THE ADDITIVE AND INTERACTIVE EFFECTS OF DIABETES AND GENERAL LIFE
STRESS ON OVERALL PSYCHOLOGICAL DISTRESS

By

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THESIS ABSTRACT

Additive and Interactive Effects of Diabetes and General
Life Stress on Overall Psychological Distress

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Type 2 diabetes is a chronic disease that is reaching epidemic proportions around the

world. A number of disease-related factors put patients at risk for experiencing

diabetes-specific stress that may contribute to patients' overall psychological distress. Yet

at the same time, patients are experiencing other significant stressful events in their lives,

which could further exacerbate their distress. Further research is clearly needed that

identifies ways in which patients are most affected by their disease to intervene

appropriately. This study sought to contribute to this area of the literature by exploring

how different types of disease-specific stress relate to overall psychological distress

(depressive and anxiety symptoms) among individuals with diabetes. This study further

sought to understand whether experiencing general life stress changed the nature of these

associations. This study used survey data collected from a community-based sample of

119 middle-aged and older adults with type 2 diabetes (mean age = 59.71) in the greater

Philadelphia area. Diabetes-related stress was assessed by examining perceived diabetes

frustrations, worry about complications, and burden; general life stress was assessed by

both a count of life events and subjective stressfulness ratings; psychological distress was

assessed by depressive and anxious symptoms. Multivariable regression analyses were

conducted to examine the main and interactive effects of diabetes-specific and general life stress in predicting psychological distress (anxious and depressive symptoms). The results revealed unique main effects for diabetes-related frustration, burden, and general life stress in predicting depressive symptoms (all $ps < .02$). The results also revealed significant interactions between two of the three scales of diabetes-related stress and subjective stress ratings of stressful life events in predicting anxious symptoms (all $ps < .02$). The findings suggest that there are unique effects of different types of stress on depressive symptoms, whereas general life stress impacts the relationship between diabetes-specific stress and anxious symptoms. Identifying the unique contributors to mental health symptoms is important in understanding how these symptoms may interfere with successful chronic disease management.

Introduction

Global health and lifestyles are rapidly changing. As a result, there is an increasing prevalence of type 2 diabetes worldwide, causing it to be a significant public health concern (Centers for Disease Control and Prevention [CDC], 2013). Approximately 1 in 11 people globally have diabetes, and if these current trends continue, it is estimated that by 2040 over 642 million people, or 1 in 10 adults, will have diabetes (International Diabetes Federation, 2015). The United States has a large share of the global burden of diabetes. Diabetes affects roughly 29 million people in the United States. The prevalence of diabetes among adults increased from 29.2% in 1999-2002 to 36.2% in 2007-2010 (CDC, 2013). In 2012 alone, an additional 1.7 million people over the age of 20 were newly diagnosed.

Diabetes becomes more common with age, with more than 25% of the US population aged 65 years having diabetes (CDC, 2011). In the U.S., the epidemic of type 2 diabetes has been closely linked to the increasing rates of people being overweight and obese (Boyle, Thompson, Gregg, Barker & Williamson, 2010). The increasing number of older adults in the population, coupled with rising obesity rates, illustrate that diabetes rates are not fleeting (Shaw et al., 2010). For example, even if diabetes rates plateau, the prevalence of diabetes will at least double in the next 20 years because of the aging of the population (CDC, 2011).

Societal costs and personal costs associated with the complications of diabetes are also increasing at an alarming rate, which is a cause for concern for individuals with the disease, as well as healthcare and insurance providers (Bjork, 2001). More than 20% of

healthcare spending in the United States is for the treatment of people diagnosed with diabetes (CDC, 2016).

On average, people with diabetes are three times more likely to be hospitalized, compared to individuals without diabetes (CDC, 2013). People living with diabetes also are at increased risk for serious health complications including nerve damage, kidney failure, amputation of feet, toes or legs, vision loss, heart disease, stroke, and premature death (CDC, 2013). Among older adults, in particular, diabetes is linked to reduced functional status, increased risk of institutionalization, and higher mortality rates. Moreover, diabetes is related to an increased risk of mental health issues such as depression and anxiety (ADA, 2014). Due to the large number of individuals diagnosed in the United States, and the personal and societal costs of uncontrolled diabetes, diabetes is a socially-relevant topic to study.

Alongside increasing rates of diabetes, the United States is faced with historically high levels of psychological stress (American Psychological Association, 2009). The current study focused on the intersection of these socially-relevant physical and mental health issues by examining stress within the context of diabetes. Specifically, the current study sought to understand how different types of disease-specific stress relate to overall psychological distress among individuals with diabetes. In addition, this study also sought to investigate the interactive effects of diabetes-specific and general life stress on psychological distress. Understanding the comorbidity between mental health issues and diabetes is important because of the possible implications for successful management of diabetes and health-related outcomes (Prince, Patel, Saxena, Maj, Maselko, Phillips &

Rahman, 2007).

Diabetes as a Source of Stress

Stressors are defined as events or situations that elicit physiological or psychosocial reactions like anxious or depressive symptoms (CDC, 2016). Diabetes represents one of the most serious stressors to patients (Piette & Kerr, 2006), and it is considered a chronic stressor (ADA, 2014), as there are many sources of diabetes-related stress on an ongoing basis. This person-environment relationship involves diabetes-related demands, like self-management, that are an added stressor to an individual's lifestyle (Morris, Moore & Morris, 2011). The distress resulting from diabetes-related stress is often related to - but distinct from - general distress (ADA, 2014). More needs to be understood, however, about how specific types of diabetes stress relate to specific types of distress.

Type 2 diabetes has been referred to as a 'lifestyle disease' because it is associated with a number of lifestyle changes (ADA, 2014). The self-management of diabetes is a necessary component of care, but can be stressful in its own right, as it involves adhering to a complex daily regimen (ADA, 2014). Such regimens involve initiating and maintaining a number of health behaviors to ensure successful diabetes control and avoid complications of uncontrolled diabetes (ADS, 2014). Soon after they are diagnosed, patients must engage in such behaviors as self-monitoring their own blood glucose, eating a healthy diet, exercising regularly, taking oral medication and/or insulin, not smoking, and keeping stress levels low (CDC, 2011). Because these behaviors often require changes to already established routines on a lifelong basis, daily adherence is

difficult and may be stressful. Further, some individuals base their diets and lifestyles around pleasure and satisfaction; ergo, satisfaction is an important part in maintaining healthy actions and lifestyle in individuals with diabetes (Lally & Gardner, 2013). When patients no longer derive satisfaction from their new diabetes lifestyle, they may experience stress (Morris, Moore & Morris, 2011).

In addition to the stress related to managing diabetes, emotional stress from diabetes may occur in response to perceptions of health threats (Watson & Dokkeen, 2014), as patients are often aware of the long term risks associated with disease related complications (Lazarus & Folkman, 1984) and shortened life expectancy (Prince, Patel, Saxena, Maj, Maselko, Phillips & Rahman, 2007). Individuals with diabetes also may experience symptoms such as pain (e.g. neurological pain and pain in the feet), as well as hypoglycemia as a result of medications, particularly insulin (CDC, 2016). Moreover, individuals with diabetes may experience functional limitations, or disability, which has been found to be related to depression and other common mental disorders (CDC, 2016). Social stigma (e.g. feeling judged and feeling isolated) from being diagnosed with diabetes can lead to guilt, loss of social support, or breakdown of key relationships (Prince, Patel, Saxena, Maj, Maselko, Phillips & Rahman, 2007).

