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The Structure of depression and anxiety symptoms in diabetic patient and community adult samples

Elizabeth Anne McDade-Montez
University of Iowa

THE STRUCTURE OF DEPRESSION AND ANXIETY SYMPTOMS IN DIABETIC PATIENT AND COMMUNITY ADULT SAMPLES

by

Elizabeth Anne McDade-Montez

An Abstract

Of a thesis submitted in partial fulfillment of the
requirements for the Doctor of Philosophy degree
in Psychology in
the Graduate College of
The University of Iowa

December 2008

Thesis Supervisor: Professor David Watson

ABSTRACT

Delineating and diagnosing depression and anxiety in the presence of a medical condition, such as diabetes, is complicated by the presence of overlapping symptoms that, therefore, are etiologically ambiguous. These overlapping symptoms include feelings of fatigue, concentration difficulties, restlessness, changes in appetite, irritability and autonomic arousal. The difficulty in understanding these overlapping symptoms has been proposed to lead to an underdiagnosis of depression and anxiety disorders among adults with diabetes, which is problematic given that such disorders are associated with poorer health outcomes. The goal of the current study is to test whether or not these overlapping symptoms are affected by the presence of diabetes by comparing structural models of these symptoms in adults with diabetes versus those free of major medical conditions. Participants include 226 adults with diabetes and 379 adults free of diabetes who completed a series of questionnaires assessing symptoms of depression, anxiety and health status. In addition, for adults with diabetes, the most recent hemoglobin A1c lab result was collected from patient medical records. Results indicate that overlapping symptoms were strongly related to mood for adults with and without diabetes. In conclusion, it is recommended that when these overlapping symptoms are present in adults with diabetes, depression and anxiety should be considered as possible contributors to their presence.

Abstract Approved: _____
Thesis Supervisor

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Title and Department

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Iowa City, City

CERTIFICATE OF APPROVAL

PH.D. THESIS

This is to certify that the Ph. D. thesis of

Elizabeth Anne McDade-Montez

has been approved by the Examining Committee
for the thesis requirement for the Doctor of
Philosophy degree in Psychology at the December 2008 graduation.

Thesis Committee:

David Watson, Thesis Supervisor

Lee Anna Clark

Michael O'Hara

Jerry Suls

Carolyn Turvey

To Hazel

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TABLE OF CONTENTS

LIST OF TABLES

Table

INTRODUCTION

An estimated 18.2 million Americans have diabetes and the prevalence is expected to increase, affecting 324 million people worldwide by 2025 (Permutt, Wasson & Cox, 2005). Among adults aged 65 and older, diabetes is 10 times as common compared with younger adults, and minority racial groups (including Hispanics, African Americans and Native Americans) are affected at a rate of 2 to 4 times that for white individuals (Permutt et al., 2005). Diabetes was the 6th leading cause of death in the U.S. in 2002 and individuals with diabetes have a two-fold risk of death compared with same-aged non-diabetics (Centers for Disease Control and Prevention [CDC], 2005).

Although causal mechanisms are unknown, significant evidence exists suggesting that diabetes is a considerable risk factor for the development of psychiatric problems such as anxiety and depression. Rates of depression among individuals with diabetes are estimated to be 21-24% of patients or twice as high as general population estimates (Anderson, Freedland, Clouse & Lustman, 2001). This two-fold increased risk of depression is generally robust whether depression is measured via structured interview or self-report (Eaton, 2002). Research has also found that the course of depression among patients with diabetes is more severe and has a high relapse rate following initial episodes (Gonder-Frederick, Cox & Ritterband, 2002).

Some anxiety disorders have also been found to be more prevalent among diabetes patients than among non-diabetics. In a review of 18 studies with a total of 4076 participants (2584 diabetic patients, 1492 control participants), Grigsby, Anderson, Freedland, Clouse and Lustman (2002) examined the prevalence of anxiety disorders and anxiety symptoms in Type 1 and Type 2 diabetes patients. The review found that 14% of

diabetes patients had any current anxiety disorder (as defined by either point prevalence in most studies or in the past 2-, 6- or 12-month intervals preceding the study in 4 studies) and identified the following additional current prevalence rates: Anxiety Disorder Not Otherwise Specified = 26.5%, Simple Phobia = 21.6%, Generalized Anxiety Disorder (GAD) = 13.5%, Social Phobia = 7.3%, Agoraphobia = 4.6%, Panic = 1.3%, Obsessive Compulsive Disorder (OCD) = 1.3% and Post-Traumatic Stress Disorder (PTSD) = 1.2%. Although the rates of panic disorder, OCD, PTSD and agoraphobia were comparable to those found in community samples, rates of GAD and any phobia were considerably higher than those found in community samples (e.g. Kessler, Chiu, Demler, & Walters, 2005). In addition, 40% of diabetes patients were found to have elevated anxiety symptoms on self-report measures.

