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Are people with diabetes getting the support they need? Deficits between support desired and received from family and friends relates to poorer health

Rebecca K. Delaney, PhD[a], **Lingzi Zhong, PhD**[a], **Xuechen Wang, MS**[a], **Linda Sossenheimer, RD, BSN, M.Ed.Psych**[b], **Julie Neuberger, BA**[c], **Angela Fagerlin, PhD**[a,d], **Michelle L. Litchman, PhD, FNP-BC**[b,c]

[a]University of Utah Intermountain Healthcare Department of Population Health Sciences, University of Utah, Salt Lake City, USA

[b]College of Nursing, University of Utah, Salt Lake City, USA

[c]Division of Endocrinology, School of Medicine, University of Utah, Salt Lake City, USA

[d]Salt Lake City VA Center for Informatics Decision Enhancement and Surveillance, Salt Lake City, USA

Abstract

Objective: To determine the mismatch of desired support versus support received and to evaluate the impact of these mismatches on health outcomes of people with diabetes.

Methods: This cross-sectional study is a secondary data analysis of medical record and survey data of participants with Type 1 and Type 2 diabetes from a diabetes care and education program. Biophysical metrics included HbA1c, body mass index, systolic blood pressure, diastolic blood pressure, triglycerides, and high- and low-density lipoproteins. Psychosocial and self-care survey outcomes included diabetes distress, diabetes self-care, and diabetes self-efficacy. Support mismatch was a difference score (support desired-support received). Descriptive statistics were computed for demographics, clinical characteristics, and primary outcomes. Multiple linear regressions were computed.

Results: The percentage of participants experiencing support mismatch (surplus/deficits) across six domains was: 15%/27% (foot care), 22%/24% (take medicine), 24%/23% (test blood sugar), 21%/29% (physical activity), and 18%/34% (follow meal plan). Greater support deficits were associated with higher triglyceride levels, increased diabetes distress, and lower diabetes self-efficacy.

Conclusions: Findings indicate that greater support deficits can be a risk factor for some poorer physical and psychosocial health outcomes.

Practice Implications: Interventions to facilitate functional supportive behaviors are an avenue for future research and clinical practice.

Corresponding author at: Rebecca K. Delaney, University of Utah Intermountain Healthcare Department of Population Health Sciences, University of Utah, 295 Chipeta Way, Salt Lake City, UT, 84108, United States [rebecca.delaney@hsc.utah.edu], 801-587-2100.

Keywords

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1. Introduction

Research has demonstrated the buffering effect of social support on morbidity and mortality and patients' management of a chronic illness, such as diabetes.[1–3] Self-management support, in particular, is a crucial component within the chronic care model, which helps empower and engage individuals in managing their chronic illness to promote better health.[4] Researchers have found that partner or spousal support is associated with effective diabetes management behaviors, such as more physical activity[5], and improved psychosocial health (e.g., reduced diabetes distress).[6] However, support and diabetes management research has largely overlooked that preferences for and actual social support may differ, resulting in a support mismatch for people with diabetes. Identification of two possible social support mismatches: those who receive more support than desired, thus experiencing a support surplus, and those receiving less support than desired, categorized as having unmet needs and experiencing support deficits. Research on both types of support mismatch indicate that social support may be most effective when received support matches one's desired support.[7] Notably, a person's desire for support has implications on support effectiveness and their physical (e.g., self-care activities) and psychological (e.g., anxiety and depression) wellbeing.[8–11]

Dyadic coping theories suggest that partner involvement may improve illness management by using collaborative and supportive strategies.[12] Some research has found that patients' diabetes management and functioning can be impacted by the patients' perceived appraisals of the degree to which diabetes management is a shared effort with their partner and the unity of the patient/partner alignment of this appraisal.[11,13] However, support mismatch has been underexplored in relation to illness management. This suggests that it is of both clinical and practical importance to examine the role support mismatch plays in the effectiveness of diabetes management.

Despite research on support mismatch in various health contexts, research that specifically examines the implications of support mismatch experienced by individuals with diabetes is limited. Additional research is needed to assess whether the mismatch between received and desired support is a risk factor for poor biophysical and psychological health and self-care of people diagnosed with diabetes. This study aims to 1) determine the level of support match and mismatch that people with diabetes experience and 2) examine the association between support mismatch, particularly support deficits, and biophysical and psychosocial health as well as self-care behaviors. Based on previous research and theoretical frameworks, [4,9,10,12] we hypothesize that individuals with diabetes experiencing greater support deficits will have poorer biophysical, psychosocial, and self-care health outcomes than those experiencing support match.

2. Methods

This cross-sectional study assessed the frequency of support match and mismatch that individuals with diabetes report and the associations between support mismatch and biophysical, psychosocial, and self-care outcomes for individuals diagnosed with Type 1 and Type 2 diabetes. The study is a secondary analysis of data that was collected as part of a larger quality improvement study of a one-day diabetes care and education intervention program that was approved by the Institutional Review Board [#00105292].