Finally, treating diabetes effectively customarily requires the routine assistance from a health care provider. Healthcare providers can be involved by assisting individuals with medication regulation, glucose control, and self-management tasks (CDC, 2013). Patients managing their diabetes often seek the guidance from multiple sources, including - but not limited to - pharmacists, registered educators, primary physicians, dieticians,

endocrinologists and nurse practitioners (National Diabetes Education Program, 2013).

Not only is scheduling, visiting, and having relationships with multiple health care

providers stressful (Sarafino & Smith, 2014), but the relationship between providers and

patients also can be stressful (Sarafino & Smith, 2014). One source of stress is negative

experiences with practitioners, which could lead people to delay or stop getting medical

attention they need, and further serve as a source of stress (Sarafino & Smith, 2014).

Practitioners can elicit stress in patients by insensitive talk, lack of responsiveness, failure

or rushed manner when explaining medical problems or treatments, and the unwillingness

to involve the patient in their own treatment plan (Gonzalez, Delahanty, Safren, Meigs,

& Grant, 2008; Sarafino & Smith, 2014). In addition, physicians who are controlling and

doctor-centered can lead to more tension in the relationship (Sarafino & Smith, 2014),

and cause patients stress.

Because patients have less routine contact with their providers, members of their

informal social network (e.g. family, friends) can have a more direct impact on how

patients manage their self-care activities independently (Villagra & Ahmed, 2004).

Patients and family members of the patient are usually recognized as being fully

responsible for diabetes adherence and decision making, which can be stressful

(Delamater, 2006). Disease-related interactions between patients and their family

members, particularly spouses, can be stressful, especially if these interactions involve

demanding, critical, or undermining behaviors from spouses (August et al., 2015; Franks

et al., 2016). These interactions may cause patients to experience further stress

(Delamater, 2006).

Co-morbidity between Diabetes and Mental Health Issues

As a result of the many stressors associated with diabetes, it is not surprising that mental health issues and diagnosed diabetes are highly comorbid (Prince, Patel, Saxena, Maj, Maselko, Phillips & Rahman, 2007). Mood and anxiety disorders are higher among people with diabetes, when compared to people without diabetes (Lin & Von Korff, 2008). Specifically, studies have found that diabetes is associated with patients experiencing more depressive symptoms and clinical levels of depression (Sorkin, Ngo-Metzger, Billimek, August, Greenfield & Kaplan, 2011; Gonzalez et al. 2008). As a result of patients' experience with changing their lifestyles and complications associated with having diabetes, individuals may be more likely to experience symptoms of depressed mood such as diminished interest, self-blame, fatigue, hopelessness and suicidal ideation (Gonzalez et al., 2008). Indeed, some studies suggest that the majority of the depression rates in patients with diabetes could stem from the stress about diabetes self-management (Fisher, Skaff, & Mullan, 2007).

Previous studies also have found diabetes to be associated with general anxiety (Morris, Moore & Morris, 2011). As a result of symptom-related worries like fear of hypoglycemia, uncertain illness progression, and injection-phobia (Smith et al., 2013), patients may experience anxiety symptoms such as excessive and unrealistic worry about everyday tasks or events (CDC, 2016). Previous research supports the idea that having a medical illness such as diabetes could lead to an increased likelihood of developing anxiety (Smith et al., 2013). In previous research, patients with type 2 diabetes displayed high rates of anxiety at rates 7–23% higher than that of the general population of adults,

although the number of patients with high levels of depression stemming from diabetes is even higher (Fisher et al. 2008).

Assessing the comorbidity between diabetes and mental health issues is important because these issues have major implications for diabetes management and diabetes outcomes (Prince, Patel, Saxena, Maj, Maselko, Phillips & Rahman, 2007). Not only does diabetes impact stress levels, but chronic stress can affect diabetes management and outcomes (Morris, Moore & Morris, 2011). Chronic stress can destroy bodies and minds; it is a risk factor for the development and progression of many diseases, as a result of pathophysiological changes in the body or engaging in poor health behaviors such as overeating, smoking, and drinking alcohol that people do to cope with stress (Miller, Smith & Rothstein, 1994).

Previous studies have concluded that patients who experience high levels of stress in their lives have worse diabetes outcomes. For example, stress may arouse negative affect that leads individuals to consume more high-carbohydrate "comfort foods" in an effort to reduce their stress (Tomiyama, Dallman & Epel, 2011). Stress and frustration caused by long term problems related to diabetes regulation may take a toll on people and also cause them to neglect their diabetes care (ADA, 2014). Not surprisingly, then, individuals with diabetes who have psychological problems are less likely to adhere to their regimens (Delamater, 2006). For example, depressive symptoms have been found to be predictive of poor diabetes self-care (Gonzalez, Delahanty, Safren, Meigs, & Grant, 2008). Also, stress from diabetes and other sources may adversely affect blood glucose levels (Morris, Moore & Morris, 2011), a critical factor for successful diabetes control

(CDC, 2013). Finally, individuals with diabetes that have depression and anxiety use medical services more frequently (Lin & Von Korff, 2008).

Other Sources of Stress

The challenge of managing diabetes adds to other sources of stress many people with diabetes experience (Lally & Gardner, 2013). Thus, it is important to note that in addition to stress that stems from the disease itself, individuals experience other life stressors within family, work, and economic aspects of their lives; these other sources of stress also may be important contributors to patients' overall psychological distress (Fisher, Chesla, Mullan, Skaff & Kanter, 2001). Stress and depression research shows the impact of stressful life events in precipitating depressive episodes (Hammen, 2005). Stress is also linked with anxiety; for example, when an acute stressor is introduced into a test taking environment, studies have shown that anxiety is high (Cassady & Johnson, 2002). The impact of different types of stress on psychological distress can be complicated, then, because of the many different types of stress patients may be experiencing at the same time –both chronic and acute stress (Miller, Smith & Rothstein, 1994).

Little is known about implications for patients' level of distress when they are already dealing with a chronic stressor such as diabetes and then experience an acute stressful event in their life. To appropriately treat diabetes and any comorbid mental health issues, there is a need to target the source and factors related to the stress (Kruse, Schmitz & Thefeld, 2003). Given recommendations that research in the area of diabetes could be further advanced by reframing research questions for existing datasets (Kelly &

Ismail, 2015), the current study used already collected data to further understand how different sources of stress are related to overall distress among patients with diabetes.

The Role of Sociodemographic Factors

The association between diabetes-specific and general life stress and overall psychological distress among individuals with diabetes may differ as a function of sociodemographic factors, as prevalence rates of diabetes and mental health issues, as well as types and sources of stress, may differ as a function of sociodemographic factors, including age, race/ethnicity, gender, marital status, and education level. (Although income also was considered as a covariate, it is not typically a good measure of socioeconomic status in later life, and the question used to assess income included ranges rather than specific values; thus, there were conceptual and methodological reasons not to include it.). Thus, these variables will be considered as potential covariates in analyses.

Age. Our health deteriorates as age increases, and this becomes a source of stress in many older adults (Link & McKinlay, 2009). Chronic diseases, such as heart disease, cancer, and diabetes are seen most often in later life, and this deterioration in health creates additional sources of stress for older adults (Morris, Moore & Morris, 2011). For individuals in the United States, 18.4% of older adults are diagnosed with diabetes, compared to 10.5% of middle-aged adults 45-64 (ADA, 2014).