The presence of depression and anxiety among diabetes patients is associated with multiple behaviors that have a negative impact on disease management. These include increased smoking, alcohol or other drug abuse; poorer eating and appetite dysregulation; and poorer self-managed metabolic control (Gonder-Frederick et al., 2002). These behaviors, in turn, are associated with poorer health outcomes and greater diabetes-related complications (Gonder-Frederick et al., 2002). A recent meta-analysis of the impact of depression on diabetes complications found a moderate overall effect size across 27 studies. The review found that depression was significantly associated with diabetic retinopathy, nephropathy, neuropathy, macrovascular complications and sexual dysfunction (De Groot, Anderson, Freedland, Clouse, & Lustman, 2001). Thus the identification and treatment of clinically significant anxiety and depression should be a priority in the treatment of diabetes.

The Comorbidity of Anxiety and Depression

Clinicians and researchers have noted the comorbidity of anxiety and depression for some time, and in particular since the release of the DSM-III-R (American Psychiatric Association [APA], 1987), which removed exclusionary rules prohibiting the diagnosis of both a mood and anxiety disorder. With the removal of this exclusionary rule, comorbidity between mood and anxiety disorders was found to be high. A review by Clark (1989) indicated that 57% of patients meeting criteria for major depression also met criteria for one or more anxiety disorders. In addition, 56% of patients meeting criteria for an anxiety disorder also met criteria for depression (Clark, 1989). This finding was replicated by the National Comorbidity Survey (NCS; Kessler et al., 1996), which found that 58% of patients with MDE met criteria for an anxiety disorder. This overlap in depression and anxiety symptoms has also been found in studies using self-report and clinician-rated measures. For example, Clark and Watson's (1991) review found correlations in the .5 to .6 range between measures of self-reported depression and anxiety for both patient and nonpatient samples. Their review also established an approximate correlation of .4 to .45 between clinician ratings of anxious and depressed symptomatology among both patients and nonpatients. Mineka, Watson and Clark's (1998) review of comorbidity found similar rates of diagnostic and self-reported comorbidity in other studies and samples (e.g. children and adolescents). Comorbidity of mood and anxiety disorders in the studies reviewed by Mineka et al. (1998) ranged from 30 to 75%.

Similar rates have been identified among diabetes patients. In a recent study of 403 Type 2 diabetes patients, Thomas, Jones, Scarinci and Brantley (2003) found that

46% of diabetes patients meeting criteria for a depressive disorder also met criteria for an anxiety disorder. In addition, 46% of patients meeting criteria for an anxiety disorder also met criteria for a depressive disorder.

Structural Models of Anxiety and Depression

The Two Factor Model

Structural models of anxiety and depression have proven useful in understanding the nature of the comorbidity between these disorders. One prominent model was based originally on the 2-factor structure of affect, consisting of the general dimensions of negative and positive affect (NA and PA, respectively; Watson & Tellegen, 1985). These dimensions are generally unipolar and largely independent of one another. Negative affect is typically characterized by various negative mood states, for example, guilt, sadness, anxiety and hostility. Positive affect is typically characterized by a variety of positive mood states such as feeling happy, energetic and strong. This model suggests that the various negative mood states associated with NA will generally be highly correlated with one another. In addition, the positive mood states linked to PA will also tend to be highly correlated with one another. This model has been robustly supported across multiple samples including students, psychiatric patients and community members, with high correlations (e.g. .5 and higher) typically found between different negative mood states such as sadness and fear (e.g. Watson, 2005). Thus the 2-factor model of NA and PA explains, in part, the overlap in the mood and anxiety disorders.

Subsequent research has sought to use this structural model to improve the discriminability of the mood and anxiety disorders. Additional studies of the 2-factor model found that low PA is specific to depressed mood and symptomatology (e.g.

Watson, Clark, & Carey, 1988). That is, low PA tends to be moderately related to indicators of depression, but more weakly associated with measures of anxiety. This finding has been found repeatedly, with correlations between anxious symptoms and PA typically ranging from 0 to -.2 and correlations between depressed symptoms and PA generally significantly higher, ranging from -.3 to -.45 (Watson, 2005).

The Tripartite Model

The tripartite model built upon this two-factor model and added an additional specific component to explicate the nature of the mood and anxiety disorders and improve discriminability between them (Clark & Watson, 1991). The tripartite model groups symptoms of anxiety and depression into three general types: (1) those that are robust markers of nonspecific distress and NA, (2) those that are unique to depression and (3) those that are unique to anxiety. Those symptoms that are general indicators of NA are referred to as nonspecific symptoms and include both sad and anxious mood, as well as other nonspecific symptoms such as restlessness, irritability, appetite disturbance and others. Those symptoms that are unique to depression include anhedonia, or low PA. Finally, the tripartite model introduced autonomic arousal (AA) as a symptom dimension specific to anxiety. This dimension is defined by markers of somatic arousal, such as feeling short of breath, dizzy, shaky and having a racing heart (Watson et. al, 1995).

