on the Diabetes Family Behavior Checklist-II.

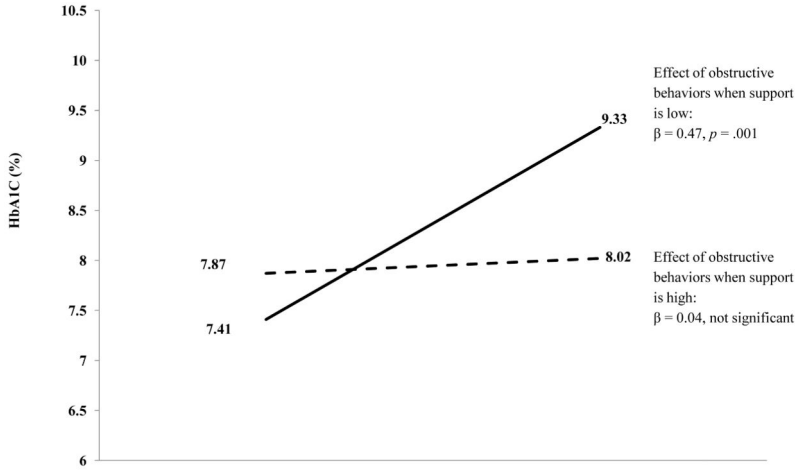

Figure 3.

Estimated values and simple slopes for the effects of obstructive family behaviors on glycemic control (HbA_{1C}, %) given different degrees of supportive family behaviors. Obstructive family behaviors have a detrimental effect on glycemic control (i.e., HbA_{1C} values are higher) for participants reporting low supportive family behaviors, but not for participants reporting high supportive family behaviors. Low and high values represent ± 1 standard deviation from the mean. Models are adjusted for age, gender, race, education, insurance status, diabetes duration, and insulin status. β = standardized regression coefficients.

Table 1

Participant characteristics

N = 192	M ± SD or n (%)
DEMOGRAPHIC CHARACTERISTICS	
Age, years	51.6 ± 10.9
Gender	
Men	57 (29.7)
Women	135 (70.3)
Race	
White	65 (33.9)
African American/Black	107 (55.7)
Other race	20 (10.4)
Hispanic ethnicity	19 (9.9)
Education, years	12.0 ± 3.0
Income[a]	
<$10,000	78 (43.6)
$10,000 – $14,999	49 (27.4)
$15,000 – $19,999	27 (15.1)
≥$20,000	25 (14.0)
Insurance Status	
Uninsured	90 (46.9)
Public insurance	87 (45.3)
Private insurance	15 (7.8)
DIABETES CHARACTERISTICS	
Diabetes duration, years	7.7 ± 7.2
Type of diabetes medications	
Oral agents only	102 (53.1)
Insulin only	42 (21.9)
Both	48 (25.0)
FAMILY BEHAVIORS (DFBC-II)	
Supportive behaviors	2.4 ± 1.0

DFBC-II = Diabetes Family Behavior Checklist-II, HbA_{1C} = point-of-care hemoglobin A1C, M = mean, SD = standard deviation, SDSCA = Summary of Diabetes Self-Care Activities.

[a] 13 participants did not report their income

Table 2

Effects of supportive and obstructive family behaviors on participants' adherence to self-care behaviors and glycemic control

	Unadjusted			Partially Adjusted[a]			Fully Adjusted[b]		
	β	*P*	R^2(%)	β	*P*	Incremental R^2 (%)	β	*P*	Incremental R^2 (%)
General diet									
Supportive	.19	.007	3.6	.44	<.001	12.3***	.43	<.001	11.5***
Obstructive	−.15	.033	2.4	−.42	<.001	11.2***	−.39	<.001	9.7***
Specific diet									
Supportive	.03	.718	0.0	.22	.015	3.1*	.22	.019	3.1*
Obstructive	−.19	.015	3.7	−.32	<.001	6.7***	−.31	.003	5.5**
Exercise									
Supportive	.26	<.001	6.8	.49	<.001	15.7***	.50	<.001	15.3***
Obstructive	−.09	.149	0.9	−.39	<.001	9.7***	−.31	<.001	7.6***
Blood glucose testing									
Supportive	.07	.378	0.4	.15	.097	1.4	.20	.045	2.5*
Obstructive	−.05	.451	0.3	−.14	.092	1.3	−.08	.373	0.8
Medications									
Supportive	.11	.151	1.2	.27	.001	4.9**	.30	.001	5.6**
Obstructive	−.11	.125	1.3	−.28	.001	5.0**	−.28	.003	4.1**
Glycemic control (HbA_{1C})									
Interaction	.27	<.001	7.4	−.22	.017	4.5**	−.22	<.001	4.5**
Main Effects									
Supportive	.10	.125	1.1	−.09	.309	0.5	−.10	.198	0.7
Obstructive	.27	<.001	7.4	.40	<.001	9.6***	.25	.007	4.5**

β = standardized regression coefficients; *p* = probability value; R^2 = percent of variance in outcome variable explained by the predictor variable; Incremental R^2 = percent of variance in outcome variable uniquely explained by the predictor variable, controlling for the other predictor variables in the model.

* p < .05

** p < .01

*** $p < .001$.

[a] Partially adjusted models include both predictors (i.e., supportive and obstructive behaviors).

[b] Fully adjusted models include both predictors (i.e., supportive and obstructive behaviors), age, gender, race, education, diabetes duration, insulin status, and insurance status; $n = 187$ due to missing data.