Race/Ethnicity. Race/ethnicity is a major determinant of the prevalence of diabetes in the United States, with racial/ethnic minorities experiencing a disproportionate burden of diabetes compared to non-Hispanic whites (National Institutes of Health, 2014, ADA, 2014). Specifically, 6.5% of Non-Hispanic White adults, 14.4%

of African American adults, and 11.8% of Latino adults have diagnosed diabetes (ADA, 2014). Although minority patients with diabetes tend to report more mental health symptoms, they are less likely to be diagnosed or treated for mental health issues compared to white patients (Sorkin et al., 2011). In addition, when compared with the general population in the United States, members of racial and ethnic minority groups are less likely to have access to or receive lower quality mental health services (Samnaliev, McGovern & Clark, 2009).

Gender. Studies have found gender differences across all ages in people with diabetes (Chiu & Wray, 2011). Studies have revealed that women have worse A1c levels, blood pressure, BMI, and more complications than their male counterparts (Chiu & Wray, 2011). Gender has been found to play a critical role in the association between stress and mental health in the context of diabetes (Heraclides, Chandola, Witte & Brunner, 2012). For example, one study found that women with diabetes had lower perceived family support and perceptions of diabetes control, which increased stress, and was related to higher depressive symptoms than for men. Previous studies have found an association between work stress and depressive and anxiety disorders (Virtanen, Honkonen, Kivimäki, Ahola, Vahtera, Aromaa & Lönnqvist, 2007), but in this case, the association was stronger for men than women (Virtanen et al, 2007). Previous studies also have found significant gender differences in several stress-related variables; women have more daily stress, as well as more chronic problems, conflicts, daily demands and frustrations (Matud, 2004). Half of stressful events listed by women and men were significantly different, with women more frequently reporting family and health-related

events experienced by other people in their life (Matud, 2004). Women are twice as likely to have depression, and symptoms of depression, as men of the same age, and 12% of all women in the United States will experience symptoms of depression at some point in their lives (CDC, 2014). Anxiety disorders often occur alongside other mental health conditions, such as depression, with gender differences also apparent – women are more likely to have generalized anxiety disorder than men (CDC, 2014).

  Marital Status. Chronic illnesses such as diabetes require a significant life adjustment, both for the patient and for the spouse of married patients (Trief, Ploutz-Snyder, Britton & Weinstock, 2004). Patients and spouses typically work together to facilitate adherence to the patients' regimen, which could include becoming educated about the disease and making changes to their established health behaviors (e.g., eating patterns); stress and anxiety may occur as a result of not only having to change one's own but also one's partner's lifestyle (Trief, Ploutz-Snyder, Britton & Weinstock, 2004). Studies have found that both patients and spouses experienced stress from the patient's' diabetes, which was related to higher levels of depressive symptoms. Differences in rates of depressive disorders and anxiety disorders in married versus unmarried men and women (Scott et al., 2010) also illustrate the importance of considering marital status, and the spousal support that is posited to occur in this context (Franks, Lucas, Stephens, Rook & Gonzalez, 2010), in the link between stress and mental health among patients with diabetes. Yet, a growing number of adults are unmarried, requiring a need to understand how diabetes-related stress is related to mental health issues among not only married patients, but unmarried patients, too.

The Current Study

If health is approached from a holistic viewpoint (World Health Organization), mental health needs to be recognized as an integral part of practice guidelines in health care, especially chronic disease management (Prince, Patel, Saxena, Maj, Maselko, Phillips & Rahman, 2007). My study sought to add to the existing literature on physical and mental health comorbidity by examining how disease-specific and general life stress were related to overall psychological distress. Specifically, this study sought to understand how different types of diabetes-specific stress are related to overall psychological distress (as assessed by depressive and anxious symptoms). This study further sought to examine whether general life stress modifies the association between different sources of diabetes-specific stress and overall psychological distress.

Hypotheses. Due to the chronic nature of diabetes and the life altering self-management behaviors, it is hypothesized that higher levels of diabetes-specific stress will be associated with higher levels of depressive and anxious symptoms.

It is also hypothesized that general life stressful events will exacerbate the association between diabetes-specific stress and depressive and anxious symptoms. In other words, the association between diabetes-specific stress and overall psychological distress will be stronger when patients also experience a high level of general life stress. Other sociodemographic factors that are posited to impact the association between diabetes-specific stress and general life stress in predicting depressive and anxious symptoms will be considered as covariates in the current study.

Method

Participants

The data used for my study was from a larger study on psychosocial factors related to diabetes management ("The Diabetes Experiences Study"). The Diabetes Experiences Study received IRB approval in March 2013 and has been renewed every year since. Data collection was conducted from March, 2013 through May 2015. The participants included middle-aged and older adults with type 2 diabetes residing in the Philadelphia area. Eligibility to participate in the study consisted of being between the ages of 45-85 years old; actively seeing a healthcare provider at least once per year to manage their diabetes; fluent in the English language; and free of any significant cognitive impairment.

A total of 119 individuals (57 men, 62 women) were recruited to participate from primarily the greater Philadelphia area, as well as from southern and central New Jersey. See Table 1 for sociodemographic characteristics of participants. The average age of participants was 59.71 ($SD = 11.19$). Racial/ethnic characteristics of the participant sample were 59.1% non-Hispanic White, 30% non-Hispanic Black, 4.5% Asian/Pacific Islander, 2.7% Hispanic, and 3.7% other race/ethnicity. Of the sample, 6.8% had less than a high school degree, 30.5% had a high school degree, 22.8% had some college, 22.0% had a bachelor's degree, and 17.8% had at least some post-collegiate education. In addition, a total of 39.7% were retired, 37.9% were working full or part time, 9.5% were unemployed, 4.3% were homemakers, and 8.7% identified with an "other" option. Income characteristics were, 45.4% earned an income less than $55,000, and 54.6%

earned an income of $55,000 or more. Marital status was as follows: 50.4% married/in a marital-like relationship, 19.3% single/never married, 19.3% divorced/separated, and 10.9% widowed. Participants were diagnosed with diabetes for 12.15 years, on average ($SD = 8.42$).

Procedure

Recruitment fliers were posted in a variety of local businesses that allowed for advertisements (e.g. grocery stores, pharmacies, offices) and health care provider offices by permission (e.g. primary care physicians, diabetes educators, specialty offices). Advertisements also were placed in local periodicals and websites (e.g. Craigslist, Facebook). Additionally, research assistants attended various local community events (e.g. Collingswood Farmer's Market, Step Out for Diabetes event, Camden County Health Fair, Burlington County Senior Expo) to spread the word about the study and distribute fliers. After screening interested participants for eligibility, individuals who agreed to participate were then given consent forms and interviews were scheduled. Before the research assistants administered the interview to the participants, the participants were asked to complete a self-administered questionnaire either over the phone, through email, or via mail. The purpose of filling out the pre-interview questionnaire prior to the interview was to assess information important for the overall purpose of the study (e.g., provider type use, insurance, clinical indicators, etc.). Most participants completed the interview either at the Relationships, Health and Aging lab on the Rutgers Camden campus, or at another location that was convenient for the participant (e.g. a participant's home, local library, place of work).