The tripartite model has received considerable support (see Mineka et al., 1998, for a review). For example, Brown, Chorpita and Barlow (1998) examined the tripartite model in a sample of 350 outpatients with diagnoses of mood or anxiety disorders (major depression, generalized anxiety disorder [GAD], social phobia, obsessive compulsive disorder [OCD] and panic disorder). The authors tested multiple structural models of the

relationships among these disorders, as well as their associations with NA, PA and AA. They found that the tripartite model was the best fit for the data: NA was nonspecifically related to all of these disorders, whereas PA had the strongest link to depression (r = -.53), and AA was specifically related to panic disorder. Contrary to the predictions of the model, however, AA was not broadly related to the other anxiety disorders.

The results of this study and others suggested areas for refinement of the tripartite model. First, the findings of Brown et al. (1998) indicate that AA is specifically linked to panic disorder/agoraphobia, rather than being more broadly characteristic of the anxiety disorders. In addition, a substantial negative association between PA and social phobia was found in Brown et al. (1998) and has been replicated in subsequent studies (e.g. Watson, Gamez & Simms, 2005). Thus the tripartite model provides a useful framework yet does not fully account for the specificity of anxiety symptoms.

Integrative Hierarchical Model of Anxiety and Depression

Additional structural models have been proposed to explain the nature of depressive and anxiety symptoms and have expanded upon the specific symptoms of the anxiety disorders. Barlow (1991) proposed a model based on a hierarchical structure of anxiety disorder symptoms. This model proposes a higher order general factor of anxious apprehension (i.e., NA), which distinguishes anxiety disorder patients from non-patients. In addition, several specific symptoms are proposed that distinguish among anxiety disorders such as OCD, GAD, panic disorder, social phobia, agoraphobia and specific phobia (see also Zinbarg & Barlow, 1996). Zinbarg and Barlow (1996) found strong support for this model in a study of 432 anxiety disorder clinic patients using self-report measures modeling both specific and nonspecific symptoms of anxiety disorders.

Mineka et al. (1998) subsequently proposed the integrative hierarchical model that incorporates elements from the tripartite model as well as from Barlow's hierarchical model. The integrative hierarchical model proposes that different disorders characterized by negative affect have both common and unique components. This model differs from previous models in three ways. First, the relative size of these general and specific components are acknowledged to vary across disorders. More specifically, the model proposes that disorders such as depression and GAD, which are marked by pervasive distress, have a greater NA component than other disorders. Second, the model is argued to be broadly applicable to virtually all types of psychopathology; that is, Mineka et al. (1998) hypothesize that the nonspecific NA dimension is not confined to the mood and anxiety disorders but also characterizes almost all forms of psychopathology. Third, the model proposes that there likely are no absolute specific components; rather, all specific components are relative. In other words, the model assumes that a symptom will rarely be unique to any single disorder, but rather will characterize a limited range of disorders, relative to others. In addition, the model proposes that AA is not specific to all anxiety disorders but rather is unique to some of them, with particularly strong links to panic disorder and post-traumatic stress disorder (PTSD).

Several specific symptoms have been proposed from these structural models (e.g. Mineka et al., 1998; Watson et al., 1995) including panic attacks, agoraphobic avoidance and autonomic symptoms, all of which are specific to certain anxiety disorders. Suicidal behavior, early-morning wakening and pessimism have been proposed as symptoms specific to mood disorders. In addition, several symptoms related to low PA may be specific to depression. These include loss of interest or pleasure, apathy, hopelessness,

fatigue and lethargy, and psychomotor retardation. Proposed nonspecific symptoms of mood and anxiety disorders including the following: NA, depressed mood, anxious mood, loss of libido, loss of appetite, feelings of worthlessness or guilt, insomnia, irritability, concentration difficulties and psychomotor agitation. In addition, Clark and Watson (1991) point out that low-self esteem may be a nonspecific symptom related to general distress, although further research has shown self-esteem to be reasonably specific to depressed rather than anxious mood (Watson, Suls, & Haig, 2002).

Examining Structural Models of Anxiety and Depression in Medical Patients

Although these structural models, in particular the integrative hierarchical model, have repeatedly received support in the literature from multiple studies, little research has applied the model to medical patients. In general, most research has been conducted on young, healthy adults or on psychiatric patients. Very little is known regarding the generalizability of the integrative hierarchical model to specific medical samples. Structural examinations of depression and anxiety symptoms are significant for two primary reasons. First, a lack of such research on medical patient samples allows for ambiguity concerning the structural nature of depression and anxiety in such samples. In other words, the associations between some symptom dimensions, for example appetite loss and negative affect, are unclear. Although research on non-medical samples shows strong associations between appetite loss and negative affect, for example, it is unclear if similar associations would emerge among medical samples as well. On a related note, the ability of specific symptoms of depression and anxiety (e.g. fatigue and PA) to differentiate between these disorders also remains unclear. In turn, this lessens our

