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The differential associations of depression and diabetes distress with quality of life domains in type 2 diabetes

Matthew M. Carper,
Behavioral Medicine Service, Massachusetts General Hospital, Boston, MA, USA. Child and Adolescent Anxiety Disorders Clinic, Department of Psychology, Temple University, 1701 N. 13th Street, Philadelphia, PA 19122, USA

Lara Traeger,
Behavioral Medicine Service, Massachusetts General Hospital, Boston, MA, USA. Harvard Medical School, Boston, MA, USA

Jeffrey S. Gonzalez,
Ferkauf Graduate School of Psychology, Yeshiva University, Bronx, NY, USA. Diabetes Research Center, Albert Einstein College of Medicine, Yeshiva University, Bronx, NY, USA

Deborah J. Wexler,
Harvard Medical School, Boston, MA, USA. Diabetes Research Center, Massachusetts General Hospital, Boston, MA, USA

Christina Psaros, and
Behavioral Medicine Service, Massachusetts General Hospital, Boston, MA, USA. Harvard Medical School, Boston, MA, USA

Steven A. Safren
Behavioral Medicine Service, Massachusetts General Hospital, Boston, MA, USA. Harvard Medical School, Boston, MA, USA

Matthew M. Carper: matthew.carper@temple.edu

Abstract

The present investigation aimed to understand quality of life domains relevant to adults with type 2 diabetes mellitus (T2DM), and the relative associations of depression and diabetes distress with these domains. Participants were 146 individuals with T2DM who were recruited for entry into a randomized controlled trial of cognitive behavioral therapy for adherence and depression. We conducted an exploratory factor analysis on the Quality of Life Inventory (QOLI) to establish domains of quality of life relevant to this patient population. Hierarchical multiple regression models were evaluated for each domain that emerged to determine independent associations of depression severity and diabetes distress with quality of life independent of demographic and illness factors. Results suggested four quality of life domains: achievement, psychosocial growth, interpersonal relationships, and environment, accounting for 60.1 % of variance in total QOLI scores. Depression severity was associated with poorer quality of life on the achievement,

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Correspondence to: Matthew M. Carper, matthew.carper@temple.edu.

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psychosocial growth, and environment domains (p's < 0.01), while diabetes distress was associated with poorer quality of life on the achievement ($p < 0.001$) domain and marginally associated with quality of life on the psychosocial growth ($p < 0.10$) domain. Interventions designed to address both depression and diabetes distress may lead to better quality of life outcomes than a generalized depression intervention or an intervention for diabetes alone.

Keywords

Diabetes; T2DM; Quality of life; QOLI; Depression; Diabetes distress

Introduction

The reciprocal relationship between type 2 diabetes (T2DM) and depression is highlighted by consistent evidence that the presence of diabetes nearly doubles the likelihood of a comorbid unipolar depressive disorder (see meta-analyses by Ali et al., 2006; Anderson et al., 2001) and the presence of a unipolar depressive disorder increases the likelihood of developing diabetes by 37 % (Bartlett et al., 2001; Knol et al., 2006). A recent meta-analysis estimated the lifetime prevalence of unipolar depressive disorders among individuals suffering from T2DM to be 18 % (Ali et al., 2006). Moreover, depression (both formal diagnoses and subclinical symptoms) is one of the most reliable predictors of poor adherence to medical regimens among those with T2DM (Gonzalez et al., 2008). Depressed individuals with T2DM often have substantially poorer glycemic control relative to their non-depressed counterparts (Lustman et al., 2000), which may lead to a greater number of health complications (deGroot et al., 2001) and increased mortality (Katon et al., 2005). Indeed, psychosocial factors such as depression are often better predictors of medical outcomes than are physiological and metabolic measures (Rosenthal et al., 1998). In the context of these medical challenges, depression is an important risk factor for poorer quality of life (Alonso et al., 2004).

Individuals with T2DM also face disease-specific emotional stress stemming from the burden of their illness and a self-care regimen that has been estimated to require more than 2 hr each day (Russell et al., 2005). Diabetes distress can manifest itself in several ways, including concerns about healthcare quality, feeling others do not understand the difficulty of managing diabetes, feeling one is not managing diabetes well enough, and feeling overwhelmed by self-care regimens. This type of distress has been linked to poor adherence to self-care behaviors, poor glycemic control, and elevated lipid levels (Polonsky et al., 2005). A recent study by Fisher et al. (2010) found that diabetes distress, but not depression (severity or diagnosis), predicted glycemic control. However, another study showed that the number of depressive symptoms was more closely related with T2DM self-management than diabetes distress, even when those who were likely to meet criteria for major depressive disorder were excluded (Gonzalez et al., 2008).