Eligible participants were adults diagnosed with Type 1 or Type 2 diabetes who enrolled in the one-day diabetes care and education care program, which encouraged attendance of their support partners. Self-reported survey data were collected prior to participants' clinic visit for the intervention and biophysical metrics were collected on the day of the clinic visit for the intervention. Analysis inclusion required participants to complete a baseline survey and have available biophysical metric (e.g., HbA1c) data. Study questionnaires were administered online via RedCap, during a phone call, or on a printed copy (based on participant preference) before the one-day diabetes care and education intervention. Consent was obtained electronically via RedCap or by the study coordinator. The study took place from December 2017 to August 2019. Participation was voluntary, and participants were not compensated for completing the study.

2.1 Measures

2.1.1 Demographic and diabetes information.—Participants completed a self-report survey to record their demographic information including age, gender identity, marital status, education level, race and ethnicity, and gross household income. Participants were also asked to self-report their diabetes type and the duration of time, in years, they have been diagnosed with diabetes.

2.1.2 Biophysical outcomes.—Hemoglobin A1c (HbA1c), body mass index (BMI), systolic and diastolic blood pressure, triglycerides, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) data were extracted from the electronic medical record for each participant from the date of their clinic visit for the intervention.

2.1.3 Diabetes distress.—The Problem Areas in Diabetes Questionnaire (PAID) [14] assessed participants' level of distress related to their diabetes, particularly related to emotion concerns, diet and diabetes complications. The PAID is widely-used in diabetes literature, has had consistent reliability and validity over the past two decades, and is more psychometrically robust relative to other measures of diabetes distress[15]. Participants rated from 0 (not a problem) to 4 (serious problem) on 20 items (e.g., feeling discouraged with diabetes treatment plan). Scores were added and multiplied by 1.25 to generate a total score between 0–100. Higher scores indicate greater distress, with 40 or greater indicating emotional burnout.

2.1.4 Diabetes self-efficacy.—The Self-Efficacy for Diabetes Scale[[16]] determined participants' confidence in various behaviors important for diabetes management. Participants rated their confidence from 1 (not at all confident) to 100 (totally confident)

on 6 items (e.g., feel that you can control your diabetes so that it does not interfere with the things you want to do). Mean scores were computed with higher scores indicating greater diabetes self-efficacy.

2.1.5 Diabetes self-care.—The Self-Care Inventory-Revised version[17] assessed participants' self-reported engagement in behaviors to support adherence to diabetes self-care recommendations using ratings from 1 (never) to 5 (always). One item ("take diabetes pills/insulin at the right time) was missing due to an error so the total number of items in the measure were 14 for this study. Since not all individuals are treated with oral medication or insulin or recommended to check ketones and not all individuals experience low blood glucose, "not applicable or N/A" are allowed for the questions that ask about ketones, insulin, pills or treatment of carbohydrate for low blood glucose. The formula used for scoring is: $\frac{(mean - minimum) * 100}{(maximum - minimum)}$. Higher mean scores indicated more frequent self-care behaviors. One item about insulin use ("If on insulin: adjust insulin dosage values, food, and exercise") was used to dictotomised those who were using insulin (i.e., responses 1–5 were classified as "yes") and those who were not (i.e., response of 6-"not on insulin" was categorized as "no").

2.1.6 Support Mismatch (i.e., support deficits and surpluses).—Participants' perception of support desired and received were measured using Diabetes Care Profile.[18] Participants rated 1 (strongly disagree) to 5 (strongly agree) on six domains (e.g., following a meal plan, take medicine). For each domain, participants indicated the extent to which they wanted help from their family and friends (i.e., support desired) and the extent to which they perceived that their family and friends supported them (i.e., support received). A mean score was computed across all items. Similar to an approach utilized by previous research[10], we assessed support mismatch by computing a difference score resulted from subtracting perceptions of support received mean scores from perceptions of support desired mean scores. Support mismatch scores were dichotomized for the main analyses into perceptions of support deficits ($M = 0.68$, $SD = 0.85$, actual range = 0 – 4) and support surpluses ($M = 0.48$, $SD = 0.66$, actual range = 0 – 3). Additional details on the support survey items and scoring are located in Appendices Table A.1.

2.2 Data analysis

Analyses were conducted using SPSS (version 26 for Windows). Descriptive statistics were conducted for participant demographic and clinical characteristics, and main outcomes. The frequencies for perceived support match and mismatch (i.e., support deficits and support surpluses) based on percentage were also analyzed. Associations between support deficits, support surpluses, biophysical, psychosocial, and self-care outcomes were examined using bivariate correlations. A series of multiple linear regression analyses were then conducted to test significant associations while accounting for demographic and clinical characteristics. Model 1 included demographic and clinical characteristics. Model 2 added perceived support. In consideration of the differential impact of diabetes burden, type of diabetes was entered into the main regression analyses and supplemental analyses included self-reported insulin treatment in Model 1. The results section will summarize the results of

the supplemental analyses in text only. Statistical significance was determined by a p –value < .05.

