

# Distress and Type 2 Diabetes Self-Care: Putting the Pieces Together

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## Abstract

**Background** Conflicting research emphasizes depression, diabetes distress, or well-being in relation to diabetes self-care and risk for poor health outcomes.

**Purpose** The purpose of this study was to test whether a latent variable for general psychological distress derived from shared variance of depression symptoms, diabetes distress, and well-being predicts a latent variable of diabetes self-care and to examine evidence for unique effects once shared effects are adjusted for.

**Methods** Adults with suboptimally controlled diabetes were recruited from the South Bronx, NY, for a telephonic diabetes self-management support trial. Baseline diabetes self-care, medication adherence, depression symptoms, diabetes distress, and well-being were measured by validated self-report. Structural equation modeling specified a latent variable for general psychological distress derived from shared variance of depression symptoms, diabetes distress, and well-being. Diabetes self-care was a latent variable indicated by diet, glucose self-monitoring, and medication adherence.

**Results** Participants ( $N = 627$ , 65% female) were predominantly ethnic minority (70% Hispanic; 45% Black) and 77% reported household income  $< \$20\text{K}/\text{year}$ . Mean (standard deviation) age = 56 (12) years; A1c = 9.1% (1.9%); body mass index = 32 (8)  $\text{kg}/\text{m}^2$ . The latent variable for psychological distress was a robust predictor of poorer diabetes self-care (coefficient =  $-0.59$  [confidence interval =  $-0.71, -0.46$ ],  $p < .001$ ) with good model fit. Unique paths from depression symptoms, diabetes distress, and well-being (all  $ps > .99$ ) to self-care were not observed.

**Conclusions** In this population of disadvantaged adults with suboptimally controlled diabetes, general psychological distress was strongly associated with poorer diabetes self-care and fully accounted for the effects of depression, diabetes distress, and positive well-being. This suggests that general distress may underlie previously reported associations between these constructs and diabetes self-care.

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## Introduction

Suboptimal self-care of Type 2 diabetes is common and is associated with increased risk of poor glycemic control, complications, and mortality [1, 2]. Individuals from socioeconomically disadvantaged groups, such as those experiencing poverty and ethnic minorities, are at increased risk of poor diabetes outcomes [3]. Identification of factors associated with problematic diabetes self-care is necessary to inform interventions to improve self-care and health outcomes.

Depression is among the most consistent patient-level risk factors associated with problematic diabetes

self-care and treatment adherence and is more common among socioeconomically disadvantaged groups [4–6]. Meta-analysis of 47 independent samples, including over 17,300 adults and children with Type 1 or Type 2 diabetes, documented consistent relationships between higher levels of depressive symptoms and worse diabetes self-care across a variety of behavioral domains, including adherence to prescribed medication, dietary recommendations, and glucose self-monitoring [6]. The same pattern is observed across chronic illnesses [7]. Meta-analyses have also shown that depression is more common among individuals with diabetes as compared to those without [8, 9], is associated with poorer glycemic control and presence of complications [10, 11], and is a risk factor for mortality [12]. Given the complexity and behavioral demands of the diabetes self-care regimen and the motivational, cognitive, and mood impairments associated with depression, it is widely assumed that depression may influence diabetes control and treatment outcomes through related impairments in self-care. However, intervention studies have yet to successfully demonstrate this sequence of effects [13, 14].

Some research suggests that diabetes-related distress, and not depression per se, is more closely associated with problematic diabetes self-care and glycemic control [15, 16]. In contrast to depression, diabetes distress is not reflective of psychopathology but rather emerges from stress and coping theory that frames a person's experience of psychological distress in the context of specific stressful situations (e.g., [17–19]). As such, diabetes distress reflects emotional distress in response to the demands of living with diabetes and its treatment regimen [20]. However, the literature comparing depression and diabetes distress in relation to diabetes self-care and diabetes health outcomes remains inconclusive. For example, evidence suggests that symptoms of depression predict problematic self-care independent of diabetes distress [21]. Yet, the relationship between depression and problematic self-care does not appear to be explained by cases of major depressive disorder (MDD) [15]. Even when likely cases of MDD are excluded from analysis, the relationship between depression symptoms and poor self-care persists [22]. These lower-intensity symptoms have long been recognized as being more reflective of general psychological distress than depression [23, 24]. This pattern of relationships suggests that a broader construct of general psychological distress, varying across a continuum of severity and occurring in various explanatory contexts (e.g., diabetes-related, other life stressors), may underlie many of the observed relationships linking depression and diabetes distress to poorer diabetes self-care and health outcomes [24].