Given these equivocal findings, investigators have stressed the importance of carefully differentiating diabetes distress, clinical depression, and subclinical depression symptoms in patients with diabetes in order to properly allocate clinical care, as depression treatments are

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unlikely to help individuals suffering from diabetes distress and self-management interventions are unlikely to be sufficient for those suffering from clinical depression (Gonzalez et al., 2011). Though work has examined these relationships in the context of self-management and glycemic control, little is known about the independent effects of depression severity versus diabetes distress on quality of life. Given that poor quality of life has been associated with greater medical service utilization, lost work days, and increased days of reduced activity (Testa & Simonson, 1998), parsing the relative contributions of these two factors has important implications for understanding how to distribute psychosocial care to patients, particularly in clinic settings with limited staff and financial resources.

Current quality of life studies among patients with T2DM are often limited by their use of either a global or a disease-specific index of quality of life (for review, see El Achhab et al., 2008). However, it is likely that individuals with T2DM value some quality of life domains over others, and these domains differ from those found in other chronic illnesses (i.e., O'Cleirigh & Safren, 2006) and forms of psychopathology (for an example among social anxiety patients, see Eng et al., 2005). Additionally, it is possible that depression severity and diabetes distress differentially impact these quality of life domains. Thus, there is a need for understanding specific quality of life domains that are relevant to individuals with T2DM who present with concerns regarding depressive symptoms. Understanding these differences could increase our understanding of how to develop interventions designed to improve depression and/or diabetes distress in order to target improvements in quality of life domains that are meaningful to patients with T2DM and depressive symptoms.

The aims of this investigation were twofold: (1) to establish domains of quality of life that are relevant to adults with both diabetes and depressive symptoms who were interested in psychotherapy treatment by analyzing the factor structure of the Quality of Life Inventory (Frisch, 1994) in this population; and (2) to determine the independent associations of depression severity and diabetes distress with domains of quality of life that emerged from the factor analysis. We hypothesized that depression severity and diabetes distress would be associated with poorer quality of life above and beyond effects of demographic, illness-related, and mental-health comorbidity variables.

Methods

Participants

Participants in the present study were recruited for entry into a randomized controlled trial (NCT00564070) of a cognitive behavioral intervention to treat depression and increase adherence to diabetes-related self-care behaviors (Safren et al., 2007). The study was conducted at Massachusetts General Hospital (MGH), a tertiary care referral center in Boston, and its affiliated outpatient clinics. Individuals were eligible for the present study if they had a diagnosis of T2DM; were between the ages of 18 and 80; were currently taking an oral hypoglycemic medication, insulin, or both; and completed the baseline assessment. Participants were excluded from the study if they could not provide informed consent; had engaged in cognitive behavioral therapy in the past 3 years; or were enrolled in the primary study but missing greater than 25 % of items on the Diabetes Distress Scale (DDS). In

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accordance with Quality of Life Inventory (QOLI) author recommendations (Frisch, 1994), participants were also excluded if they were missing either an importance or satisfaction rating for two or more life areas assessed by the QOLI (three areas may be missing if "relatives" is one of the missing areas, since participants may not have any living relatives). Of the 209 participants screened for entry into the randomized trial, 146 (M_{age} = 56.01, *SD* = 9.28) met inclusion criteria for the present analyses. Sixty-three participants (30.1 %) were excluded because they were missing two or more areas on the QOLI; 43 of these 63 participants were also missing greater than 25 % of items on the DDS (note, these were generally participants who did not go on to participate in the larger study, and mostly did not complete any of the self-report forms). One participant was missing two areas on the QOLI, but was included in the sample because one of the missing areas was relatives. None of the participants included in the present study were missing data on either the Montgomery Asberg Depression Rating Scale (Montgomery & Asberg, 1979) or the Mini International Neuropsychiatric Interview (Sheehan et al., 1998).

Procedure

Participants were recruited from the MGH Diabetes Center, primary care clinics affiliated with the hospital, and radio advertisements. A research assistant screened interested participants by phone prior to their baseline assessment to determine whether they reported depression as a problem and whether their diabetes was in poor control (HbA1c ≥ 7 %). Only individuals who reported that depressive symptoms were a problem and were likely to have an HbA1c ≥ 7 % were scheduled for a baseline assessment. All participants provided written informed consent, and study procedures were approved by the Massachusetts General Hospital Institutional Review Board. This cross-sectional study used baseline (i.e., pre-intervention) data collected prior to randomization into the larger trial.