3. Results

3.1 Sample characteristics

Most participants reported that they had a diagnosis of Type 2 diabetes (n = 162; 81%). The mean age of the sample was approximately 57 years old (range = 18–87), 59% reported being female, and 83% reported that they were White. Additional sociodemographic information for the overall sample and by type of diabetes is reported in Table 1. Participants' mean HbA1c was 8.2 % ± 2.1 % and mean diabetes duration was approximately 12 years. Descriptive statistics for biophysical outcomes and psychosocial and self-care outcomes are further described in Table 2. Some significant differences by type of diabetes were found where participants with Type 2 diabetes reported older age, shorter diabetes duration, higher BMI, higher systolic blood pressure, higher triglycerides, lower HDL, and poorer self-care compared to participants with Type 1 diabetes.

3.2 Frequency of Support Match and Mismatch

The percentages of participants experiencing support match and mismatch (support surpluses and deficits) across the six domains of diabetes support are displayed in Figure 1. Roughly half of the participants experienced at least one type of support mismatch. Particularly, for each domain, the percentage of participant perceptions of support mismatch in each domain as follows: 52% in following a meal plan, 46% in taking medicine, 42% in care of feet, 50% in physical activity, 46% in testing blood sugar, and 49% in handling feelings about diabetes. Of these, 23% to 34% of participants had support deficits in which they perceived that they received less support than they reported they desired (see Figure 1 for details). In particular, participants reported the highest support deficits, relative to support surpluses, for domains related to following a meal plan, help with handling their feelings about diabetes, and help with getting enough physical activity.

3.3 Bivariate correlations among key study variables

Table 3 shows the correlations between perceived support deficits, support surpluses, biophysical, and psychosocial outcomes. Participants who reported higher levels of perceived support deficits were significantly more likely to have a higher HbA1C (r = .24, p = .011), higher BMI (r = .23, p = .01), higher triglycerides (r = .24, p = .02), higher LDL levels (r = .25, p = .02), higher diabetes distress (r = .37, p < .001) and lower diabetes self-efficacy (r = −.27, p = .004). No significant associations were found with perceived support deficits and blood pressure, HDL, or diabetes self-care. Support surpluses were not significantly associated with any key study outcomes. Table A.2 also includes bivariate correlations with perceived support deficits and support surpluses and demographic and clinical characteristics. Women (r = .20, p = .03) and participants who reported using insulin (r =.21, p = .02) reported greater support deficits. No significant associations were found with perceived support surpluses.

3.4 Linear regressions among key outcomes

Based on the significant bivariate correlations, six hierarchical regression models were conducted to assess whether support deficits were significantly associated with HbA1c, BMI, triglycerides, LDL, diabetes distress, and diabetes self-efficacy, after controlling for participant characteristics (e.g., age, gender, race, diabetes type, and diabetes duration). Table 4 presents each regression model.

3.4.1 Models with diabetes type.—In Model 1, older age was associated with lower A1c, lower BMI, lower diabetes distress, and higher diabetes self-efficacy. Women reported higher diabetes distress and lower diabetes self-efficacy. Participants who were White had higher BMI. Participants with Type 2 diabetes had higher BMI and triglycerides levels.

After accounting for demographic and clinical characteristics, greater perceived support deficits were significant associated with higher triglyceride levels (R^2 Δ = .05, p = .04), diabetes distress (R^2 Δ = .10, p < .001), and diabetes self-efficacy (R^2 Δ = .05, p = .004). Support deficits were not significantly associated with A1c (R^2 Δ = .03, p = .06), BMI (R^2 Δ = .02, p = .08), or LDL (R^2 Δ = .05, p = .08).

3.4.2 Supplemental analyses with insulin (Appendix, Table A.3).—In Model 1, older age was associated with lower diabetes distress, and higher diabetes self-efficacy. Women reported lower diabetes self-efficacy.

After accounting for demographic and clinical characteristics, greater perceived support deficits were significant associated with higher BMI (R^2 Δ = .04, p =.03), higher triglyceride levels (R^2 Δ = .07, p =.02), diabetes distress (R^2 Δ = .11, p < .001), and diabetes self-efficacy (R^2 Δ = .06, p = .007). Support deficits were not significantly associated with A1c (R^2 Δ = .03, p =.08) or LDL (R^2 Δ = .04, p =.07).