Psychological well-being can sustain coping efforts when experiencing psychological distress and can reduce

reactivity to stressors [25, 26]. Research supports that experience of positive psychological states of mind are associated with lower mortality risk among individuals with and without diabetes and independent of depression and negative affect [27, 28]. Positive states of mind have also been associated with better treatment adherence in HIV/AIDS and Type 2 and Type 1 diabetes samples [25, 29–31]. Additionally, positive psychological states have been associated with better glycemic control among individuals with and without diabetes [26, 32, 33]. Although well-being may represent a distinct construct that buffers against the negative effects of psychological distress, widely used depression screening instruments nevertheless focus on the experience of positive affective states (e.g., Hospital Anxiety and Depression Scale and Well-Being Index, a five-item questionnaire from the World Health Organization [WHO-5]) [34, 35] and other commonly used depression screening instruments mix positive and negative affective states (e.g., Center for Epidemiologic Studies Depression Scale) [36]. We are unaware of prior studies that simultaneously evaluate the contribution of positive and negative affective states in the prediction of diabetes self-care.

The current study examined the relationship between three indicators of psychological distress—MDD-based depression symptom severity, diabetes distress, and positive well-being—and diabetes self-care in a primarily ethnic minority and socioeconomically disadvantaged sample of adults with suboptimally controlled Type 2 diabetes. The population from which our sample is drawn could be expected to experience more stressors than socially advantaged individuals [5] and experience worse diabetes treatment outcomes [3], and they have been underrepresented in prior research on emotional distress and diabetes self-care. The three constructs of depression, diabetes distress, and well-being were selected because they capture both negative and positive aspects of psychological distress, as well as diabetes-specific versus nonspecific explanatory context for distress [37]. These constructs for psychological distress in diabetes have been differentiated from each other at the conceptual level, and empirical evidence for their validity is supported by independent associations with diabetes self-care and health outcomes; however, shared variance among these indicators is typically excluded from analysis due to the analytic approach of prior studies [16, 21, 38, 39]. We used structural equation modeling to pool shared variance among these indicators of psychological distress, via latent variable modeling, and used this shared variance to predict diabetes self-care. Once these shared effects were accounted for, evidence for unique effects was examined. We hypothesized that the latent construct of general psychological distress would show a strong negative association with diabetes self-care.

We then tested whether unique aspects of depressive symptoms, diabetes distress, and well-being that were not captured by our general emotional distress latent variable could independently predict diabetes self-care. Given the available, sometimes conflicting, literature showing relationships for these constructs with relevant outcomes [6, 21, 22, 39], we expected they would be significantly associated with diabetes self-care through pathways other than their shared variance. Finally, we explored whether participants identifying as female, or those who were younger [40], may show a stronger relationship between general psychological distress and self-care.

## Methods

### Study Sample and Procedures

Residents of the South Bronx who were in the New York City Department of Health and Mental Hygiene (NYC DOHMH) A1c Registry [41] were recruited for a telephonic self-care randomized controlled trial (RCT;  $N = 941$ ), and the larger study and sample have been described by Walker et al. [42]. Inclusion criteria for this larger RCT included being 18 years or older, having self-reported diabetes, having A1C values  $>7\%$  measured within the prior 3–6 weeks, having not opted out of receiving any communication from the Registry, and living within the 10 South Bronx zip codes. Individuals were excluded from the larger study if they had plans to move from NYC in the next 12 months, they were unable to read or speak in English or Spanish, had evidence of cognitive dysfunction, or a history of or intention to have bariatric surgery.

A preintervention subset of the full sample ( $n = 627$ ) completed the Diabetes Distress Scale (DSS) [20], which was added approximately 1 year after enrollment had commenced, were included in the current study. As the larger RCT did not include face-to-face interactions, informed consent and Health Insurance Portability and Accountability Act authorization were obtained over the telephone. Institutional review boards at the Albert Einstein College of Medicine and the NYC DOHMH approved the study protocol and it was registered with ClinicalTrials.gov (<http://clinicaltrials.gov/show/NCT00797888>).

### Measures

#### *Demographic and clinical characteristics*

Demographic and clinical characteristics collected at baseline included: race/ethnicity, country of origin,

household income, marital status, educational attainment, insurance status, hemoglobin A1C, and body mass index (BMI).