At the baseline evaluation, a Ph.D. or Master's level clinician performed a psychodiagnostic assessment and a rating of depression severity (detailed below). Participants then completed a battery of self-report questionnaires (including the QOLI and DDS).

Measures

Clinician-administered

Mini International Neuropsychiatric Interview (MINI): The MINI (Sheehan et al., 1998) is a valid, structured diagnostic tool that assesses Axis I and II disorders in accordance with DSM-IV symptom criteria. The MINI was used to establish baseline diagnoses for each participant and was administered by an independent assessor blind to treatment condition. For participants who met criteria for multiple diagnoses, the independent assessor identified the primary, or most clinically salient, diagnosis. MINI data were used to identify unipolar depressive disorders and to generate a count variable representing the number of other comorbid Axis I diagnoses.

Montgomery Asberg Depression Rating Scale (MADRS): The MADRS (Montgomery & Asberg, 1979) is a 10-item, semi-structured assessment designed to measure depression severity. The MADRS is a well-validated and reliable measure of depression severity (Montgomery & Asberg, 1979) that has been recommended for use among medical

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populations (Kearns et al., 1982). Each item represents a specific aspect of Major Depressive Disorder (MDD), and responses are rated on a scale from 0 to 6. Anchors are provided for even numbered items (i.e., 0. 2, 4, 6), and the clinician administering the assessment must decide whether the rating falls on a defined anchor or between two anchors (i.e., 1, 3, or 5). In the present study, the MADRS was administered by an independent assessor blind to treatment condition. The MADRS was used to establish a more comprehensive rating of depression severity than would be provided by self-report.

Self-report measures

Demographics: Participants completed a brief questionnaire including age, race, ethnicity, education level, time since diabetes diagnosis, and diabetes complications. Participants also provided a list of current medications.

Diabetes Distress Scale (DDS): The DDS (Polonsky et al., 2005) is a widely-used, 17-item self-report measure designed to assess diabetes distress in four domains: Emotional burden, Physician-related distress, Regimen-related distress, and Interpersonal-related distress. Items are measured on a 6-point Likert-type scale with reference to the past month, with higher scores indicating greater distress.

Quality of Life Inventory (QOLI): The QOLI (Frisch, 1994) is a 32-item self-report questionnaire that assesses quality of life in terms of personal importance (e.g., “How important is WORK to your happiness?”) and satisfaction (e.g., “How satisfied are you with your WORK?”) across 16 life areas (e.g., work, self-esteem). Importance is assessed on a 3-point scale from 0 (not important) to 2 (very important). Satisfaction is rated on a 6-point scale from −3 (very dis-satisfied) to +3 (very satisfied). The product of the importance and satisfaction scores yields a quality of life score for each area ranging from −6 to +6, with higher scores representing higher quality of life. The sum of the non-zero products yields a total quality of life score. The QOLI manual (Frisch, 1994) recommends the following cutoffs for total QOLI scores for classifying individuals with very low quality of life (−6–0.8), low quality of life (0.9–1.5), average quality of life (1.6–3.5), and high quality of life (3.6–6.0).

Statistical analyses

Our first aim, to establish domains of quality of life relevant to adults with T2DM, was evaluated by performing an exploratory principal components factor analysis using a varimax rotation on the products of the importance and satisfaction scores of the 16 life areas assessed by the QOLI. Domains (i.e., factors) for extraction were selected on the basis of eigenvalues and by examination of the scree plot. Items selected for each domain were retained if their factor loading was greater than 0.3. When items had similar loadings that were greater than 0.3 on more than one domain, the interpretability of the domain was used to guide item assignment. These techniques follow those used in previous studies of the measure (e.g., Eng et al., 2005; O’Cleirigh & Safren, 2006) and general recommendations for conducting exploratory factor analysis (Floyd & Widaman, 1995). Cronbach’s alpha was used to evaluate internal consistency of the resulting domains. Mean scores were created by averaging item scores within each domain.