4. Discussion and conclusion

4.1 Discussion

This study examined the association between support mismatch (i.e., support surpluses and deficits) and biophysical and psychosocial health and self-care of people with diabetes. Support mismatch was found to be a relatively common issue faced by individuals with diabetes. Between 42% to 52% of participants in this study reported experiencing support mismatch across six domains; with 23% to 34% reporting perceptions of support deficits in their diabetes management (i.e., they received less support then they desired). Support deficits, in particular, was correlated with poorer biophysical and psychosocial outcomes. Women and insulin-using participants also reported greater support deficits. Support surpluses were not significantly related to any key study outcomes. After accounting for demographic and clinical characteristics, those who perceived greater support deficits had higher triglyceride levels, greater diabetes distress, and lower diabetes self-efficacy. The regression models that controlled for insulin use (instead of type of diabetes) had similar findings, except that in addition to the aforementioned associations, perceptions of greater support deficits were also associated with higher BMI. Together, these findings highlight the potential that individuals with living with diabetes who perceive support deficits may

be at a greater risk for some negative biophysical and psychosocial health outcomes. These findings shed light on the importance of the concordance of desired and received support in diabetes management[11–13] and align with dyadic coping concepts found in theoretical frameworks.[12]

Our study adds to social support literature by moving beyond studying only perceived support available to exploring the mismatch between perceptions of received and desired support. By focusing on the gap between perceptions of received and desired support, we were able to examine the nuances of the associations between support deficits, support surpluses, and health in the context of diabetes. Our findings are consistent with previous research in that the alignment of individuals' perceptions of desired and received support has implications on individuals' physical (e.g., self-care activities) and psychosocial health (e.g., anxiety, depressive symptoms) across different health domains (e.g., diabetes, cancer).[7,9,18,19]

4.1.1 Support deficits versus surpluses.—

Correlations indicated that perceived support deficits were significantly associated with important diabetes-related outcomes (i.e., A1c, BMI, triglycerides, distress, and self-efficacy), while perceived support surpluses were not correlated with any outcomes. Literature on the implications of support surpluses (i.e., perceptions of receiving more support than wanted) has generated mixed findings. Some research concluded that more support is not always better, as support surpluses have detrimental effects on patients' psychological adjustment[19]. Other research[8] indicated that support surpluses were not problematic and did not have significant effects on patients' psychosocial functioning (e.g., anxiety and depression symptoms)[9]. In the current study, we did not find any significant associations between perceived support surpluses and any of the biophysical and psychosocial outcomes. A few reasons may account for the insignificant findings. First, the sample size of patients who perceived to experience support surpluses is small, potentially limiting the power to detect significant associations. Second, given that diabetes is a chronic illness, receiving support from family and friends may be routine for some patients. Thus, their perceptions of receiving more support than desired may not be problematic in a way that impedes their diabetes management[8,23].

4.1.2 Support deficits and individual characteristics.—

Findings suggested that women and people using insulin reported greater support deficits. These findings are consistent with previous literature. Women with diabetes often receive less perceived support than men with diabetes[24–26]. Other studies have also found that people living with Type 2 diabetes who were in insulin-dependent perceived less family social support than those with noninsulin-dependent diabetes[25].

4.1.3 Support deficits and biophysical outcomes.—

Research that has examined support mismatch among people living with diabetes has mostly been with people who had Type 2 diabetes and focused on diabetes self-care and mental health outcomes[8,10]. This study adds to the literature by including people with Type 1 and Type 2 diabetes and is one of the first to examine the associations between support deficits and biophysical outcomes, including HbA1c, BMI, and triglycerides levels. Greater perceptions of support deficits were correlated with higher HbA1c, BMI, triglycerides, and LDL levels, but not blood

pressure or HDL levels. There may be a few explanations underlying associations between perceived support deficits and biophysical health outcomes. Social networks can provide key information related to diabetes treatment, which in turn can support self-care behaviors that lead to positive health outcomes.[20] Perceptions of receiving less support than desired, where individuals aren't getting their desired informational or emotional support, may lead to information deficits and/or creating additional stressors related to diabetes management—thereby having a cascading impact on health outcomes.

After controlling for demographic and clinical characteristics, associations only remained between support deficits and triglyceride levels and BMI (only in the insulin-use model). The survey items within the support scale could have influenced different associations with biophysical outcomes. BMI and triglyceride levels are impacted by diet and physical activity[27]. Therefore, lacking support in relation to those specific domains could have more of an impact on BMI and triglyceride levels. Future studies should continue to explore the association with support deficits and biophysical outcomes by looking at other diabetes management domains.

4.1.4 Support deficits and psychosocial outcomes.—The current study had different findings from other studies[8] that examined associations between support deficits and psychosocial outcomes. We found that perceived support deficits were associated with greater diabetes distress and lower diabetes self-efficacy in correlational and regression analyses. Social support may reduce perceived stress and help individuals more efficaciously cope with stressful events related to their chronic disease, manage stress of their treatment regimen, and buffer negative effects of stress on their overall health.[21] People living with diabetes who are experiencing support deficits, where they perceive they are not receiving the support they would like, could likely benefit from support interventions to lower their distress and improve confidence in diabetes management[28]. These findings differ from a study of people living with Type 2 diabetes in which there was no association between support deficits and depressive symptoms[8]. Using surveys that specifically address diabetes-related psychosocial outcomes may offer more insight into the stressors that people living with diabetes experience.