#### *Depressive symptoms*

Symptoms of depression experienced over the previous 2 weeks were assessed using the validated Patient Health Questionnaire-8 (PHQ-8) [43]. The PHQ-8 asks individuals to report symptoms for the preceding 2 weeks on a four-point scale (0 = not at all, 1 = several days, 2 = more than half the days, and 3 = nearly every day). The items are summed for a total score ranging from 0 to 24, with higher scores indicating increased distress. Internal consistency in the current sample for total scores was good ( $\alpha = .82$ ).

#### *Diabetes distress*

The 17-item DDS [20] was used to assess illness-specific distress over the past month. Total mean scores typically range from 1 (no distress) to 6 (serious distress), with a mean score of  $<2$  indicating little to no distress, 2–2.9 indicating moderate distress, and  $\geq 3$  indicating high distress [44]. We reduced the original response scale to a four-point scale to facilitate telephone administration. The revised four-point scoring was as follows: 1 = not a problem, 2 = a slight problem, 3 = a moderate problem or somewhat serious problem, and 4 = a serious problem or a very serious problem. As we were interested in capturing psychological distress specific to diabetes, we used the five-item emotional burden subscale (DDS-EB) of the DDS in analyses as done previously [39] to avoid items that overlap with adherence to the treatment regimen (i.e., regimen distress items) and to exclude items that are not directly representative of emotional distress (e.g., dissatisfaction with providers and support from significant others). The DDS-EB most clearly measures emotional distress related to diabetes and has been previously associated with self-reported and electronically monitored medication adherence among adults with Type 2 diabetes [20, 39]. Internal consistency for the emotional burden subscale was excellent in this sample ( $\alpha = .86$ ).

#### *Well-being*

The Well-Being Index, a five-item questionnaire from the World Health Organization, also known as the WHO-5, captures positive feeling states, including cheerfulness, calm, vigor, feeling well rested, and having interest in one's daily life [34]. The WHO-5 is widely used as an indicator of depression and distress [45–47]; however, it may also represent a distinct construct from emotional distress given the literature on the independence of positive and negative affective states. The WHO-5 asks

participants to answer how often over the last 2 weeks they were experiencing a particular positive state of well-being (e.g., I have felt calm and relaxed) on a six-point scale (5 = all of the time, 4 = most of the time, 3 = more than half of the time, 2 = less than half of the time, 1 = some of the time, and 0 = at no time). The items are summed for a total score ranging from 0 to 25, with higher scores indicating higher well-being. The internal consistency in this sample was excellent ( $\alpha = .87$ ).

### Diabetes self-care

Assessment of medication adherence was based on the four-item Morisky Green Levine Medication Adherence Scale (MGLMAS) [48], while adherence to diet recommendations (four items) and self-monitoring of blood glucose (SMBG; two items) was assessed using the Summary of Diabetes Self-Care Activities Measure (SDSCA) [49]. The validated MGLMAS assesses both unintentional and intentional nonadherence to medications. Response choices are dichotomous (yes/no), which were added together with higher scores indicating poorer medication adherence (0 = high adherence and 4 = low adherence), and then reverse-coded. The SDSCA has been shown to be valid and reliable in capturing self-reported data about diabetes self-care; given the low interitem correlations for this scale, using the individual subscales is recommended [49]. We excluded items assessing exercise and foot care as these items loaded poorly onto the latent self-care construct. Higher scores on adherence to medication, diet, and SMBG indicate better self-care. The internal consistencies of these three scales in our sample are .56 (MGLMAS), .67 (adherence to diet), and .87 (adherence to SMBG).

### Statistical Analysis

Descriptive statistics were computed for demographic and study-related variables. Bivariate relations among study variables were also examined. Structural equation modeling was used to test study hypotheses, as this approach provides us the ability to test the relationship between the shared variance among depression symptoms, diabetes distress, and well-being measures in predicting diabetes self-care. Structural equation modeling specified a latent variable for general psychological distress derived from the shared variance of depression symptoms, diabetes distress, and positive well-being. Diabetes self-care was a latent variable indicated by diet, glucose self-monitoring, and medication adherence. We also tested the potential moderating effects of age (examined as terciles) and sex, and their interaction, on the relationship between the latent variables of general psychological distress and self-care.

In each of the models, the structural path(s) from the focused variable(s) to poor self-care was tested by a likelihood ratio (LR) test of the model with and without a zero constraint on the path coefficient, and we show only the unconstrained model, its fit statistics, and the LR test. We analyzed each model using standard goodness of fit statistics, including chi-square, root mean square error of approximation (RMSEA;  $<.05$ ) [50], comparative fit index (CFI;  $>.95$ ) [51], and standardized root mean square residual (SRMR;  $<.05$ ) [52]. As modifications were made to models, reported *p*-values do not accurately reflect Type I error rates and findings should be confirmed in replication studies. Analyses were conducted using Stata 16.1 [53].