ability to discriminate among depression and anxiety disorders among medical samples. Second, the integrative model's specification of specific and nonspecific symptoms of anxiety and depression may be of particular use in samples in which some symptoms have an uncertain etiology, such as in diabetes patients. Currently, the diagnostic utility of some common symptom dimensions of anxiety and depression (e.g. dizziness, fatigue, increased appetite), which typically have been studied in healthy samples, are unclear in diabetes samples (see "Pathophysiology of Diabetes," below, for more detail). Common practice among many health care providers excludes these symptoms from diagnostic criteria in the presence of a medical illness (e.g. Cavanaugh, 1995). In fact, the DSM-IV criteria for major depressive episode exclude any such symptom "due to the direct physiologic effects of . . . a general medical condition," (p. 356, APA, 1994) although the means by which to determine a symptom's etiology are not stated. As a result, such symptoms are often eliminated from the criteria, even though they have not been empirically established as unrelated to depression or anxiety among medical samples. Thus depression and anxiety continue to be under-recognized in diabetes patients, with estimates that 2 out of 3 depression cases are not identified (Lustman, Griffith & Crouse, 1997). A structural test of depression and anxiety symptoms helps resolve the nature of relations among such symptom dimensions.

A review of the literature revealed one study examining a structural model of depression and anxiety symptoms in a medical sample. D. A. Clark, Cook and Snow (1998) sought to determine if depression symptom presentation differences are present among medical patients. Investigators compared 75 medical in-patients, 52 psychiatric in-patients and 25 normal controls on symptoms of depression and anxiety based on the

tripartite model. The authors administered several broad measures of anxiety and depression, including the Beck Depression Inventory (BDI; Beck & Steer, 1993), the Hamilton Rating Scales of Depression and Anxiety (HRSD; Hamilton, 1960, & HARS; Hamilton, 1959, respectively), the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) and the Mood and Anxiety Symptom Questionnaire (MASQ; Watson & Clark, 1991). To summarize the authors' main findings, a one-factor solution of a principal-components analysis revealed that all measures loaded |.66| or higher on this single factor in the medical sample, and |.22| or higher in the psychiatric patient sample. In addition, affective and negative cognition symptoms of depression best discriminated the psychiatric patients from the medical patients. Among medical patients, the somatic and behavioral symptoms of depression and anxiety (i.e. anhedonia, low PA, and physiological hyperarousal) best discriminated the depressed from the nondepressed medical patients. However, the authors performed a discriminant function analysis that indicated that the symptoms of anhedonia and hyperarousal may also be influenced by the presence of a medical condition. Therefore, these symptoms may not be pure markers of depression and anxiety in a medical population. Based on their results, the authors concluded that the most significant differences between the psychiatric patients and the medical patients were differences in severity rather than type of depression symptoms.

Several limitations of this study are worth noting. First, the group sizes were relatively small, which minimized the ability to find significant differences between samples. Second, several of the measures selected were poor discriminators of depression and anxiety and generally were highly correlated across most other measures,

particularly in the medical sample. In addition, some of the specific and nonspecific lower order symptoms of anxiety and depression were not well modeled in the measures the authors used. In addition, the authors recruited a heterogeneous medical sample with a wide range of illnesses and disease severity. The heterogeneity of the medical patient group confuses the meaning of certain lower order symptoms, such as fatigue and concentration difficulties, which may or may not be present in some medical conditions. Nevertheless, the study addresses an important issue and suggests ways to make meaningful improvements in future research, such as by using a homogeneous sample and controlling for disease-related differences as well as modeling the specific and nonspecific symptoms of depression and anxiety more thoroughly. The use of a diabetes sample, in which similar symptoms are commonly experienced by most patients, would eliminate many of the problems in the D. A. Clark et al. (1998) study and yield clearer, more interpretable results.

Pathophysiology of Diabetes

Diabetes mellitus is a chronic endocrinological disorder which arises as a result of problems in the body's production and/or uptake of the hormone insulin. Insulin is produced by the pancreas, in the pancreatic beta cells, and allows cells to utilize glucose in the bloodstream so that it can be transformed into essential nutrients and energy. Without the presence or proper utilization of insulin, blood glucose levels rise, which can cause damage in small blood vessels throughout the body. Diabetes mellitus is diagnosed by the presence of abnormally high blood glucose levels, which is also known as hyperglycemia, typically through a fasting blood or oral glucose test. Once an individual has been diagnosed with diabetes, blood glucose levels are generally measured using

hemoglobin A_{1c} (HbA1c) levels. HbA1c is accepted as the best measure of recent glycemic control (i.e., past 120 days) and is generally measured at least 2 times per year for diabetes patients. The American Diabetes Association (ADA) recommends HbA1c levels of less than 7% for most diabetes patients. An HbA1c level of 5% is typical for individuals without diabetes (ADA, 2007).