4.1.5 Support deficits and diabetes self-care.—Our study did not find significant correlations between support deficits and diabetes self-care. These findings are contrary to two studies that found greater support deficits were associated with poorer self-care management[8,10] [8, 10]. Differences in findings with past studies could be related to methodological (e.g., measures of self-care and support deficits) or study sample differences (e.g., other studies only had participants with Type 2 diabetes). Our study sample of people with Type 1 diabetes who reported perceiving support deficits (n =19) was too small to drawn conclusions. Additional research is needed to assess potential differences based on type of diabetes and test replicability of findings using consistent survey measures.

Despite the abovementioned contributions, findings from the current research need to be interpreted considering some limitations. First, the nature of the data is cross-sectional and retrospective; therefore, there is insufficient evidence to establish causal links or directional relationships among the studied variables. Second, the data collected does not offer insights

into the different types of support (e.g., emotional, instrumental, informational) people with diabetes receive and desire. There is also no standard approach to measure support mismatch. Additional studies have considered other approaches, such as using participant- and family-reported actual and desired support to examine communal coping among those living with diabetes[8]. The ability to examine the experiences of family members of people with diabetes can provide additional insights into their preferences for providing support and impact on their own health[34]. Third, data about participants' identification of their primary source of support (e.g., spouse, friend) and the sources' perspectives of support provision were not collected. Fourth, there are different measures of diabetes distress, such as the Diabetes Distress Scale[35], that focuses more on physician-related distress and self-management behaviors. Future studies should explore support deficits in relation to different measures of diabetes distress. Finally, the sample sizes of participants with Type 1 diabetes and Type 2 diabetes were uneven, limiting our ability to examine if participants' support deficits and diabetes management differ based on the type of their diabetes In our sample, patients with Type 1 diabetes were significantly younger, had longer diabetes duration, had lower BMI, blood sugar, and Triglycerides, and reported greater diabetes self-care compared with those with Type 2 diabetes. As indicated in previous research[1], possibly due to age at diagnosis and diabetes duration, patients with Type 1 diabetes may have more access to support from family and friends for diabetes management and thus experience diabetes distress differently than those with Type 2 diabetes. Future research should consider exploring the different experiences of patients with Type 1 diabetes in particular given a lack of research within this population.

4.2 Conclusion

Our study demonstrates the prevalence of the mismatch between desired and received support perceived by people with diabetes. It also reveals the significant associations between support deficits and biophysical and psychosocial health of those with diabetes. Findings from our study offer empirical evidence for designing intervention programs that can ensure patients receive adequate and high-quality support they need during diabetes management.

4.3 Practice implications

In addition to theoretical contributions to the literature of social support and health outcomes, several practical implications can be gleaned from the current study to inform clinical care. First, given the prevalence of support mismatch perceived by participants with diabetes in our sample, tools in the form of pre-visit questionnaires and visit check-ins can be developed to identify patients experiencing support mismatch.[19] Support deficits can be addressed during clinic visits through provider discussions leading to an understanding of helpful interventions such as referrals to social work or therapy.[22,23] Intervention programs can be designed for support providers to assist care partners with identifying the patient's thresholds of support needs and thus tailoring their support provision.[[34] 24,25,26] Clinical interventions could also target women and patients with diabetes that are insulin-dependent to improve support as well, given our findings that they were more likely to perceived deficits in support.