## Results

### Sample Characteristics

Characteristics at the baseline of the larger sample are described by Walker et al. [42]. The current sample included a lower percentage of Black individuals (45% vs. 54% in the larger sample) and a larger percentage of multiracial individuals (24% vs. 16% in the larger sample) and did not show other significant differences from the larger study sample. As seen in Table 1, participants on average were ethnic minority (70% Hispanic; 45% Black) older adults who were largely foreign born (70%), and 77% reported a household income  $< \$20K$ /year. Mean glycemic control was poor (hemoglobin A1C =  $9.1 \pm 1.9\%$ ) and 35% were taking insulin. The average PHQ-8 score was  $6.4 \pm 5.4$ , and 28% scored above the threshold

**Table 1.** Sample characteristics ( $N = 627$ )

Characteristic	Mean [ <i>SD</i> ] or <i>n</i> [%]
Age	56 [12]
Female	406 [65%]
Latino	430 [70%]
Black	215 [45%]
Spanish language	354 [57%]
Born in USA	188 [30%]
Less than HS/GED	313 [50%]
Unemployed	162 [26%]
Disabled/retired	275 [44%]
Family income $< \$20K$	418 [77%]
Body mass index	32 [8]
HbA1c	
Percentage	9.1 [1.9]
Millimoles per mole	76 [20.8]

*HbA1c* hemoglobin A1C.

for clinically significant depression (PHQ-8  $\geq 10$ ). The average DDS score was  $1.8 \pm 0.7$ , with 33% of the sample indicating clinically significant diabetes distress (mean DDS  $\geq 2$ ) [44].

**Preliminary Analyses**

In bivariate analyses, shown in Table 2, depression symptoms, diabetes distress, and well-being were highly correlated. Self-care behaviors (MGLMAS, diet, and SMBG scores) showed a small to moderate correlation. Depression symptoms, diabetes distress, and well-being were most associated with medication adherence and least associated with SMBG. Older age was most associated with reduced diabetes distress and most associated with better medication adherence when considering self-care. Male sex showed a small association with less depression and better well-being and did not show meaningful associations with self-care behaviors.

Depression symptoms (coefficient = 0.83), diabetes distress (coefficient = 0.72), and well-being

(coefficient =  $-0.76$ ) were each correlated with the latent construct of psychological distress (all  $ps < .001$ ). Adherence to medication (coefficient = 0.55), diet (coefficient = 0.49), and SMBG (coefficient = 0.31) were each correlated with the construct of self-care (all  $ps < .001$ ).

**Structural Equation Models**

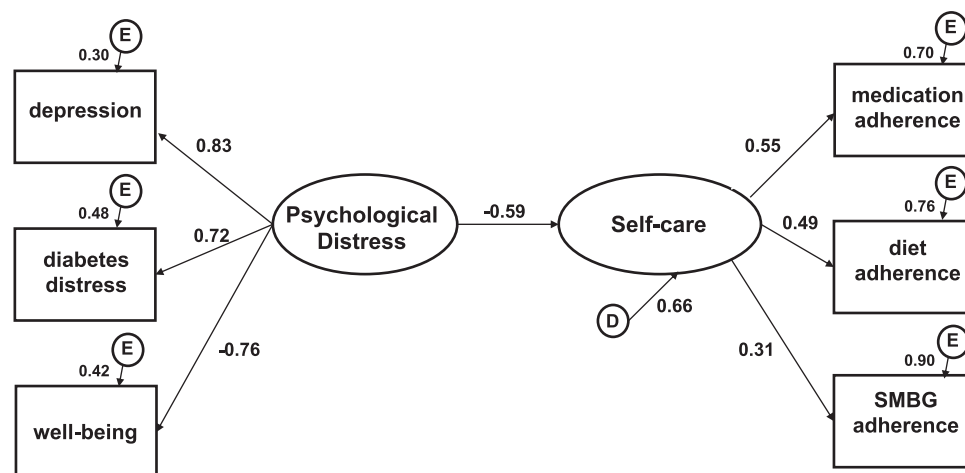
A structural model shown in Fig. 1 regressed the latent variable for self-care, defined by medication adherence, diet adherence, and SMBG scores, on general psychological distress, based on depressive symptom, diabetes distress, and well-being scores. The latent variable for general psychological distress was a robust predictor of poorer diabetes self-care (coefficient =  $-0.59$  [confidence interval, CI:  $-0.71, -0.46$ ],  $p < .001$ ) in a model with acceptable fit ( $\chi^2(8) = 25.12$ ,  $p = .001$ ; CFI = .95; RMSEA = .059; SRMR = .048).