At the beginning of each interview the procedure and consent forms were briefly reviewed and participants were asked if they had any questions before proceeding with the survey. Participants were then instructed to begin the interview, which lasted approximately 90 minutes (but ranged between 1-2 hours across participants). Within that time frame, approximately 15 minutes were devoted to the questions specific to this study. Trained interviewers read each question aloud. To further aid in comprehension, cards with each response option were provided for all multi-item response scales, so participants had a visual reference for their answers. Participants were offered breaks between each interview section and were offered another opportunity to ask questions at the end of the interview. After the interview, participants completed a short (approximately 15 minute) post-interview self-administered questionnaire, which included questions specific to the current study, including ones about anxiety and depressive symptoms. A brief exit survey also asked participants about any questions or concerns they had related to their participation.

For participants who were interested and eligible to complete the study, but could not commit to an in-person interview (e.g., as a result of travel limitations, time constraints), a mail-out version of the interview was sent to participants, which included return postage. Participants who chose to complete this mail-out questionnaire were given the contact information for the lab if they had any questions regarding the materials. Participants were allotted at least 2 weeks to complete the materials (of which, participants typically spent between 60-90 minutes completing the questionnaires). A variable for interview versus mail version was developed to examine any significant

differences in key variables by type of survey administration (preliminary analyses suggest no significant differences for mode of administration on any key variables). All participants were compensated $20 for their time, either in cash (in person) or via money order after the completed questionnaire was returned to the lab (mail-out version). Participants also were entered into a raffle for a chance to win an additional $100. Lastly, the participants who traveled to the Rutgers-Camden campus were compensated for parking and bridge toll costs.

Measures

Independent Variables. The independent variables were levels of diabetes-specific stress, namely, diabetes-related frustration, burden and worry. All three measures have been used successfully in other diabetes patient samples by the PI. Instead of examining the three types of diabetes stressors together, they were analyzed separately to assess for differences in how each stress scale was related to depressive and anxious symptoms. A factor analysis and unique associations with outcomes also supported the decision to analyze these scales separately.

Frustration. To assess participants' frustration about possible diabetes-related management, seven items were used *[See Appendix 3 and Table 2]*. Participants rated on a 5-point scale how often they were burdened or frustrated about the management of diabetes (1 = none of the time, 4 = all of the time). A sample item included "Were you frustrated about your diabetes?" The items were averaged to create a composite measure of diabetes frustration ($\alpha = .90$).

Diabetes-Related Burden. To assess participants' level of diabetes-related

burden, seven questions were used *[See Appendix 1 and Table 2]*. Participants rated on a

6-point scale the extent to which they felt burdened by their chronic disease (1 = very

large burden, 6 = not a burden at all). A sample item included "Overall, how much of a

burden is having diabetes on you and your family in each of the following areas… Your

overall health?" The items were reverse coded and averaged to create a composite

measure of diabetes-related burden (α = .91).

Worries about Complications. To assess participants' worries about possible

diabetes-related complications, seven items were used *[See Appendix 2 and Table 2]*.

Participants rated on a 5-point scale the extent to which they were worried or concerned

about complications that may develop from diabetes (1 = extremely worried, 5 = not at

all worried). A sample item included "Dying earlier than most people because of

diabetes." The items were reverse coded and averaged to create a composite measure of

diabetes worries (α = .95).

Moderator: Stressful Life Events. Participants were asked which of several

different types of life stress had occurred in the past six months (0 = did not occur, 1 =

did occur), a time period found to yield relatively accurate recall of life events (Turner &

Wheaton, 1995) *[See Appendix 4 and Table 3]*. Items were drawn from commonly used

measures of life stress (Dohrenwend, Krasnoff, Askenasy, & Dohrenwend, 1978; Turner

& Wheaton, 1995) and from measures specifically designed for older adults (Aldwin,

1990). If participants answered affirmatively to experiencing an event, they were asked a

follow up question, "How stressful?" (1 = very, 5 = not at all). Participants who did not

experience that event were coded as 5. The items were then reverse coded and averaged

to create a composite measure of subjective ratings of stressful life events. Subjective

ratings of stressful life events were used in regression analyses because of a) the

importance of perceptions of stress in contributing to mental health and (Sarafino &

Smith, 2014) and b) to be parallel with the diabetes-stress measures, which also assess

participants' subjective ratings of stress. However, stressful life events are still included

in descriptive analyses (which show a high correlation with subjective ratings of these

events, $r = .89$, $p < .001$).

Dependent Variables. The dependent variables include anxious and depressive

symptomatology.

Depressive Symptoms. To assess depressive feelings, the 11-item version of the

Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was used

($\alpha = 0.83$) *[See Appendix 6 and Table 3]*. The CES-D is a self-report questionnaire that

includes 11 questions, which are scored on a 4-point Likert-type scale (1 = rarely or none

of the time, 4 = most or all of the time), and is based on experiences in the past month.

This scale (average of items) was used to assess severity of depressive feelings.

Questions range from asking about enjoyment of life to quality of sleep. A sample

question from the CES-D was, "I felt that I could not shake off the blues even with help

from my family or friends."

This measure has been used to examine depressive feelings in patients with type 2

diabetes (Rubin & Peyrot, 1999). Not only has it been cited as a reliable and valid

measure in general and in different patient populations (Macrodimitris & Endler, 2001),

among a wide variety of other measures of depression, the CES-D has been found to be

most accurate at determining depressive symptoms in patients with type 2 diabetes

(McHale, Hendrikz, Dann, & Kenardy, 2008). In a meta-analysis of the factor structures

of various depression inventories, the CES-D has been found to have one of the best

factor structures for accessing depression (Shafer, 2005). The use of abbreviated forms of

the CES-D has been found to preserve mostly all of the essential features (Kohout,

Berkman, Evans, & Cornoni-Huntley, 1993; Zvi, 2010).

Anxious Symptoms. To assess anxious feelings, the Zung Self-Rating Anxiety

Scale (SAS; Zung, 1971) was used ($\alpha = 0.85$) *[See Appendix 5 and Table 3]*. The SAS is

a self-report questionnaire that includes 20 questions that are scored on a 4-point

Likert-type scale (1 = rarely or none of the time, 4 = most or all of the time), and are

based on experiences in the past month. This scale (average of items) was used to assess

the severity of anxiety-related symptoms. It asked questions that range from general

feelings about anxiety and nervousness, to psychosomatic symptoms of anxiety. A

sample question, "I felt afraid for no reason at all."

The SAS has been cited to have good item-total correlations, test-retest reliability,

internal consistency, and has been shown to be sensitive to change in the treatment of

anxiety (Leentjens et al, 2008; Sevlever, & Rice, 2010; Tang et al., 2010). The SAS has

been used in the past to measure anxiety in individuals with diabetes as cited by Rubin

and Peyrot (1999).

Potential Covariates. Various sociodemographic variables were assessed and

considered as potential covariates; these included age, race/ethnicity, gender, time since

diagnosis, education, marital status, and income. Consistent with a common empirical

strategy in the literature, the final selection of covariates was made by examining bivariate correlations between each of these variables and the outcomes of interest; only variables that were significantly correlated ($p < .05$) with either of the outcomes were included in regression models. Coping also was considered as a potential covariate, but after careful consideration, it did not make sense to include as a covariate from a conceptual perspective because coping was assessed using only 1 item and was asked immediately following questions about life stress. This could possibly prime participants into thinking about their coping as it relates to general life stress (not diabetes stressors, too) thus not accurately reflecting coping for all types of stress in participants' life.