An important avenue for future research practices and clinical care would be identifying patients with support deficits and designing interventions to facilitate functional, supportive behaviors, such as family-based interventions to engage individuals who might offer sources of support based on their abilities and strengths. Future research should also continue to examine how those without family and/or friend support may particularly benefit from diabetes-specific online peer support.[36] Additional exploration of the congruency between people with diabetes and their care partners' perception of support provided and support received will be beneficial when developing dyadic intervention strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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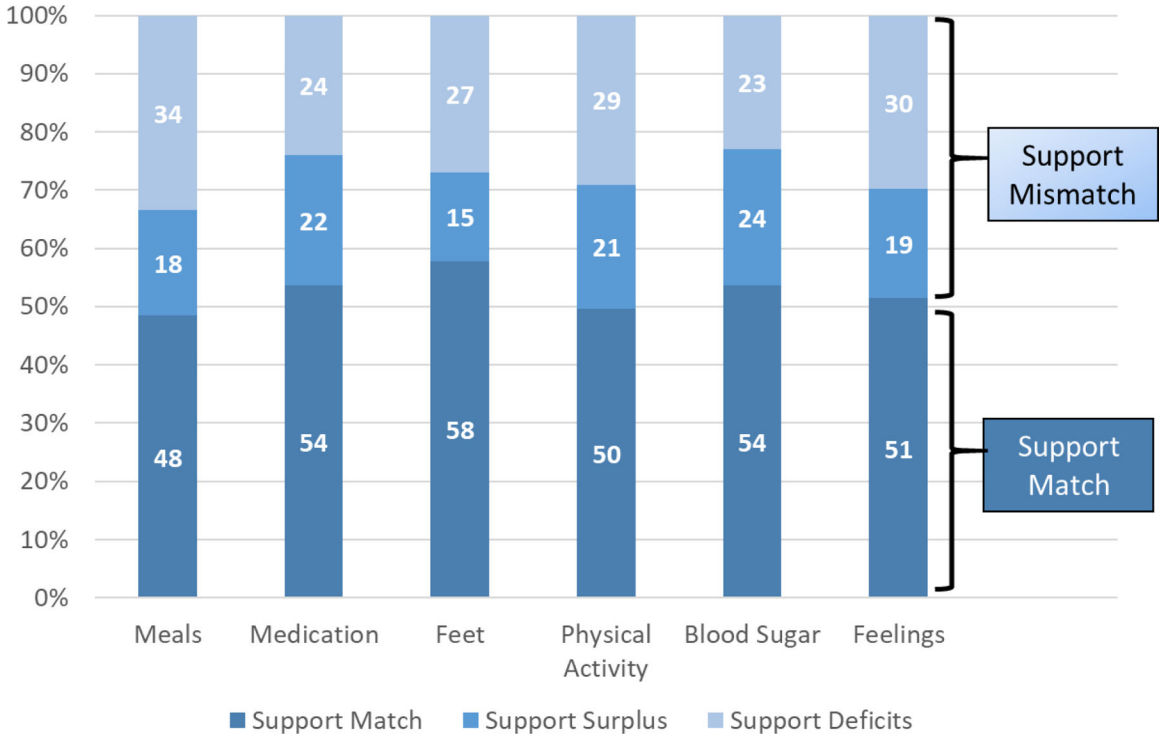

Figure 1.
Frequency of Support Match and Mismatch by Self-Care Domain

Table 1.

Demographic Characteristics of Participants

	Type 1 Diabetes ***n*** **= 38**	**Type 2 Diabetes** ***n*** **= 162**	**Total** ***N*** **= 200**	***p*-value**
Age, mean (standard deviation)	41.0 (17.43)	60.54 (12.76)	56.8 (15.7)	< .001
Gender, no. (%) *				1.00
Male	15 (39.5)	66 (41.3)	81 (41)	
Female	23 (60.5)	94 (58.8)	1127 (59)	
Marital status, no. (%) *				.07
Married or domestic partnership	16 (42.1)	94 (59.5)	110 (56)	
Single/divorced/widowed/other	22 (57.9)	64 (40.5)	88 (44)	
Education level, no. (%) *				.03
≤ High school degree or technical, trade, or vocational diploma	12 (31.6)	37 (23.0)	19 (25)	
Some college	15 (39.5)	39 (24.2)	54 (27)	
Associate's or Bachelor's degree	7 (18.4)	58 (36.0)	65 (33)	
Master's degree	4 (10.5)	20 (12.4)	24 (12)	
Professional degree or Doctorate	0 (0.0)	7 (4.3)	7 (4)	
Race & Ethnicity, no. (%)				
White	34 (85.0)	137 (83.0)	171 (83.4)	.61
Black or African American	0 (0.0)	7 (4.2)	7 (3.4)	.35
Asian or Asian American	2 (5.0)	3 (1.8)	5 (2.4)	.36
American Indian or Alaskan Native	0 (0.0)	8 (4.8)	8 (3.9)	.24
Native Hawaiian or Pacific Islander	0 (0.0)	1 (0.6)	1 (0.5)	1.00
Other	1 (2.5)	2 (1.2)	3 (1.5)	.47
Prefer not to answer	3 (7.5)	7 (4.2)	10 (4.9)	.40
Hispanic or Latin/o/a/x of any race	1 (7.9)	24 (15.0)	25 (12.5)	.05
Gross Household Income, no. (%)				.77
≤ $39,999	15 (39.5)	57 (35.2)	72 (36)	
$40,000-$79,999	9 (23.7)	36 (22.2)	45 (23)	
≥ $80,000	6 (15.8)	41 (25.3)	47 (24)	
Prefer to not answer	8 (21.1)	28 (17.3)	36 (18)	

Note. For continuous outcomes, independent samples *t*-tests were used and for dichotomous outcomes, Fisher's exact tests were used to assess significant differences between participants with Type 1 and Type 2 diabetes.

* Data were missing for participants with Type 2 diabetes as follows: age (n=1), gender (n=3), marital status (n=3), and education (n=2).

Table 2.