There are three major types of diabetes including type 1, type 2 and gestational diabetes. Type 1 diabetes mellitus (T1DM) appears to have a genetic link that results in an autoimmune-mediated elimination of the pancreatic beta cells. As a result, the pancreas produces little to no insulin which results in blood glucose accumulation, resulting in hyperglycemia and possible subsequent damage to small blood vessels. This inability to utilize blood glucose leads to the breakdown of fat for use as energy, which results in a build up of ketone acids. The treatment for T1DM consists of delivery of subcutaneous injections or an insulin pump, which deliver insulin, to reduce hyperglycemia and prevent death in such patients. T1DM is typically diagnosed in childhood or early adulthood (CDC, 2005).

Type 2 diabetes mellitus (T2DM), also known as adult onset diabetes, is the most common form of diabetes and affects approximately 90 to 95% of diabetes patients (CDC, 2005). In T2DM, the cells do not use insulin properly as a result of either insufficient insulin production, insulin resistance or both. As this insulin deficiency increases over time, the pancreas eventually loses its ability to produce insulin. Type 2 diabetes is associated with older age, obesity, inactivity, family history of diabetes, personal history of gestational diabetes, impaired glucose metabolism and ethnicity. Type 2 is more common among African Americans, Hispanics, Native Americans, Native

Hawaiians and some Asian Americans. In addition, T2DM is being diagnosed in children and adolescents more frequently in recent years with the population-wide increase in obesity and inactivity (CDC, 2005). Individuals with T2DM are treated in a variety of ways, including changes in diet and exercise, oral medications for hyperglycemia reduction (i.e. antihyperglycemic medication), insulin injections, weight loss or a combination of these.

Gestational diabetes is a type of glucose intolerance that is diagnosed during pregnancy, typically during the third trimester of pregnancy, as a result of insufficient insulin produced by the pancreas. Like T2DM, gestational diabetes is more common among African Americans, Hispanics, and Native Americans, as well as among obese women and those with a family history of diabetes. Gestational diabetes requires treatment during pregnancy in order to normalize blood glucose levels and to avoid complications in the fetus. Typically, 90 to 95% of women with gestational diabetes return to normal blood glucose levels after pregnancy, yet they are at a much higher risk of developing T2DM in the future.

Proper management of diabetes is essential to the prevention of serious long-term complications resulting from excessive blood glucose levels. The most common complications include cardiovascular disease and stroke, high blood pressure, retinopathy and blindness, renal disease and failure, nervous system damage, amputations and periodontal disease. In all forms of diabetes, the treatment goal is to keep blood glucose levels as close to normal as possible in order to prevent or reduce these complications. Despite this goal, only a small percentage of diabetes patients are able to obtain normal blood glucose levels. Approximately 50% of patients with diabetes are able to achieve

HbA1c levels of less than 8%, and very few are able to achieve levels of less than 7% (Anderson et al., 2002). The Diabetes Control and Complications Trial (DCCT: DCCT Research Group, 1993) found that intensive treatment aimed at controlling blood glucose levels in T1DM can delay or prevent the onset of some of these complications. However, the DCCT also found that, even with the intensive support of the intervention trial, only 5% of T1DM patients maintained normal blood glucose levels.

Short-term complications of poorly controlled blood glucose levels include hyperglycemia (excessive blood glucose) and hypoglycemia (insufficient blood glucose). Hypoglycemia occurs as a result of excessive insulin in the presence of insufficient blood glucose, such as with a delay or decrease in food consumption, exercise or other physical activity or alcohol consumption. Hypoglycemia occurs more often in individuals taking either oral or injection insulin medication who have inconsistent diet and exercise regimens, a long duration of diabetes or autonomic neuropathy. Severe hypoglycemia typically occurs when more moderate signs of hypoglycemia are either ignored or not recognized and can cause loss of consciousness (Gonder-Frederick et al., 2002; Gullege & Beard, 1999). In hypoglycemia, patients commonly experience a rapid onset of symptoms (i.e. within minutes), which are typically mild in severity and easily treated by the patient. These symptoms include confusion, perspiration, dizziness, headache, hunger, irritability, paleness, increased heart rate, shallow breathing, restlessness, blurred vision and fatigue (Gullege & Beard, 1999).

As stated previously, hyperglycemia is the result of insulin deficiency leading to a build up of blood glucose. Hyperglycemia typically has a slower onset than hypoglycemia and occurs over the course of hours or days. Severe hyperglycemia may

result in diabetic ketoacidosis (DKA) in T1DM or in hyperosmolar hyperglycemic nonketotic coma (HHNC), which more typically occurs in T2DM. DKA is a serious condition that can lead to coma or death. It occurs as the result of the usage of fat for metabolic energy, resulting in dangerously high levels of ketones in the blood. High levels of ketones are toxic, leading to low blood pH, or acidosis. Signs of DKA can include thirst, dry mouth, frequent urination, fatigue, dry or flushed skin, nausea, vomiting, abdominal pain, shortness of breath, fruity breath odor, concentration difficulties and confusion. In HHNC, the body attempts to rid itself of high levels of blood glucose by passing the excess through urine. This leads to increases in urine production which can lead to severe dehydration. The dehydration can result in seizures, coma and death if untreated. HHNC can take days or weeks to develop. Signs of HHNC include dry mouth, extreme thirst, warm and dry skin, fever, sleepiness, confusion, loss of vision, hallucinations and weakness on one side of the body. Symptoms of lower levels of hyperglycemia are similar and include appetite loss, nausea, vomiting, hot and dry skin, frequent urination and weight loss (Gullege & Beard, 1999).