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Our second aim, to determine independent associations of diabetes distress and depression with each QOLI domain and total QOLI scores, was evaluated by performing a hierarchical multiple regression model separately for each domain and the total QOLI score. The first set of predictors entered into each model included demographic and illness-related variables that have been found to impact quality of life (for review, see Rubin & Peyrot, 1999): age, gender, race (non-Hispanic White vs. not White), years of education, diabetes complications (yes vs. no), insulin prescription (yes vs. no), diabetes duration, MDD diagnosis (yes vs. no), and psychological comorbidity (count variable indicating number of other diagnoses). The unipolar depressive disorder diagnosis included only MDD due to preliminary analyses indicating that the presence of dysthymia with or without MDD was not associated with QOLI scores. The second set entered included depression severity as assessed by the MADRS and total scores on the DDS. The squared semipartial correlations (i.e., $r_{a(b.c)}^2$) of depression severity and diabetes distress represent unique variance explained by each predictor. These values were calculated for each predictor variable entered. For models in which DDS total scores were a significant predictor, a second hierarchical regression was performed using DDS subscale scores and MADRS total scores as predictors in step 2 to determine whether certain DDS subscales were associated with QOLI domains.

Results

Sample characteristics

Men (57.5 %) and women (42.5 %) in the current sample were primarily non-Hispanic White (82.0 %), with 7.5 % African American or Black, 4.8 % bi-racial, and 3.4 % Asian. Participants had completed approximately 14.6 (*SD* = 3.4) years of education. Thirty-five percent of participants worked full-time, 20.5 % held part-time jobs, and 15.8 % were on disability.

According to the MINI, over half (56.8 %) of participants met criteria for a primary diagnosis of MDD, 10.3 % met criteria for Dysthymia, 2.7 % for Double Depression (i.e., MDD and Dysthymia), 4.1 % for “other” primary diagnosis, and 26.1 % met for no diagnosis. Among the “other” primary diagnoses, 1 met criteria for adjustment disorder, 1 for alcohol dependence, 1 for bipolar II, most recent episode depressed, 1 for depression not otherwise specified, 1 for MDD in partial remission, and 1 for mood disorder with psychotic features. The most common secondary diagnoses were Generalized Anxiety Disorder (21.2 %), Agoraphobia (15.1 %), and Social Phobia (13.0 %). There was a small but significant association between diabetes distress and depression severity ($r = 0.22$, $p < 0.01$). The sample represented individuals who, on average, were mildly depressed ($M_{MADRS} = 21.71$, $SD = 9.75$) according to MADRS cutoff scores (see, Kearns et al., 1982; Muller et al., 2003) and were distressed about their diabetes ($M_{DDS} = 2.87$, $SD = 1.09$). Additional demographic data are presented in Table 1.

Factor structure of the quality of life inventory

Four domains emerged that had eigenvalues higher than one (see Table 2); these domains accounted for 60.7 % of the variance in total QOLI scores. Five QOLI items loaded on to the first domain (goals and values, money, self-esteem, health, and work). This domain was

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labeled *Achievement* and demonstrated an internal consistency reliability of 0.79. Five items loaded on to the second domain (friends, helping, learning, creativity, and play). This domain was labeled *Psychosocial Growth* and showed an internal consistency of 0.78. One item that loaded on this domain (play: "what you do in your free time to relax, have fun, or improve yourself") had loadings greater than 0.3 on the *Achievement* and *Psychosocial Growth* domains. This item was assigned to *Psychosocial Growth* due to better conceptual fit with this domain, and increased its internal consistency from 0.74 to 0.78. Three items loaded onto the third domain (love, relatives, and children). These items reflect satisfaction in interpersonal relationships with one's partner, family, and children, and were therefore labeled as the *Interpersonal Relationships* domain. This domain had an internal consistency of 0.59. Finally, three items loaded onto a fourth domain (neighborhood, community, and home). This domain was labeled *Environment* and demonstrated an internal consistency of 0.74. One item (home) loaded similarly onto the *Interpersonal Relationships* and *Environment* domains, but was assigned to the *Environment* domain due to conceptual fit with the other items comprising this domain. Total QOLI scores in the present sample had an internal consistency of 0.86.

Depression, diabetes distress, and quality of life

In the present sample, the mean QOLI total score fell in the "very low" category (normative data are not available for QOLI subscale scores). Participants were least satisfied with the Achievement domain of quality of life (see Table 2 for means and standard deviations of each quality of life domain), though scores on this domain did not significantly differ from neutral, $t(145) = -1.47$, $p = 0.14$. Participants were slightly satisfied (i.e., had scores greater than 0) with the Psychosocial Growth ($t[145] = 5.18$, $p < 0.001$), Interpersonal Relationships ($t[145] = 6.69$, $p < 0.001$), and Environment ($t[145] = 8.48$, $p < 0.001$) domains of quality of life. Pearson correlations between diabetes distress, depression severity, depressive disorder diagnosis, QOLI total scores, and the four domains that emerged from the factor analysis are presented in Table 3.