Participant Clinical Characteristics and Diabetes Outcomes

	Type 1 Diabetes	Type 2 Diabetes	Total*	p-value*
Diabetes duration	n = 38	n = 155	n = 193	
Mean (SD)	17.18 (15.81)	10.41 (8.19)	11.7 years (11.0)	.02
Insulin, no. (%)	n = 38	n = 150	n = 188	< .001
Yes	38 (100)	82 (54.7)	120 (63.8)	
No	0 (0)	68 (45.3)	68 (36.2)	
Biophysical Outcomes				
Hemoglobin A1C	n = 36	n = 150	n = 186	.92
Mean (SD)	8.23 (2.03)	8.19 (2.10)	8.2 (2.1)	
Body mass index	n = 36	n = 155	n = 191	<.001
Mean (SD)	28.21 (7.24)	35.05 (8.39)	33.7 (8.6)	
Systolic blood pressure	n = 36	n = 155	n = 191	<.001
Mean (SD)	117.67 (14.29)	125.62 (12.04)	124.1 (12.8)	
Diastolic blood pressure	n = 36	n = 155	n = 191	.18
Mean (SD)	73.83 (10.02)	76.15 (9.23)	75.7 (9.4)	
Triglycerides	n = 29	n = 121	n = 150	<.001
Mean (SD)	113.41 (66.25)	197.15 (145.72)	181.0 (137.9)	
High-density lipoprotein	n = 29	n = 121	n = 150	.02
Mean (SD)	57.41 (25.73)	45.08 (15.22)	47.5 (18.3)	
Low-density lipoprotein	n = 30	n = 121	n = 151	.31
Mean (SD)	99.83 (51.69)	91.15 (39.27)	92.9 (42.0)	
Psychosocial and Self-Care Outcomes				
Diabetes distress	n = 35	n = 150	n = 190	.74
Mean (SD)	35.29 (23.2)	36.61 (21.1)	36.20 (21.3)	
α	.95	.95	.95	
Diabetes self-care	n = 36	n = 146	n = 186	<.001
Mean (SD)	59.50 (16.27)	50.34 (14.32)	52.2 (15.3)	
α	.83	.72	-	
Diabetes self-efficacy	n = 35	n = 153	n = 188	.23
Mean (SD)	69.66 (14.99)	65.93 (21.17)	66.6 (20.2)	
α	.79	.86	.85	

Note. For diabetes duration, a continuous score was entered such that participants who had diabetes for < 6 months were coded as 0, participants with duration between 6 months and 1 year were coded as 1, and so on. Independent samples *t*-tests or chi-square tests (for dichotomous variables) were used to evaluate significant differences between participants with Type 1 and Type 2 diabetes.

Table 3.

Correlations between Support Deficits, Support Surplus, Biophysical and Psychosocial Outcomes

	Support deficits	Support surplus	HbA1c	BMI	Systolic blood pressure	Diastolic blood pressure	Triglycerides	High-density lipoprotein	Low-density lipoprotein	Diabetes distress	Diabetes self-care	Diabetes self-efficacy
Support deficits	--	--										
Support surplus	--	--										
Hemoglobin A1c	0.24**	0.05	--									
Body mass index	0.23**	0.10	0.01	--								
Systolic blood pressure	0.03	0.03	−0.05	0.17*	--							
Diastolic blood pressure	0.04	0.05	0.06	0.15v	0.48***	--						
Triglycerides	0.24*	−0.12	0.19*	0.32***	0.11	0.14	--					
High-density lipoprotein	−0.13	−0.04	−0.10	−0.25**	0.00	−0.04	−0.24**	--				
Low-density lipoprotein	0.25*	−0.03	0.21*	0.06	0.07	0.30***	0.17*	0.05	--			
Diabetes distress	0.37***	0.15	0.17*	0.18*	−0.01	0.14	0.30***	−0.02	0.09	--		
Diabetes self-care	−0.14	0.04	−0.15	−0.29***	−0.06	−0.16*	−0.19*	0.09	−0.11	−.19**	--	
Diabetes self-efficacy	−0.27**	−0.07	−0.18*	−0.29***	0.04	−0.10	−0.14	−0.04	−.198*	−.037***	0.36***	--

*** *Note*. Correlation is significant at the 0.001 level;

** Correlation is significant at the 0.01 level (2-tailed);

* Correlation is significant at the 0.05 level (2-tailed). Hemoglobin A1c= HbA1c, Body mass index = BMI.

Table 4.