Age. Participants were asked to report their age numerically in the pre-interview questionnaire. Participants also were asked their age and birth date (and whether they matched) in person to assess cognitive impairment *[See Appendix 7 and Table 1]*.

Education. Participants were asked to report their highest grade of education completed in the amount of years.

Race/Ethnicity. Participants also reported on their self-identified race and ethnicity (e.g. White, African American or Black, Hispanic, Asian/Pacific Islander, Native American or Alaskan Native, Mixed Racial Background, or Other); due to the small number of minority participants, this variable was dichotomized to indicate participants who were non-Hispanic White (0) and those who were a minority (1) *[See Appendix 7 and Table 3]*.

Time Since Diagnosis. Participants were asked to report their time since diagnosis in the amount of years. *[See Appendix 9]*.

Marital Status. Participants were asked to report their current marital status

("Are you currently…" with an option to choose: married, in a marital-like relationship,

divorced, widowed, separated, single/never married, or other); this variable was be

dichotomized to indicate participants who were married/in a marital-like relationship (0)

and those who were unmarried (1) *[See Appendix 7 and Table 3].*

Income. Participants were asked to report their income in pre identified ranges of

income. *[See Appendix 7].*

Gender. Gender was measured through a one-item based on interviewer

observation: Male or Female. This was coded as 0 = male, 1 = female *[See Appendix 8*

and Table 3].

Analytic Plan. All analyses were conducted using SPSS version 24 software.

Descriptive analyses were conducted by examining the frequencies for all study variables

as well as the range, mean and standard deviation for continuous variables. Bivariate

correlations among key study variables also were examined.

Linear multivariable regression analyses were performed to determine the

significance and strength of the association between the independent and dependent

variables. Specifically, to examine how disease-specific stress and general life stress

relate to psychological distress among individuals with diabetes, a multivariable

regression analysis was conducted for each combination of independent (3) and

dependent (2) variables. The interactions between different types of diabetes-specific and

general life stress were calculated by using the product of centered versions of these

variables (i.e., the mean was subtracted from each variable). Variables were entered into

the regression model in the following sequence: covariates (step 1), independent variables (diabetes-specific frustration, burden and worry), and moderator (subjective ratings of stressful life events; step 2), and interaction terms of the independent variable X moderator (step 3). Separate regressions were run for each outcome. Thus, a total of six regression models were run. Any significant interaction effects were examined further in depth to determine how the potential moderator influences the nature or direction of the associations between the independent variable and dependent variable in two ways. First, simple slopes were calculated using an online calculator (http://www.quantpsy.org/interact/mlr2.htm), and second, graphs were created at two levels (+/-1 SD) of the IV and moderator.

Results

Descriptive Analyses

The potential covariates that were significantly associated with depressive and anxious symptoms were: education, race/ethnicity, and marital status (all *ps* < .05). Thus, only these three covariates were used in the regression models to test study hypotheses.

Next, I examined the extent to which patients in the current study experienced different types of stressors, how stressful they were, and how they coped with these stressors. I also examined the extent to which patients experienced both depressive and anxiety symptoms. Results showed that, on average, patients experienced a medium level of diabetes-related burden (*M* = 3.12 on a scale of 1-6); a medium level of diabetes-related frustration (*M* = 3.16 on a scale of 1-5); and a low level of diabetes-related worry (*M* = 1.68 on a scale of 1-5). In addition, patients rated their average amount of diabetes stress as low to medium (on a scale of 1-5, 1 = not at all, 5 = a great deal*, M* = 2.46, *SD* = 1.13). Patients ranked diabetes versus other stressors as low to medium (on a scale of 1-10, 1 = not very stressful, 10 = very stressful patients, *M* = 4.19, *SD* = 2.43).

Over half (68%) of the patients reported experiencing at least one stressful life event. On average, patients reported experiencing about one to two events (*M* = 1.2, *SD* = 1.23). Patients reported a medium to high level of subjective stress related to these events (*M* = 3.59 on a scale of 1-5).

On average, patients reported a medium amount of stress in their life (on a scale of 1-6, 1 = very low, 6 = extremely high, *M* = 3.08, *SD* = 1.40). On average, patients

reported a medium level of bothersomeness for overall stress in their life (on a scale of 1-5, 1= not at all, 5 = a great deal, $M = 2.97$, $SD = 1.30$). Patients rated themselves as moderately effective in coping with stress in their life, on average (on a scale of 1-5, 1 = not at all effective, 5 = very effective, $M = 3.49$, $SD = 1.08$).

Finally, patients rated their depressive symptoms as low to medium, on average ($M = 1.95$ on a scale of 1-4). Patients also rated their anxiety as low to medium, on average ($M = 1.70$ on a scale of 1-4).

As shown in table 2, all of the diabetes-related stressors (frustration, burden, worry) were significantly associated with each other (all $ps < .001$). Both measures of general life stress (both objective number of events and subjective ratings) were significantly associated with each other ($p < .001$). Depressive and anxious symptoms also were significantly associated with each other ($p < .001$). Frustration and burden (but not worry) were significantly related to depressive symptoms ($ps < .001$). Frustration, burden, and worry were significantly related to anxious symptoms (all $ps < .05$). Finally, both measures of general life stress were significantly related to depressive and anxious symptoms (all $ps < .01$). Instead of examining the 3 types of diabetes stressors together, they were analyzed separately to assess for differences within each stress scale.

Hypotheses Tests

 Depressive Symptoms. Findings for diabetes-specific stress and general life stress in predicting depressive symptoms are shown in tables 3, 4 and 5.

 Main Effects. Patients who reported high levels of diabetes-related burden ($p=.02$) and diabetes-related frustrations ($p =.03$) also reported high levels of depressive

symptoms. Patients who reported high levels of general life stress also reported high levels of depressive symptoms (p=.04). Diabetes-related worry was not significantly related to depressive symptoms (p=.22).

Interactive Effects. No significant interactions were found between any of the three types of diabetes-specific stress and general life stress in predicting depressive symptoms.

Anxious Symptoms. Findings for diabetes-specific stress and general life stress in predicting anxious symptoms are shown in tables 3, 4, and 5.

Main Effects. Patients who reported high levels of diabetes-related frustrations (p = .02), burden (p=.01), and worry (p=.01) also reported high levels of anxious symptoms. Patients who reported high levels of general life stress also reported high levels of anxious symptoms (p=.006).

Interactive Effects. Two significant interactions emerged between diabetes-specific stress and general life stress in predicting anxious symptoms: 1) between diabetes-related frustration and general life stress (p=.03) and 2) between diabetes-related worry and general life stress (p=.02).

As shown in Figure 1, among individuals with high levels of life stress, there was a positive association between frustration and anxious symptoms (simple slope = .007 (.002), t=3.56, p=.001). In contrast, among patients with low levels of stress, there was no association between frustration and anxious symptoms (simple slope = .0002 (.002), t=.14, p=.89).

Similar to findings for frustration, as shown in Figure 2, among individuals with

high levels of life stress, there was a positive association between worry and anxious symptoms (simple slope = .01(.001), *t=6.87, p=.0002*). Among those patients with low levels of stress, there was no association between worry and anxious symptoms (simple slope = .002(.001), *t=1.17, p=.28)*. The interaction between diabetes-related burden and life stress was not significant, but was marginal (*p=.02*).