We conducted five hierarchical linear regressions in which the criterion variables were the four domains that emerged from the factor analysis and the total QOLI score. Results of the five regressions are summarized in Table 4. When total DDS scores were a significant predictor of QOLI subscale or total scale scores, a second hierarchical linear regression was performed using total MADRS and DDS subscale scores as predictors in step 2. Results of the regressions using DDS subscales are described below.

Total QOLI scores—The overall regression model was significant ($F[11,127] = 7.27$, $p < 0.001$) and explained 39 % of the variance in total QOLI scores. Depression severity was significantly associated with total QOLI scores ($\beta = -0.42$, $t = -4.20$, $p < 0.001$). Total DDS scores were also significantly associated with total QOLI scores ($\beta = -0.23$, $t = -3.03$, $p < 0.01$). In follow-up analyses, none of the DDS subscale scores significantly predicted total QOLI scores (all p's > 0.05).

Achievement—The overall regression model was significant ($F[11, 127] = 5.11$, $p < 0.001$) and explained 31 % of the variance in scores on the Achievement domain.

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Depression severity was significantly associated with scores on the Achievement domain (β = −0.32, t = −3.00, p < 0.01). The Regimen-Related Distress subscale of the DDS was marginally significantly associated with scores on the Achievement domain (β = −0.19, t = −1.86, p = 0.07).

Psychosocial growth—The overall regression model was significant (F[11, 127] = 4.03, p < 0.001) and explained 26 % of the variance in scores on the Psychosocial Growth domain. Depression severity was significantly associated with scores on this domain (β = −0.37, t = −3.37, $p \leq 0.001$). None of the DDS subscale scores were significantly associated with scores on the Psychosocial Growth domain (all p's > 0.05).

Interpersonal relationships—The overall regression model was significant (F[11, 127] = 2.76, p < 0.01) and explained 18 % of the variance in scores on the Interpersonal Relationships domain. Depression severity was not significantly associated with scores on the Interpersonal Relationships domain (β = −0.17, t = −1.44, p = 0.15). None of the DDS subscales were significantly associated with scores on this domain (all p's > 0.05).

Environment—The overall regression model was significant (F[11, 127] = 3.67, p < 0.001) and explained 24 % of the variance in scores on the Environment domain. Depression severity was significantly associated with scores on the Environment domain (β = −0.42, t = −3.74, p < 0.001). Additionally, none of the DDS subscales were significantly associated with scores on this domain (all p's > 0.05).

Discussion

The present study identified domains of quality of life relevant to treatment-seeking patients with T2DM who presented with depressive symptoms or diabetes distress, and examined the independent associations of depression severity and diabetes distress with quality of life. Results suggest four related, but conceptually distinct, domains that are important to understanding quality of life in this population: (1) achievement, (2) psychosocial growth, (3) interpersonal relationships, and (4) environment. Participants scores on the achievement domain were lowest (though not significantly different from neutral), while scores on the psychosocial growth (i.e., personal fulfillment), interpersonal relationships, and environment domains were only slightly above neutral. In comparison to a nonclinical standardization sample and mental health samples (see, Frisch, 1994), the mean total QOLI score for the current sample was in the "very low" category of quality of life. These findings highlight the importance of developing strategies to improve quality of life, particularly with regard to sense of achievement, self-worth, and fulfillment, among individuals with T2DM presenting with depressive symptoms and/or diabetes distress.

Results also suggest that depression severity and diabetes distress, as related but distinct constructs, are each uniquely associated with various aspects of poorer total quality of life above and beyond demographic and illness factors, even within this sample where the overall rates of depression were high. One previous study found that diabetes distress, and not depression (severity or diagnosis), predicted metabolic control (Fisher et al., 2010), while another study found that depression symptoms were more closely related to self-care

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adherence than diabetes distress was (Gonzalez et al., 2008). Current findings suggest that both diabetes distress and depression severity explain a significant amount of variance in total quality of life. A particular strength of the present study was the use of a more sensitive measure of depression severity (i.e., MADRS; Montgomery & Asberg, 1979) than had been used in previous studies. Indeed, the use of the MADRS resulted in considerably larger effect sizes for explaining variance in quality of life domains than did a diagnosis of depression (see Table 3), which highlights the importance of assessing subclinical depressive symptoms (e.g., not meeting diagnostic criteria) in clinical care (Gonzalez et al., 2011). More work is needed to understand the independent associations of depression severity and diabetes distress with measures of quality of life that are objective (i.e., nomothetic approaches to measurement that do not allow for perceived importance to be factored into measurement) versus subjective (i.e., idio-graphic approaches to measurement) to appropriately allocate clinical care to this patient population.