Six Multivariable Linear Regression Models to Assess with Association between Support Deficits and Key Outcomes

	HbA1c			BMI			Triglycerides			LDL			Diabetes Distress			Diabetes Self-Efficacy		
	B	**SE**	***p***	***B***	**SE**	***p***	***B***	**SE**	***p***	***B***	**SE**	***p***	***B***	**SE**	***p***	***B***	**SE**	***p***
Model 1	$F(9, 97) = 1.30$, $p = .25$, $R^2 = .10$			$F(8, 101) = 3.86$, $p < .001$, $R^2 = .23$			$F(8, 76) = 1.87$, $p = .08$, $R^2 = .08$			$F(8, 76) = 1.22$, $p = .30$, $R^2 = .11$			$F(8, 06) = 3.08$, $p < .001$, $R^2 = .27$			$F(8, 104) = 3.02$, $p = .004$, $R^2 = .19$		
Age	**−0.04**	**0.02**	**0.02**	**−0.15**	**0.07**	**0.02**	−2.54	1.33	0.06	−0.54	0.33	0.11	**−0.03**	**0.01**	**<.001**	**0.40**	**0.16**	**0.01**
Female	0.21	0.47	0.65	2.81	1.66	0.09	41.50	34.70	0.24	13.68	8.56	0.11	**0.40**	**0.16**	**0.01**	**−8.13**	**3.94**	**0.04**
White	0.11	0.78	0.89	**6.95**	**2.71**	**0.01**	114.18	65.06	0.08	6.44	16.05	0.69	−0.22	0.25	0.37	3.36	6.21	0.59
Married	−0.10	0.53	0.84	0.85	1.88	0.65	−3.32	39.11	0.93	0.13	9.65	0.99	0.04	0.17	0.82	6.94	4.43	0.12
Education	0.04	0.22	0.86	0.13	0.79	0.87	2.95	16.58	0.86	4.03	4.09	0.33	0.00	0.07	0.98	−0.08	1.83	0.97
Income	−0.20	0.26	0.44	−1.34	0.94	0.16	4.44	19.23	0.82	−4.79	4.74	0.32	−0.10	0.09	0.27	1.22	2.18	0.58
Type 2 diabetes	0.78	0.69	0.26	**10.66**	**2.52**	**<.001**	**119.46**	**49.56**	**0.02**	5.43	12.23	0.66	0.20	0.24	0.40	−9.45	5.94	0.12
Diabetes duration	0.03	0.02	0.18	0.04	0.08	0.66	−0.88	1.75	0.62	−0.22	0.43	0.60	−0.01	0.01	0.56	0.17	0.20	0.41
Model 2	$F(9, 96)=21.59$, $p=.13$; $R^2\Delta = .03$, $p=.06$			$F(9, 100) = 3.85$, $p<.001$; $R^2\Delta = .02$, $p=.08$			$F(9, 75)= 2.25$, $p=.03$; $R^2\Delta = .05$, $p=.04$			$F(9, 84) = 1.48$, $p = .04$; $R^2\Delta = .05$, $p = .08$			$F(9, 05) =6.89$, $p < .001$; $R^2\Delta = .10$, $p < .001$			$F(9, 103) = 3.52$, $p < .001$; $R^2\Delta=.05$, $p=.004$		
Age	**−0.04**	**0.02**	**0.05**	**−0.13**	**0.07**	**0.05**	−2.13	1.31	0.11	−0.45	0.33	0.17	**−0.02**	**0.01**	**<.001**	**0.33**	**0.16**	**0.04**
Female	−0.01	0.47	0.99	2.16	1.68	0.20	24.26	34.85	0.49	10.06	8.67	0.25	0.27	0.15	0.08	−5.77	3.95	0.15
White	0.09	0.77	0.91	**6.86**	**2.68**	**0.01**	109.61	63.61	0.09	5.48	15.82	0.73	−0.20	0.23	0.39	3.02	6.06	0.62
Married	0.03	0.52	0.96	1.19	1.87	0.53	2.45	38.31	0.95	1.34	9.53	0.89	0.13	0.16	0.44	5.24	4.38	0.23
Education	0.05	0.22	0.83	0.15	0.78	0.85	4.10	16.21	0.80	4.27	4.03	0.29	0.01	0.07	0.84	−0.28	1.79	0.87
Income	−0.27	0.26	0.31	−1.52	0.93	0.11	1.01	18.86	0.96	−5.51	4.69	0.24	−0.14	0.08	0.08	2.15	2.16	0.32
Type 2 diabetes	0.52	0.70	0.46	**9.82**	**2.54**	**<.001**	**99.22**	**49.34**	**0.05**	1.19	12.27	0.92	0.05	0.23	0.82	−7.09	5.87	0.23
Diabetes duration	0.02	0.02	0.39	0.01	0.09	0.95	−1.71	1.75	0.33	−0.40	0.44	0.36	−0.01	0.01	0.12	0.28	0.20	0.18
Support deficits	0.52	0.27	0.06	1.72	0.97	0.08	**40.09**	**18.70**	**0.04**	8.40	4.65	0.08	**0.36**	**0.09**	**<.001**	**−5.67**	**2.26**	**0.01**

Note: Bold text indicates significant associations. Categories were coded as follows: Female (0 = male, 1 = female), White (0 = underrepresented minority, 1 = White), Married (0 = single, divorced, separated, widowed, 1 = married or living with partner); Type 2 diabetes (0 = Type 1 diabetes, 1 = Type 2 diabetes). Unstandardized coefficients are presented.