Discussion

Investigation of stress among aging adults with type 2 diabetes is important, given how stress influences both physical and mental health outcomes within this at-risk population. Stress from the disease itself can include feelings of frustration with everyday management and burden from substantial changes to lifestyle, as well as worries about poor adherence to their medical regimen, which can lead to significant health problems and complications. However, patients also are likely experiencing other types of life stress, which may exacerbate the stress they also experience from diabetes. Not surprisingly, mood disorders are higher among people with diabetes, when compared to people without diabetes. Assessing the comorbidity between diabetes and mental health issues is important because these issues have major implications for diabetes management and diabetes outcomes.

The purpose of the present study was to contribute to the literature by exploring how different types of disease-specific stress relate to overall psychological distress (depressive and anxious symptoms) among individuals with diabetes. This study further sought to understand whether experiencing general stressful life events changed the nature of these associations.

Depressive Symptoms. Providing partial support for the first hypothesis, significant main effects were found in predicting depressive symptoms such that higher levels of diabetes-related frustration and burden were related to more depressive symptoms. However, the other type of diabetes-specific stress – worry about future complications – was not significantly related to depressive symptoms. Although life

stress also significantly predicted depressive symptoms, no significant interactions were found between any type of diabetes-specific stress and life stress in predicting depressive symptoms. These findings suggest unique, independent effects of each type of stress and depressive symptoms.

These findings further suggest that by being burdened by diabetes or feeling frustrated by its management, patients may be more likely to experience depressive symptoms. This is because diabetes has a large self-care component, which requires adherence to a complex daily regimen (ADA, 2014). Moreover, diabetes management is a lifelong process, which can add stress to individuals' daily life. Such regimens involve initiating and maintaining a number of health behaviors to ensure successful diabetes control and avoid complications of uncontrolled diabetes (ADS, 2014). Individuals with diabetes also may experience symptoms such as pain (e.g. neurological pain and pain in the feet), as well as hypoglycemia as a result of medications, particularly insulin (CDC, 2016). Over time, the chronic nature of disease-specific stress may lead to depressive symptoms (ADS, 2014).   Whether these depressive symptoms are clinical in nature, however, is not known. There is some evidence that the threshold researchers use for what constitutes clinical levels of depression in non-ill samples is not the same threshold for detecting clinical levels of depression in individuals with chronic diseases (Fisher et al., 2010). Regardless, more needs to be understood about the underlying causes of stress given that high levels of distress are related to worse diabetes outcomes (Sorkin et al., 2011).

A possible reason why only two types of diabetes-related stressors were related to

depressive symptoms could be because of the nature of these types of stressors, and how they were assessed in the current study. Unlike worry, the other two diabetes-related stressors were assessed by asking patients how likely they were to impact their feelings about current lifestyle changes (frustration) and overall burden diabetes may pose in the patients' life (burden). The way that worry was assessed, in contrast, was by asking patients questions about how they felt about possible future events (i.e., complications). Consistent with other research, current – not future or possible events – are more important in contributing to depressive feelings (Fisher et al., 2010). The findings for the current study suggest that increased screening should be done for both depression and sources of diabetes stress for individuals with type 2 diabetes (Fisher et al., 2010).

Anxious symptoms. Providing partial support for the second hypothesis, life stress moderated the associations between diabetes-related frustration and diabetes-related worry in predicting anxious symptoms. Thus, the relationship between diabetes stress and anxious symptoms depended on the level of general life stress the patient also was experiencing. Although the interaction between diabetes-related burden and life stress in predicting anxious symptoms was marginal, the findings were in the same direction as for the other types of diabetes-related stress. These findings are consistent with other research that has found a positive association between diabetes stress (Kort et al. 2012, Trento et al. 2011, Kessler et al. 2005) and anxious symptoms (Bener et al. 2011; Kessler et al. 2005; Kort et al. 2012; Smith at all. 2012; Trento et al. 2011), and as a result, patients with diabetes should be screened for such symptoms (Collins, 2009). The findings from this study suggest that different types of

diabetes-stress are related to anxious symptoms – but only when individuals are also experiencing other types of life stress.

The interaction between diabetes-related stress and life stress in predicting anxious symptoms is consistent with the stress-exacerbation hypothesis (Rook, 1998). This hypothesis suggests that having to deal with two different kinds of stressors at the same time can tax an individual's coping resources thus causing the emotional reactions to the stressors to be more pronounced than if the stressors were experienced in isolation of each other. Other research has found support for the stress-exacerbation hypothesis, but only for specific types of stressors (August, Rook, & Newsom, 2007).

Future research should attempt to understand other reasons why patients with diabetes may potentially be anxious because of how their condition will be perceived by others including friends, family and work colleagues. People who are unfamiliar with the genetic component of type 2 diabetes often regard it as a voluntary condition brought on by an unhealthy lifestyle (ADA, 2014). How individuals may want, or may worry how others view them and their disease may alter their coping strategies and health in a negative or positive way. Thus, perception of how others may view individuals because of their disease and limitations because of said disease may be an additional source of stress and thus valuable to assess for future studies.

Limitations and Future Directions. These findings must be interpreted within the context of the study limitations. This study used a cross-sectional design and therefore causality cannot be determined, nor can the direction of effects be established. It is very possible, for example, that individuals who are already prone to depressive and anxious

symptoms are more likely to experience stress in their life, or more likely to have a

negativity bias in perceiving their stressful experiences (Piette & Kerr, 2006). Future

research would need to examine these patterns longitudinally in an attempt to disentangle

the effects of the independent and dependent variables.

Another limitation was that data were gathered through in-person interviews and

self-report questionnaires. Although surveys are commonly used in the literature to assess

both the subjective nature of stressful experiences as well as emotional experiences, the

use of a single informant may artificially inflate correlations among constructs. Future

research should consider using additional methodologies (e.g. information from medical

records, prescriptions for psychotropic medications, family member reports) to more fully

understand the extent of patients' experiences. Future research should continue to study

the different stressors involved in diabetes management, however, in order to fully

understand the interaction of stress on imparting self-management behaviors with

diabetes.

An additional limitation is the use of a relatively small sample size in which

statistical power is reduced to determine significant effects. Moreover, this sample was

unique because of the relatively high level of education (more than half of participants

had some college) and health care usage (the latter being a requirement for study

inclusion). However, the sample was community-based and more diverse compared to

other studies in this area (e.g., approximately 40% of participants were non-White).

Results would need to be replicated among a larger, more representative sample to

increase confidence in the validity of these findings. Finally, these data were not

collected for the intentions of this study; however, the data were used to contribute to the literature in an innovative way.

Study Implications. Despite these limitations, the results of this study provide some insight as to how different types of disease-specific stress relate to overall psychological distress (depressive and anxiety symptoms) among individuals with diabetes. The findings suggest that it is important to discover ways to lessen these stressors for an individual coping with a chronic disease like diabetes. Individuals who are coping with a chronic disease like diabetes should be aware of the high rates of disease specific stress. Some health-related interventions could include reducing stress, such as mindfulness techniques like yoga and meditation (CDC, 2013). A great way to reduce stress related towards diabetes, or any other chronic disease, is to increase patients' perceived amount of control. By taking charge of one's owns health by learning about diabetes and understanding how to prevent complications, patients could possibly reduce anxiety and depression (Sarafino & Smith, 2014). Another health-related intervention strategy is the use of physical activity, as previous research has shown that regular physical activity helps to relieve stress, as well as depressive and anxious symptoms (CDC, 2015). Physical activity is also widely recommended for overall health, and for individuals with type 2 diabetes (CDC, 2015). These are additional strategies that can help people cope with stress and at the same time, reduce anxiety and depression symptoms.