Finally, unique paths from each indicator of psychological distress to self-care were added, simultaneously, to determine whether information specific to an indicator was predictive of self-care beyond general psychological distress. These additional independent paths from

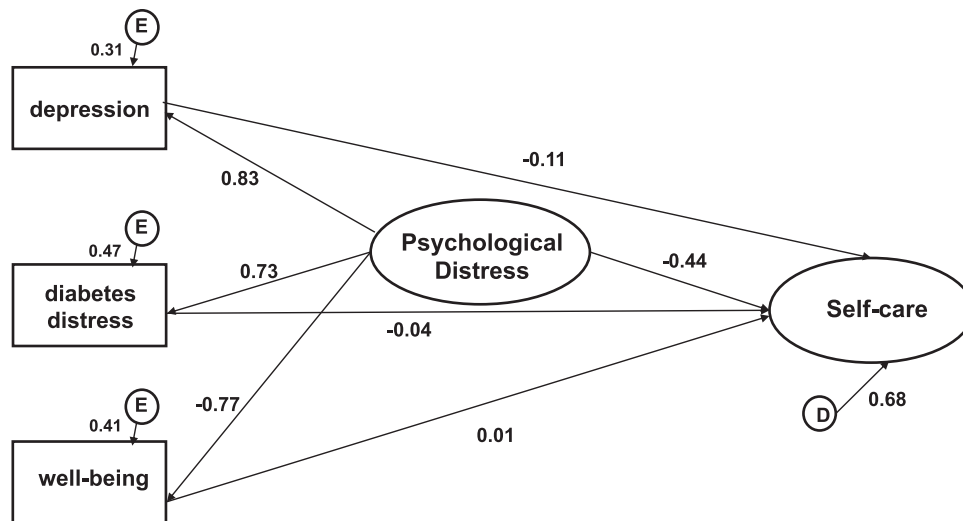
**Table 2.** Bivariate correlation matrix

	1	2	3	4	5	6	7	8
1. Depression symptoms	1.00							
2. Diabetes distress	.61	1.00						
3. Well-being	-.65	-.56	1.00					
4. Medication adherence	-.29	-.28	.24	1.00				
5. Diet	-.26	-.19	.24	.21	1.00			
6. SMBG	-.04	-.03	.04	.18	.21	1.00		
7. Age	-.07	-.19	.08	.20	.08	.11	1.00	
8. Male sex	-.11	-.07	.11	.07	.05	-.07	-.09	1.00

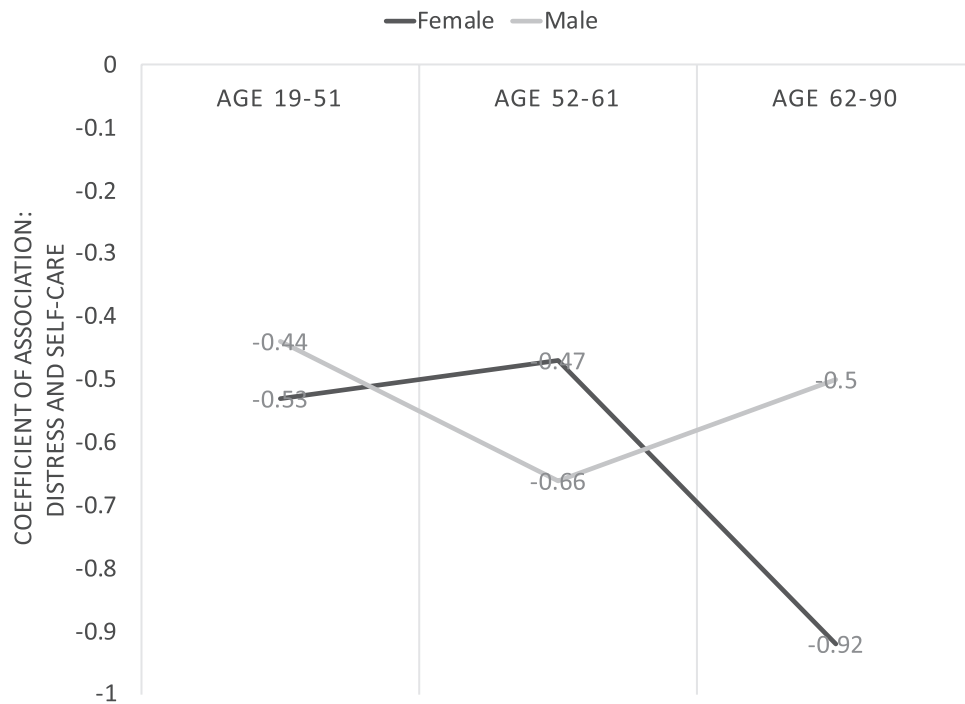
SMBG self-monitoring of blood glucose.