Although diabetes mellitus includes a number of disorders (T1DM, T2DM, and gestational diabetes), the disorders share several common characteristics. Each disorder is characterized by similar symptoms related to both hyperglycemia and hypoglycemia, as described above. In addition, the disorders have the same management goals for glycemic control (HbA1c <7.0%), regardless of the type of diabetes, and the most recent standards of care prefer insulin therapy for T2DM as well as T1DM given insulin therapy's effectiveness (ADA, 2007). In addition, all diabetes disorders share the same medical nutrition therapy recommendations (i.e., managing weight and obesity, limiting

fat intake and monitoring carbohydrate intake), exercise recommendations (although these programs need to be tailored to each patient depending on level of glycemic control) and guidelines for the prevention and management of diabetes-related complications. Thus, although on a pathophysiological level there are differences between these diabetes disorders, on a clinical level there are a considerable number of similarities between disorders.

As stated previously, most patients have difficulties maintaining normal blood glucose levels, and as a result, hypo- and/or hyperglycemia are experienced at some time by most patients. Several of the above stated hypo- and hyperglycemia symptoms are also specific and nonspecific symptoms of anxiety and depression. For example, perspiration, dizziness, increased heart rate, shallow breathing, nausea, abdominal pain and shortness of breath are all signs of panic disorder. In addition, hunger, irritability, restlessness, concentration difficulties, appetite loss and weight loss are all nonspecific symptoms of depression and anxiety. Fatigue and sleepiness are associated with low PA and, therefore, are relatively specific symptoms of depression. This overlap in symptomatology has led to uncertainty in identifying anxiety and depression among diabetes patients, as well as among other medical patients who may also experience these symptoms for multiple reasons. In addition, some research has found that the relationship between these symptoms and objective measures of glucose control are weak, creating even more confusion in understanding the nature of these symptoms (Ciechanowski, Katon, Russo, & Hirsch, 2003; Lustman, 1988).

This overlap in symptomatology also has generated considerable research with diabetes patients in order to understand the nature of such symptoms. Studying this

overlap within the context of a structural model, such as the integrative model, allows for better understanding of these symptoms. However, no tests of the integrative model have been conducted in patients with diabetes, and as such I will focus the following review of research on correlational studies of specific symptoms of depression and panic disorder, as well as nonspecific symptoms of depression and anxiety.

Studies of Specific and Nonspecific Symptoms of Depression and Anxiety in Diabetes Samples

Researchers have used a number of methods in order to understand the role of depression and anxiety symptoms in medical patients. The following review will focus on two different study designs with diabetes patients that have been used to understand these symptoms: (1) studies examining depressive disorders and/or anxiety disorders and correlates and (2) studies assessing only self-reported symptoms of depression and/or anxiety and their correlates. Although the following studies do not test the integrative model specifically, an examination of the correlates of the components of the integrative model allows for some understanding of the model, as well as for the generation of hypotheses for the model within a diabetes sample.

Depressive Disorders, Anxiety Disorders and Correlates in Diabetes Patients

Lustman, Freedland, Carney, Hong & Clouse, 1992. Lustman, Freedland, Carney, Hong and Clouse (1992) examined the symptom profile of depression in diabetic (T1DM & T2DM) and psychiatric out-patients. The authors diagnosed depression with the Diagnostic Interview Schedule – Version Three (DIS; Robins, Helzer & Croughan, 1981) using DSM-III-R criteria and assessed depression symptomatology with the BDI in

both the diabetic and psychiatric groups. The authors identified 41 depressed diabetic patients, 63 depressed psychiatric patients, and 58 non-depressed diabetics using the DIS. The authors then compared (1) mean level differences of total scores on the BDI, (2) prevalence differences of individual items of the BDI and (3) differences in reported severity of the individual items. The authors found significant differences in mean level scores on the BDI between the depressed diabetic patients (mean = 24.2) and non-depressed diabetic patients (mean = 4.8), as well as between the depressed psychiatric patients (mean = 22.5) and the non-depressed diabetic patients. There was no significant difference on total score between the depressed diabetic and depressed psychiatric patients. Thus, the BDI total score did not appear to be inflated due to the presence of diabetes.