If an individual is having problems adjusting to their regimen related to diabetes such as with medication nonadherence, common among patients with comorbid

depression/anxiety (Gonzalez, 2008), the general practitioner should refer the individual

to a mental health professional. Some literature suggests that clinicians may be more

likely treat anxiety disorders than to treat patients with high levels of diabetes distress

(Fisher et al. 2008). Other research suggests that health professionals might minimize the

seriousness of disease specific distress because they feel that it is common among those

with diabetes and other chronic conditions (Surwit et al. 1992). Thus, providers should

be particularly aware of signs of high levels of stress, and be familiar with *both* types of

mental health issues. Providers should proactively discuss sources of stress with their

patients while giving them options and reiterating how a healthy lifestyle would benefit

their physical and mental health while coping with their disease. In conclusion, a better

understanding of sources of stress could lead to more effective coping with stress, and

significant improvement in the quality of life for individuals with diabetes.

Table 1
Sociodemographic Variables

Sociodemographic Variables	M/%	SD
Time since diagnosis (years)	12.15	8.42
Age	59.71	11.19
Education		
Less than a high school degree	6.8%	
High school degree	30.5%	
Some college or more	62.7%	
Race		
Non-Hispanic White	59.1%	
Non-Hispanic Black	30%	
Other	10.9%	
Marital Status (% married)	50.4%	
Gender	52.9% female	
Employment status		
Working full or part time	37.9%	
Retired	39.7%	
Other	22.4%	
Income		
Less than $55,000	45.4%	
$55,000 or more	54.6%	

Table 2
Correlation Table

	M (SD)	Range	1	2	3	4	5	6	7
1 Diabetes-related frustration	3.16 (2.55)	(1-4)	–	.596***	.512***	.354***	.385***	.476***	.421***
2 Diabetes-related burden	3.12 (2.54)	(1-6)		_____	.551***	.322***	.351***	.351***	.323***
3 Diabetes-related worry	4.32 (2.76)	(1-5)			_____	.305**	.251**	.243*	0.127
4 Objective ratings of general life stress	1.18 (1.27)	(0-9)				_____	.885***	.349***	.280**
5 Subjective ratings of general life stress	1.41 (0.54)	(1-5)					_____	.409***	.313**
6 Anxious symptoms	1.70 (0.46)	(1-4)						_____	.697***
7 Depressive symptoms	1.95 (0.61)	(1-4)							_____
p < .05. **p* < .01. ***p* < .001.									

Table 3
Diabetes related frustration analyses

	Anxious Feelings		Depressive Feelings	
	B	*t*	*B*	*t*
<u>Main Effects</u>				
Diabetes-related frustration	0.36	**4.08*****	0.37	**3.90*****
Life stress	0.28	**3.26***	0.18	**2.00***
	Adjusted R^2=0.34		Adjusted R^2=0.25	
<u>Interactions</u>				
Diabetes-related f**rustration** x Life stress	0.34	**3.73*****	-0.09	-0.90
	Adjusted R^2=0.41		Adjusted R^2=0.25	

Note. All analyses controlled for education, marital status, and race/ethnicity

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4
Diabetes related worry analyses

	Anxious Feelings		Depressive Feelings	
	B	*t*	*B*	*t*
Main Effects				
Diabetes-related worry	0.18	**2.04***	0.10	1.09
Life stress	0.37	**4.18***	0.29	**3.03***
	Adjusted R²=0.26		Adjusted R²=0.14	
Interactions				
Diabetes-related **worry** x Life stress	0.24	**2.15***	0.09	0.74
	Adjusted R²=0.29		Adjusted R²=0.14	

Note. All analyses controlled for education, marital status, and race/ethnicity

*p < .05. **p < .01. ***p < .001.

Table 5
Diabetes related burden analyses

	Anxious Feelings		Depressive Feelings	
	B	*t*	*B*	*t*
<u>Main Effects</u>				
Diabetes-related burden	0.24	**2.67****	0.25	**2.59***
Life stress	0.32	**3.60*****	0.22	**2.26***
	Adjusted R²=0.28		Adjusted R²=0.18	
<u>Interactions</u>				
Diabetes-related burden x Life stress	0.17	1.84+	0.037	0.37
	Adjusted R²=0.29		Adjusted R²=0.18	

Note. All analyses controlled for education, marital status, and race/ethnicity

*p < .05. **p < .01. ***p < .001.

Figure 1
Association between diabetes-related frustration and anxious symptoms depends on level of life stress
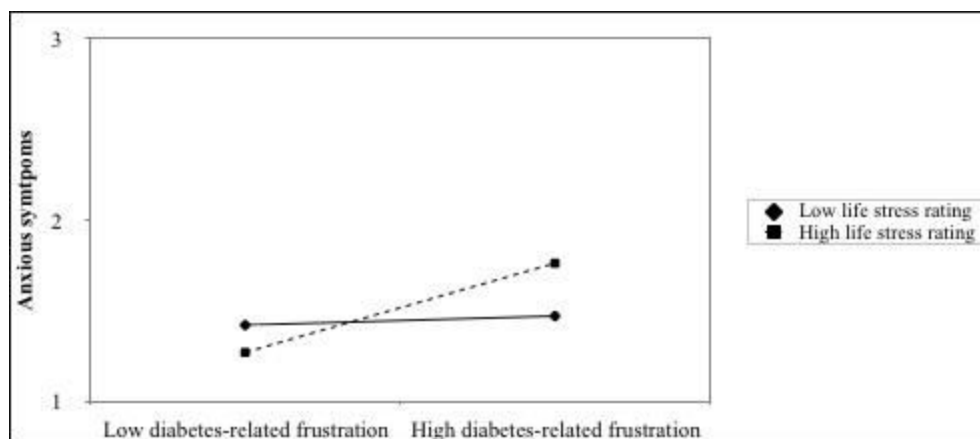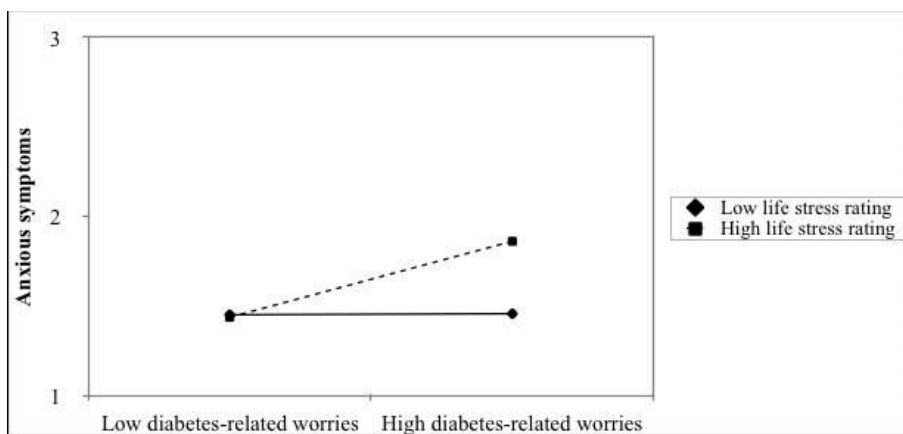
Figure 2