While both depression severity and diabetes distress were independently associated with total quality of life, relationships between these problems and different quality of life domains were variable. Both diabetes distress and depression severity were independently associated with the achievement domain and psychosocial growth domain (diabetes distress was only marginally significantly associated with the psychosocial growth domain). This finding may reflect that both distress related to a complex self-care regimen and depressive cognitive schemas of failure and hopelessness (Abramson et al., 1989; Beck, 1967) may affect perceptions of progress towards general life goals and personal growth. Indeed, regimen-related diabetes distress was marginally significantly associated with the achievement domain. On the other hand, depression severity, but not diabetes distress, was associated with satisfaction with the environment domain, highlighting the relative importance of depressive cognitive schemas and general emotional distress over disease-specific distress in this domain. Notably, neither diabetes distress or depression severity was associated with scores on the interpersonal relationships domain. However, the number of diagnoses an individual had was associated with scores on this domain highlighting the contribution of psychological comorbidity to satisfaction with interpersonal relationships. Using total QOLI scores to capture overall quality of life, findings suggest that interventions should focus on alleviating depression *and* diabetes distress to provide optimal psychosocial outcomes for patients.

The present investigation had several limitations. First, some have recommended a ratio of participants to measure items of 10:1 for conducting exploratory factor analyses (e.g., Floyd & Widaman, 1995), while others have recommended a ratio of 5:1 (e.g., Gorusch, 1983). The present sample had a ratio of participants to measure items 9:1, which is just shy of the more stringent recommendations but exceeding the 5:1 guideline. The sample was recruited for entry into a randomized controlled trial of cognitive behavioral therapy for adherence and depression, thus elevating rates of depressive symptomatology and diabetes distress relative to the general diabetes population. However, this would have restricted the range of depression severity and distress scores, and our significant findings emerged despite this potential restricted range. As one reviewer noted, it is possible that stronger associations would have emerged if individuals with lower levels of depression severity and diabetes

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distress were also included. The sample was also primarily non-Hispanic White, limiting generalizability of our findings to other racial/ethnic groups. Additionally, the cross-sectional design limits our ability to make causal inferences about associations of diabetes distress and depression with quality of life domains. While the use of a count variable to quantify psychological comorbidity has a number of drawbacks, it has been shown to perform better than categorically coding psychological comorbidity (see, Widiger, 1992; Kraemer et al., 2004). Further analysis of the association between the severity of comorbid disorders and quality of life domains may provide more information on the contribution of this variable. Finally, results from the interpersonal relationships domain should be interpreted with caution given the low internal consistency of this domain.

Despite these limitations, findings provide preliminary guidance for improving clinical care for distressed patients with T2DM. First, interventions targeting both depressive symptoms and diabetes distress may lead to better outcomes relative to a depression-specific intervention, which does not address diabetes-specific concerns or a targeted intervention for diabetes self-efficacy, which ignores depression pathology. Indeed, our recent review of treating depression in individuals with diabetes found mixed evidence for the effectiveness of interventions targeting depression alone in improving metabolic control (Markowitz et al., 2011). The authors concluded that interventions integrating depression treatment with diabetes-specific medical adherence training may improve diabetes-related outcomes.

Findings also suggest several avenues for future research. The use of the QOLI may enhance outcomes measurement in clinical trials for T2DM because it integrates perceptions of both the quality and the importance of quality of life domains (for a review of literature supporting the use of the QOLI in clinical trials more generally, readers are referred to Frisch, 1994). Differing from the Audit of Diabetes Dependent Quality of Life (ADDQoL; Bradley et al., 1999), which assesses perceptions of the impact of diabetes on quality of life, the QOLI offers a unique measurement strategy that can be both disease-specific (by using the scoring system outlined above, which is based on a distressed, diabetes population and is similar to scoring systems found for other chronic illness populations [see, O'Cleirigh & Safren, 2006]) *and* general (by using the total QOLI scores)—thus allowing comparisons between diabetic samples, non-diabetic samples, and samples with other chronic illnesses.