An examination of item prevalence differences between the three groups revealed significant differences. First, the depressed diabetic patients had a greater prevalence of the following items when compared with the psychiatric patients: decreased interest in people, fatigue, health worries and decreased interest in sex. The presence of diabetes may have influenced the prevalence of fatigue and health worries, yet differences in interest in people and sex would not typically be expected due to the presence of diabetes. The authors interpret this to suggest that an interaction may occur with the presence of both depression and diabetes, causing some symptoms to be present at a greater rate than would be expected by either disorder on its own. When compared with the non-depressed diabetic patients, both the depressed diabetic patient group and depressed psychiatric patient group had a greater prevalence of all items except weight loss. Weight loss was reported at a low prevalence for both depressed and non-depressed

diabetic patients. The psychiatric patient group had a significantly greater prevalence of weight loss when compared with the non-depressed diabetic patient group. Thus the prevalence of each of the 21 items of the BDI, with the exception of weight loss, was influenced more heavily by the presence of depression than by the presence of diabetes.

Similar patterns were found for the severity of the items. More specifically, depressed patients, including both diabetic and psychiatric, endorsed items at a higher severity than the non-depressed diabetic patients. In addition, depressed diabetic patients reported higher severity on the following items when compared with depressed psychiatric patients: decreased interest in people, decreased interest in sex and health worries. The weight loss item was, again, similar between the two diabetes groups, with no significant differences in severity reported between groups. There was a significant difference between the psychiatric patient group and the non-depressed diabetic patient group on the weight loss item, with psychiatric patients reporting a higher severity of weight loss when compared with non-depressed diabetic patients.

The results of this study suggest several conclusions. First, the authors found a general similarity in the symptom profile of depressed individuals regardless of diabetes illness status. This would suggest that most symptoms measured by the BDI that overlap with symptoms of hypo- or hyperglycemia (e.g. appetite loss and irritability) will demonstrate similar patterns of correlations in a diabetes sample. Results of this study also suggest that weight loss may be a poorer indicator of depression in diabetes patients. This may be due, in part, to the diabetes self-care regimen that often targets diet and weight loss in order to prevent diabetes complications, particularly among T2DM patients. In addition, fatigue may be reported at higher than expected levels among

depressed diabetes patients, and does not appear to be as common among non-depressed diabetes patients.

Ludman et al., 2004. Ludman and colleagues (2004) examined the relationship between a diagnosis of major depression and diabetes symptom reporting in 4,186 patients with diabetes with an average age of 63.5 years. Investigators used the Patient Health Questionnaire (PHQ; Spitzer, Kroenke, & Williams, 2001), a self-report measure of depressive symptoms, to obtain a dichotomous indicator of major depressive disorder (based on DSM-IV criteria) as well as a continuous severity score of depression for each participant. In addition, diabetes patients completed the Self-Completion Patient Outcome instrument (SCPO; Whitty, Steen, & Eccles, 1997), a 9-item measure of diabetes symptoms including the following: (1) cold hands and feet, (2) numb hands and feet, (3) polyuria, (4) excessive hunger, (5) abnormal thirst, (6) shakiness, (7) blurred vision, (8) feeling faint and (9) feeling sleepy. On this instrument, participants indicated the frequency of experiencing each of the symptoms using a Likert-scale from "never" to "everyday." Investigators added one new item to the inventory, namely, pain in hands and feet. They also measured the severity of diabetes using medical records from the past 1.5 year period based on the following considerations: (1) diabetes complications, (2) treatment intensity and (3) glycemic control as measured with HbA1c.

The investigators performed two sets of analyses. First, they performed ANCOVAs to determine if the number of reported diabetes symptoms was related to the presence of major depression or to the number of reported depression symptoms. Second, they ran logistic regression analyses to determine the relative strengths of relationships between individual diabetes symptoms and (1) the presence of major

depression, (2) HbA1c levels greater than 8% and (3) two or more diabetes complications. Results of ANCOVAs suggested that individuals with major depression or with higher numbers of depression symptoms reported significantly greater numbers of diabetes symptoms, even after controlling for objective measures of diabetes severity, medical comorbidity and demographic characteristics such as age.

Results of logistic regression analyses found that each of the 9 diabetes symptoms of the SCPO were significantly related to the presence of major depression, after adjusting for number of complications and HbA1c levels. Patients with major depression were 2 to 5 times more likely to report such symptoms. In addition, 4 of the 9 diabetes symptoms were significantly related to HbA1c levels of 8% or greater, including polyuria, abnormal thirst, blurred vision and daytime sleepiness, even when controlling for depression and number of diabetes complications. Patients with HbA1c levels of 8% or greater were 1.17 to 1.34 times as likely to report these four symptoms. Lastly, logistic regression analyses found that all but 1 of the 9 diabetes symptoms (excessive hunger was the exception) were significantly related to the presence of 2 or more diabetes complications, after controlling for depression and HbA1c levels, and that patients with complications were 1.27 to 2 times as likely to report these 8 diabetes symptoms.