**Fig. 1.** Model 1: psychological distress and self-care.



**Fig. 2.** Model 2: added independent paths from depression, diabetes distress, and well-being to self-care.



**Fig. 3.** The interaction of age by sex on the strength of association between the latent constructs of general psychological distress and diabetes self-care.

depression symptoms (coefficient =  $-0.11$  [CI:  $-309.0, 308.8$ ]), diabetes distress (coefficient =  $-0.04$  [CI:  $-177.4, 177.3$ ]), or well-being (coefficient =  $0.01$  [CI:  $-214.6, 214.6$ ]) to self-care were not significant (all  $ps > .99$ ). This model shown in Fig. 2 did not improve the fit of the model (change in degrees of freedom,  $dfs$  [ $\chi^2(3) = 0.30, p = .96$ ]).

**Moderation Analyses**

Sex was not found to moderate the relationship between general psychological distress and self-care,  $\chi^2 = 0.29$

( $df = 1, p = .59$ , with males (coefficient =  $-0.57$ ) and females (coefficient =  $-0.56$ ) showing similar strengths in associations. Analyses supported a trend for age moderating the relationship between the latent constructs of general psychological distress and self-care,  $\chi^2 = 5.31$  ( $df = 2, p = .07$ , with this association being stronger among those who were in the highest age tercile (62–90 years; coefficient =  $-0.74$ ) compared to those who were in the middle (52–61 years; coefficient =  $-0.59$ ) and lowest age terciles (19–51 years; coefficient =  $-0.59$ ). As shown in Fig. 3, an interaction between age and sex was observed,  $\chi^2 = 19.14$

( $df = 5$ ),  $p = .002$ . Males and females particularly differed in the highest age tercile, showing that the increased strength between latent psychological distress and latent self-care in this age tercile was driven by females (coefficient<sub>F</sub> =  $-0.92$ ; coefficient<sub>M</sub> =  $-0.50$ ). In the middle age tercile, females (coefficient =  $-0.47$ ) showed an attenuated association between the latent constructs of general distress and self-care compared to males (coefficient =  $-0.66$ ). In the lowest age tercile, females (coefficient =  $-0.53$ ) showed a stronger association compared to males (coefficient =  $-0.44$ ). Model fits remained acceptable among moderated models.

## Discussion

In this sample of disadvantaged adults with suboptimally controlled Type 2 diabetes, the latent construct of general psychological distress, comprised of shared variance among measures of depression symptoms, diabetes distress, and positive well-being, was strongly associated with poorer diabetes self-care. Furthermore, this construct of general psychological distress fully accounted for the independent associations between depression, diabetes distress, well-being, and self-care. Our results may help explain some inconsistent findings from studies that have examined independent effects of diabetes distress and depression in relation to diabetes self-care [16, 21, 38, 39]. The multivariable linear regression analysis approach typically taken by these previous studies to examine independent effects may severely underestimate the effects of psychological distress in relation to diabetes self-care in that the underlying shared variance is ignored. Structural equation modeling provides a solution to this problem, as it specifies latent variables representing variance that is shared among related predictors. Results from our latent variable approach suggest that shared variance among depressive symptoms, the emotional burden of diabetes, and positive emotional well-being is a robust correlate of diabetes self-care among disadvantaged adults with suboptimally controlled Type 2 diabetes.

The pattern of relationships observed in this study supports the idea that a broader underlying construct of general psychological distress may underlie many of the observed relationships linking depression, diabetes distress, and well-being to poorer diabetes self-care and health outcomes. Suls and Bunde [54] have argued that an overarching affective construct may also be central to various affect–health relationships observed in cardiovascular disease. They point out that the considerable measurement overlap among constructs like depression, hostility, and anger creates ambiguity for testing

theories and interpreting evidence related to affect and health. Furthermore, discriminant validity among affective measures is often found to be low [55], which Suls and Bunde [54] point out further supports the need to consider underlying dimensions like negative affectivity. The authors caution that, by focusing on a single construct at a time, health professionals are unable to test whether one construct is more predictive of health outcomes than other overlapping constructs within one individual or whether a hidden underlying dimension may be most predictive [54]. In our sample of adults with Type 2 diabetes, we find that none of the three constructs tested were more predictive of health behaviors, while an underlying dimension was robustly predictive.