Quality of life assessment among individuals living with T2DM is an important area of research to inform intervention development. Results of the present study provide support for using the QOLI to measure quality of life domains that are relevant to individuals with T2DM presenting with emotional distress. Results suggest that targeting both diabetes distress and depression may enhance the outcomes of psychosocial intervention strategies in this population.

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Table 1

Participant demographic information (N = 146)

Variable	*M* (*SD*)	% (N)
Age (years)	56.01 (9.28)	–
Sex		
Male	–	57.5 (84)
Female	–	42.5 (62)
Time since T2DM diagnosis	10.93 (8.23)	–
HbA1c(%)	8.25 (2.21)	–
Prescribed insulin	–	50.0 (73)
Diabetes-related complications		
Cardiovascular disease	–	21.2 (31)
Nephropathy	–	4.8 (7)
Retinopathy		19.9 (29)
Neuropathy	–	32.2 (47)
Comorbidities		
Physical (i.e., medical diagnoses beyond diabetes)	–	71.2 (104)
Psychological	–	53.4 (78)

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Table 2

Rotated factor loadings, communalities, means, and internal consistency of QOLI life areas

	Domain 1	Domain 2	Domain 3	Domain 4	Communalities
Domain 1: *Achievement* (M = −0.29, SD = 2.40, α= 0.79)					
Goals	0.755	–	–	–	0.624
Money	0.741	–	–	–	0.596
Self-esteem	0.691	–	0.358	–	0.659
Health	0.690	–	–	–	0.491
Work	0.657	–	–	–	0.536
Domain 2: *Psychosocial growth* (M = 0.93, SD = 2.18, α = 0.78)					
Helping	–	0.791	–	–	0.637
Friends	–	0.685	0.358	–	0.610
Learning	0.382	0.635	–	–	0.591
Creativity	0.410	0.622	–	–	0.565
Play	0.544	0.462	0.328	–	0.624
Domain 3: *Interpersonal relationships* (M = 1.45, SD = 2.62, α = 0.59)					
Love	–	–	0.790	–	0.684
Relatives	–	–	0.702	–	0.607
Children	–	0.354	0.387	–	0.303
Domain 4: *Environment* (M = 1.63, SD = 2.33, α = 0.74)					
Neighborhood	–	–	–	0.881	0.795
Community	–	–	–	0.852	0.791
Home	–	–	0.509	0.499	0.607
Total QOLI scores M = 0.78, SD = 1.77, α = 0.86					

Life areas with rotated factor loadings less than 0.3 are not shown. They are available upon request of the first author

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Table 3

Pearson's correlations between the DDS, MADRS, and QOLI total and domain scores

Variables	$MADRS_{total}$	Depressive disorder diagnosis[a]	DDS_{total}	$QOLI_{total}$	Achievement	Psychosocial growth	Interpersonal relationships	Environment
$MADRS_{total}$	–							
Depressive disorder diagnosis	0.44^{**}	–						
DDS_{total}	0.22^{**}	0.04	–					
$QOLI_{total}$	-0.49^{**}	0.10^{**}	-0.32^{**}	–				
Achievement	-0.41^{**}	0.09^{**}	-0.36^{**}	0.77^{**}	–			
Psychosocial growth	-0.37^{**}	0.06^{*}	-0.20^{*}	0.83^{**}	0.51^{**}	–		
Interpersonal relationships	-0.25^{**}	0.04	$-0.16^{\dagger}$	0.71^{**}	0.31^{**}	0.49^{**}	–	
Environment	-0.40^{**}	0.04	$-0.16^{\dagger}$	0.64^{**}	0.28^{**}	0.38^{**}	0.47^{**}	–

$^{*}p < 0.05$;

$^{**}p < 0.01$;

$^{\dagger}p < 0.10$

[a]Coefficients represent R^2 since this variable was dummy coded (MDD, Dysthymia, and Double Depression versus no depression). Follow-up analyses indicated that only MDD was associated with QOLI scores

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Table 4

Hierarchical regression models of depression severity and diabetes distress predicting domains of quality of life and total Quality of Life Inventory (QOLI) scores