Association between diabetes-related worry and anxious symptoms depends on level of life stress

Appendix 1
Frustration

4. Sometimes diabetes can be source of frustration or concern to those who have it.

1 MOST of the Time   2 SOME of the Time   3 A LITTLE of the Time   4 NONE of the Time

a.   Were you frustrated about your diabetes?   1   2   3   4
b.   Were you discouraged because you have diabetes?   1   2   3   4
c.   Did you feel despair over any problems caused by your diabetes? 1   2   3   4
d.   Was your diabetes a source of worry or concern in your life?   1   2   3   4
e.   Was your diabetes a nuisance or bother?   1   2   3   4

Appendix 2
Burden of diabetes

	7: Overall, how much of a burden is having diabetes on you and your family in each of the following areas?	VERY LARGE burden	LARGE burden	Feel NEUTRAL	SMALL burden	VERY SMALL burden	NOT burden at all
a.	Your overall health	1	2	3	4	5	6
b.	Your social activities	1	2	3	4	5	6
c.	Your lifestyle	1	2	3	4	5	6
d.	Your finances in general	1	2	3	4	5	6
e.	Your finances due to the cost of medications	1	2	3	4	5	6
f.	Your finances due to the cost of monitoring supplies	1	2	3	4	5	6
g.	Your finances due to the cost of health care for diabetes (visits to the doctor, etc.)	1	2	3	4	5	6
h.	Your finances due to the cost of your health insurance because of having diabetes	1	2	3	4	5	6

Appendix 3
Concerns/Worries about Complications about diabetes

6: Sometimes people with diabetes have concerns about complications that may develop. How much are you *worried* or *concerned* about each of the following?	EXTREMELY Worried	VERY Worried	WORRIED	NOT VERY Worried	NOT Worried AT ALL
a. Losing your eyesight from diabetes	1	2	3	4	5
b. Losing toes, feet, or legs due to diabetes	1	2	3	4	5
c. Becoming dependent on family or friends because of diabetes	1	2	3	4	5
d. The lack of a cure for diabetes	1	2	3	4	5
e. Dying earlier than most people, because of diabetes	1	2	3	4	5
f. Having other major health problems (such as heart disease or arthritis) made worse by diabetes	1	2	3	4	5
g. The overall impact of diabetes on your health	1	2	3	4	5

Appendix 4
Stressful life events

11. These next set of questions ask you about things that might have happened to your during the past six months.

In the past 6 months…	NO	YES	IF YES, How stressful? (1=very, 5 = not at all)
a. Did you have a serious change for the worse in your health?	1	2	1 2 3 4 5
b. Did you have a major increase in caring for a family member?	1	2	1 2 3 4 5
c. Did you move to a different place (i.e. change where you live)?	1	2	1 2 3 4 5
d. Has your home needed a major repair?	1	2	1 2 3 4 5
e. Have you been a victim of a serious crime?	1	2	1 2 3 4 5
f. Have you retired?	1	2	1 2 3 4 5
g. Have you had a major financial problem, including problems with Social Security, retirement benefits, or other benefits?	1	2	1 2 3 4 5
h. In the past 6 months, have you become separated or divorced?	1	2	1 2 3 4 5
i. [If married] In the past 6 months, has your spouse passed away?	1	2	1 2 3 4 5

Appendix 5
Zung Self-Rating Anxiety Scale (SAS)
Note: Items marked with an asterisk (*) will be reverse coded.
During the past month, how often were the following statements true:

	RARELY or NONE of the time	Some of the time	Occasionally	MOST or ALL of the time
1. I felt more nervous and anxious than usual.	1	2	3	4
2. I felt afraid for no reason at all.	1	2	3	4
3. I got upset easily or felt panicky.	1	2	3	4
4. I felt like I was falling apart and going to pieces.	1	2	3	4
5. I felt that everything was all right and nothing bad will happen.*	1	2	3	4
6. My arms and legs shake and tremble.	1	2	3	4
7. I am bothered by headaches neck and back pain.	1	2	3	4
8. I felt weak and got tired easily.	1	2	3	4

9. I felt calm and could sit still easily.*	1	2	3	4
10. I could feel my heart beating fast.		2	3	4
11. I was bothered by dizzy spells.		2	3	4
12. I had fainting spells or felt like it.		2	3	4
13. I could breathe in and out easily.*		2	3	4
14. I got feelings of numbness and tingling in my fingers & toes.		2	3	4
15. I was bothered by stomach aches or indigestion.		2	3	4
16. I had to empty my bladder often.		2	3	4
17. My hands were usually dry and warm.*		2	3	4
18. My face got hot and blushed.		2	3	4
19. I fell asleep easily and got a good night's rest.*		2	3	4
20. I had nightmares.		2	3	4

Appendix 6

Center for Epidemiological Studies Depression Scale 11-item version
Note: Items marked with an asterisk (*) will be reverse coded.
During the past month, how often were the following statements true:

		Rarely or NONE of the time	SOME of the time	OCCASIONALLY	MOST or ALL of the time
a.	I was bothered by things that usually don't bother me	1	2	3	4
b.	I felt that I could not shake off the blues even with help from my family or friends	1	2	3	4
c.	I had trouble keeping my mind on what I was doing	1	2	3	4
d.	I felt depressed	1	2	3	4
e.	I felt that everything I did was an effort	1	2	3	4
f.	My sleep was restless	1	2	3	4
g.	I was happy*	1	2	3	4
h.	I felt lonely	1	2	3	4
i.	I enjoyed life*	1	2	3	4
j.	I felt sad	1	2	3	4
k.	I could not get going	1	2	3	4

Appendix 7
Eligibility: Age, Race/Ethnicity, Health Status, Marital Status

To determine if you are eligible to participate in our study, we have a few questions for you to answer

*NOTE: you must answer "yes" to all of the following questions to be eligible:

Are you 45 or older? ____ yes _____ no _____ age

Have you been diagnosed with type 2 diabetes by a physician or other health care provider? ____ yes ____ no

Do you see a health care provider regularly to manage your diabetes (at least once per year)? ____ yes ____ no

Do you both speak and write fluently in English? ___ yes ____ no

Are you willing to participate in this study in your home or at a convenient location to you for approximately 2 hours? ____ yes ____ no

Please answer the following additional questions: Are you currently?

a. Married………………………………………………	yes or no
b. In a marital-like relationship (e.g., cohabitating)	yes or no
c. Divorced……………………………………	yes or no
d. Widowed………………………………………..	yes or no
e. Separated……………………………………………	yes or no
f. Single (never married)……………………….	yes or no
g. Other (please specify)_____	yes or no

[IF ANSWERED 'A' OR 'B' ABOVE]

6a).   Is your spouse/partner also interested in participating (and receiving an additional $20)?_____ yes _____ no _____ maybe

What is your racial background?

a. White……………………………………………………………..	1
b. African American or Black………………………………….	2
c. Hispanic………………………………………………………….	3
d. Asian or Pacific Islander………………………………….	4
e. Native American or Alaskan Native………….……………...	5
f. Mixed racial background………....Specify_____	6
g. Other race (Specify)_____	7

Appendix 8
Gender

1. (INTERVIEWER: CODE SEX BY OBSERVATION)
   a. Male
   b. Female

Appendix 9
Time Since Diabetes Diagnosis

1. When were you diagnosed with diabetes?
(Please list year) _____

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