Our findings suggest that studies examining affect in relation to diabetes outcomes may have more predictive power when assessing general and nonspecific affective states than when distinguishing among specific emotional constructs and measures. We found that neither negative/positive aspects of psychological distress, symptoms related to psychopathology versus nonpathological, nor diabetes-specific versus nonspecific aspects of distress showed independent associations with diabetes self-care. This is consistent with previous research indicating that depressive symptoms, including those falling below the level of clinical significance, are more closely related to diabetes self-care and glycemic control than an MDD diagnosis [22, 37]. This is also consistent with Suls and Bunde's [54] conclusions that, among those with cardiovascular disease, an underlying construct representing a general tendency toward negative affectivity could account for all observed effects of specific emotional constructs like depression, anger, and anxiety.

Our results further supported a sex by age moderation in that the strength of the relationship between the latent constructs of psychological distress and diabetes self-care differed based on a person's age and sex. The finding that the association was strongest among women in the highest age tercile suggests that psychosocial variables may intersect in how they impact reactivity to psychological distress. This idea is consistent with the Strength and Vulnerability Model [56] in that aging can become more of a vulnerability in specific contexts. Our findings contribute to the sparse literature on the moderating effect of age on the relationship between distress and diabetes self-care. Helgeson et al. [40] showed an attenuated association between diabetes regimen distress and medication adherence among older compared to younger individuals with Type 2 diabetes. The different findings between this previous study and the current study could be related to differences in specific constructs assessed (e.g., diabetes regimen distress vs. latent general psychological distress and medication adherence vs. latent self-care) or race/ethnicity and socioeconomic differences

across studies. We did not have enough diversity in race/ethnicity or socioeconomic status to test these psychosocial variables as moderators, and future studies should examine whether these variables influence the association between general psychological distress and diabetes self-care and influence the moderating effects of older age. Such work would help identify which individuals may most benefit from interventions addressing the management of, and reactivity to, psychological distress.

Results of this study have several implications for practice. One clinical implication includes that routine evaluation of general psychological distress may best identify individuals at risk for poor diabetes self-care. While a recent position statement by the American Diabetes Association (ADA) on psychosocial care for individuals living with diabetes recommends screening for specific psychosocial issues, such as depression and diabetes distress, the position statement does not include the recommendation to screen for broader general psychological distress or general psychological well-being using validated measures among adults with diabetes [57]. If future research can replicate our findings and extend them to the examination of other diabetes outcomes, it may be advisable to follow developments in cancer care promoting systematic assessment of general psychological distress. If general psychological distress is the central construct related to self-care and diabetes outcomes, using a simple and quick screening measure currently used in cancer care, like a distress thermometer assessing distress over the past week on a 10-point scale ranging from 0 (no distress) to 10 (extreme distress), may be helpful in identifying those at risk [58]. The Problem List checklist assessing practical (e.g., housing and financial), family, emotional, spiritual/religious, and physical (e.g., constipation, nausea, and pain) problems that contribute to the distress that the patient is experiencing is often used together with the distress thermometer and may provide a model for a simple clinical tool that can capture both the severity of psychological distress and the contextual factors that may be contributing to it [58]. General stress screening tools like these have not been adequately assessed in diabetes care. Assessment of a more general construct of psychological distress, which does not necessarily focus on the identification of symptoms that may be associated with MDD or take the time to distinguish whether the distress is diabetes related or not or whether it captures other important aspects of well-being, may be sufficient for the identification of patients that may have problems with diabetes self-management. This could be accomplished by using a simple assessment tool, such as a distress thermometer, rather than longer scales recommended by the ADA position statement [57].