Predictor Variable	*b*	*β*	R^2	R^2_{Change}	*F* (df_{model}, df_{error})	$r_{a(b.c)}^2$
Total QOLI score						
Step 1: Demographic and illness factors			0.25		4.74 (9, 129)***	
Age	0.01	0.03				0.00
Gender (0 = Male; 1 = Female)	0.58	0.33[a]*				0.02
Race (0 = Non-hispanic white; 1 = Minority)	0.51	0.29[a]				0.01
Years of education	−0.05	−0.09				0.01
Diabetes complications (0 = No; 1 = Yes)	−0.30	−0.17[a]				0.01
Prescribed insulin (0 = No; 1 = Yes)	0.31	0.17[a]				0.01
Diabetes duration	0.00	0.01				0.00
MDD diagnosis (0 = No; 1 = Yes)	−0.57	−0.32[a]†				0.02
Number of comorbid psychological diagnoses	−0.57	−0.40***				0.11
Step 2:			0.39	0.14	7.27 (11, 127)***	
MADRS	−0.08	−0.42***				0.08
DDS	−0.02	−0.23**				0.04
Achievement						
Step 1: Demographic and illness factors			0.17		3.03 (9, 129)**	
Age	−0.01	−0.05				0.00
Gender	0.22	0.09[a]				0.00
Race	0.79	0.33[a]				0.01
Years of education	−0.01	−0.01				0.00
Diabetes complications	−0.25	−0.10[a]				0.00
Prescribed Insulin	−0.01	−0.00[a]				0.00
Diabetes duration	0.01	0.04				0.00
MDD diagnosis	−0.99	0.41[a]*				0.04
Number of comorbid psychological diagnoses	−0.58	−0.30**				0.06
Step 2:			0.31	0.13	5.12 (11, 127)***	
MADRS	−0.08	−0.32**				0.05
DDS	−0.04	−0.30***				0.07
Psychosocial growth						
Step 1: Demographic and illness factors			0.17		2.95 (9, 129)**	
Age	0.00	0.01				0.00
Gender	0.84	0.39[a]*				0.03
Race	0.55	0.25[a]				0.01

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Predictor Variable	*b*	*β*	R^2	R^2_{Change}	*F* (df_{model}, df_{error})	$r_{a(b.c)}^2$
Years of education	−0.04	−0.06				0.00
Diabetes complications	−0.01	−0.00[a]				0.00
Prescribed insulin	0.71	0.33[a†]				0.02
Diabetes duration	−0.01	−0.03				0.00
MDD diagnosis	−0.68	0.31[a†]				0.02
Number of comorbid psychological diagnoses	−0.52	−0.29**				0.06
Step 2:			0.26	0.09	4.03 (11, 127)***	
MADRS	−0.08	−0.37***				0.07
DDS	−0.02	−0.14†				0.02
Interpersonal relationships						
Step 1: Demographic and illness factors			0.16		2.81 (9, 129)**	
Age	0.01	0.05†				0.00
Gender	0.88	0.34[a]				0.03
Race	0.40	0.15[a]				0.00
Years of education	−0.12	−0.16†				0.02
Diabetes complications	−0.49	−0.19[a]				0.01
Prescribed insulin	0.09	0.03[a]				0.00
Diabetes duration	0.01	0.03				0.00
MDD diagnosis	−0.01	−0.00				0.00
Number of comorbid psychological diagnoses	−0.66	−0.32***				0.07
Step 2:			0.19	0.03	2.76 (11, 127)	
MADRS	−0.04	−0.17				0.01
DDS	−0.02	−0.13				0.01
Environment						
Step 1: Demographic and illness factors			0.15		2.59 (9, 129)**	
Age	0.04	0.15				0.02
Gender	0.55	0.24[a]				0.01
Race	−0.01	−0.00[a]				0.00
Years of education	−0.03	−0.04				0.00
Diabetes complications	−0.27	−0.12[a]				0.00
Prescribed insulin	0.35	0.15[a]				0.00
Diabetes duration	0.00	0.01				0.00
MDD diagnosis	−0.27	−0.12[a]				0.00
Number of comorbid diagnoses	−0.54	−0.29**				0.06
Step 2:			0.24	0.09	3.67 (11, 127)***	
MADRS	−0.10	−0.42***				0.08
DDS	−0.01	−0.06				0.00

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Significance of *F*-statistic for Step 2 represents the significance of the change from Step 1

$^{\dagger}p \leq 0.10$;

$^{*}p < 0.05$;

$^{**}p < 0.01$;

$^{***}p \leq 0.001$

[a]Represents Y-standardized coefficients