Another implication is that screening for general psychological distress could reduce unnecessary

overburdening of already-scarce mental health resources. While screening for depression in clinical settings has become widely integrated into medical care settings, problems persist in the availability of mental health resources when someone does screen positive. This system can become more overburdened when false-positive screens, which can include up to 69–71% of all individuals with diabetes who screen positive [15], are unnecessarily referred. While those experiencing MDD or other more severe presentations of distress may benefit from a referral [57], many emotional aspects of diabetes do not require extensive mental health training to address, and mild to moderate levels of distress may be best addressed as part of comprehensive diabetes care rather than by a mental health specialist who is unfamiliar with diabetes care. Additionally, while screening for diabetes distress is currently recommended by the ADA [57], processes to follow up with those reporting elevated scores are often not in place. By focusing more broadly on general psychological distress and well-being, including identifying specific sources of distress and conflict, medical care settings may be better able to help their patients address a variety of psychosocial barriers to optimal diabetes self-care. This might include connecting patients with available community resources. Focusing on psychological distress rather than psychiatric conditions can also be less stigmatizing and may make individuals more receptive to assessments and interventions targeting distress in diabetes care.

Focusing on general psychological distress rather than depression also has implications for treatment and future research on affect and health. Most importantly, the conceptualization of general psychological distress does not involve the notion of psychopathology and, thus, psychological distress would not be considered a comorbid condition [24, 37]. Rather, psychological distress can be understood as an expected emotional response to various stressors, including managing diabetes. Our findings that a general underlying construct was robustly associated with self-care, with no independent effects for depression, diabetes distress, and well-being, suggests further work in this area might be fruitful for improving our understanding of how affect is related to health among individuals with diabetes. Future studies should include multiple assessments of related emotion constructs that can be compared within persons and assess the discriminant validity of these measures, as well as test for underlying constructs in relation to outcomes. Future intervention studies could target general psychological distress more directly and compare this to interventions targeting depression. It is possible that depression may be an outcome of an earlier process that contributes to both depression and poorer self-care, such as psychological distress, rather than depression causing reduced self-care directly (as supported by our models).



The results of this study should be considered in the context of its design. Limitations include that our sample was homogenous in terms of race/ethnicity and socioeconomic status and involved adults with suboptimally controlled Type 2 diabetes who volunteered for a trial of a telephone intervention aimed at improving diabetes education and self-management, which may limit the generalizability of findings. Furthermore, baseline data were cross-sectional and, thus, directional and causal inferences cannot be drawn. It is possible that poor self-care contributes to higher levels of emotional distress. While we assessed well-being using the WHO-5, this measure did not assess all aspects of well-being and positive psychological states and has been validated as a screening measure for depression [34]. It is possible that the inclusion of other measures of positive psychological states in a similar model might show independent associations with diabetes self-care when accounting for the latent construct of psychological distress. Additionally, telephone administration of measures, which included a reduction of the Likert response scale for the DDS, could have introduced social desirability bias and additional measurement error [59, 60]. Furthermore, we did not include a composite measure of diabetes self-care, which show a strong association with depression symptoms [6], and some self-care activities were omitted from the model (exercise and foot care). We were also unable to include additional measures like anxiety and perceived stress for the latent construct of general psychological distress, as these were not included in the larger study. Omission of variables can contribute to biased parameter estimates and imprecise estimates of standard errors [61]. Additionally, alternative models may fit the data equally well or better [61]. As such, our results should be considered as exploratory and in need of subsequent confirmation that includes a larger set of measures in replication studies.

In sum, our preliminary findings suggest that general psychological distress, rather than depression or diabetes distress specifically, is most robustly related to diabetes self-care. Such findings are also consistent with the larger research on general psychological distress and health. The chronic experience of general psychological distress has shown consistent and robust associations with a variety of negative health outcomes among various populations [62], as well as those with diabetes [63]. These relationships between general psychological distress and poorer physical and mental health are believed to be both behavioral and physiological in nature [62, 64]. Results from the current study strengthen support for the behavioral pathway connecting general psychological distress and poor health outcomes among disadvantaged individuals with diabetes. Future studies with a longitudinal design, including ecological momentary

assessment methods, may better evaluate the direction of influence underlying the observed associations between general psychological distress and diabetes self-care.

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#### Compliance with Ethical Standards

**Authors' Statement of Conflict of Interest and Adherence to Ethical Standards** None of the authors have conflicts of interest to disclose.

**Authors' Contributions** J.S.G. conceived the study design and contributed to all aspects of this article. C.J.H. contributed the study concept and wrote and revised the manuscript. C.B.S. and M.M.L. contributed to the study concept, data analyses, and revisions of the manuscript.

**Ethical Approval** Institutional review boards at the Albert Einstein College of Medicine and the New York City Department of Health and Mental Hygiene (NYC DOHMH) approved the study protocol.

**Informed Consent** All participants provided informed consent.

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