Several conclusions can be drawn from these findings. First, the presence of major depression appears to be a better predictor of reporting diabetes symptoms than are objective measures of diabetes, including HbA1c levels and number of diabetes complications. In addition, some diabetes symptoms appear to be unrelated to objective measures of diabetes severity (HbA1c), although they are significantly related to the presence of major depression, including coldness, pain and numbness in the hands and

feet, excessive hunger, shakiness and feeling faint. Second, excessive hunger is not significantly related to either HbA1c levels or number of diabetes symptoms, suggesting that this symptom is more related to mood than to diabetes. Finally, daytime sleepiness was found to be significantly related to both major depression and to objective measures of diabetes, although the odds of reporting daytime sleepiness were approximately 5 times greater for those with major depression, compared with 1.17 and 1.26 times greater risk for patients with HbA1c levels of 8% or greater or with 2 or more complications, respectively. Thus, fatigue was related to both disease and depression, yet appears to be more strongly related to depression. Although these results are consistent to some extent with those of Lustman et al., 1992, one major short-coming of the study is the lack of a control group to aid in the interpretation of the findings.

Friedman, Vila, Timsit, Boitard, & Mouren-Simeoni, 1998. Friedman and colleagues (1998) examined relationships between anxiety and depressive disorders and disease severity indicators (e.g. compliance, glycemic control and diabetes complications) in a sample of 69 T1DM patients and a control group of 99 non-diabetic outpatients and nursing students. Anxiety and depressive disorders were diagnosed using a French version of the Schedule for Affective Disorders and Schizophrenia (SADS; Leboyer et al., 1991) based on DSM-III-R criteria. In addition, patients completed the BDI and the 58-item Hopkins Symptom CheckList (SCL-58; Pichot, Lacassin, & Dreyfuss, 1978; depression & anxiety scales), also in French. The SCL consists of psychological symptoms that are rated on a 5-point Likert scale of distress, where 0 = "not at all" and 4 = "extremely." Mean HbA1c over the past 6 months, compliance with regimen and frequency and type of diabetes complications were obtained from

participants' medical records. Investigators sought to (1) examine the prevalence of anxiety and depressive disorders among diabetes patients (2) compare anxiety and depressive symptoms between groups and (3) examine the relationship of these disorders and symptoms to disease severity indicators.

Investigators identified the following current (i.e. past 2-months) prevalence rates of anxiety disorders: anxiety disorder NOS = 37%; simple phobia = 27%; social phobia = 22%; agoraphobia = 10%; PTSD, panic disorder and agoraphobia with panic disorder = 2.4% each; no cases of GAD were found. Current prevalence of depressive disorders among diabetes patients were: dysthymia = 7%; depressive disorder NOS and cyclothymia = 2.4% each; no cases of major depression were identified. In comparing mean differences on self-report measures of depression and anxiety, investigators found that participants in the control group (in particular, the medical outpatients) had higher BDI and SCL-58 scores than diabetes patients. Investigators did not find a significant correlation between either BDI or SCL-58 scores and HbA1c levels. However, findings did suggest significant differences in HbA1c values for diabetes patients with versus without current social phobia and current depression (i.e. non-specified depression, dysthymic type and dysthmia). Those individuals with current social phobia or depression had higher HbA1c levels, which may indicate poorer compliance with the diabetes regimen among these patients. In regression analyses, neither BDI or SCL-58 scores, or anxiety or depressive disorder diagnoses, predicted diabetes complications. Instead, HbA1c levels and duration of diabetes were the only significant predictors of diabetes complications.

Several prevalence rates of anxiety and depressive disorders were considerably higher than those found in the Epidemiologic Catchment Area study (ECA; Reiger et al., 1984) and NCS, including simple and social phobia, agoraphobia and dysthymia. These findings are similar to those of other studies of diabetes (e.g. Anderson et al., 2001; Grigsby et al., 2002), which often find higher than expected rates of mood and anxiety disorders among diabetes patients. In contrast, however, prevalence rates of GAD and major depression were lower in the diabetes sample than typically expected in both population-based studies and diabetes-specific studies. The authors propose that this finding may be due to their particular diabetes sample, which they characterized as physically healthier than those in other studies. However, these results are limited by the lack of diagnostic data from the control group, which makes interpreting the diabetes prevalence rates from this particular sample difficult. Results of correlation and regression analyses suggest that the presence of diabetes is not associated with self-reported depression and anxiety symptoms, as the control group endorsed higher levels of depression and anxiety on questionnaires. However, the medical outpatients of the comparison group were poorly defined and may had higher BDI scores due to overlapping symptoms from their medical condition, which makes interpreting this finding difficult. In addition, the study included a relatively small sample of diabetes patients (N = 69), which limited their ability to detect significant differences and effects in their analyses.

Anderson et al., 2002. Anderson and colleagues (2002) performed a meta-analytic review of the literature to determine the relationship between anxiety and glycemic control in T1DM and T2DM. Investigators located all studies published from

1975 to 2002 that examined either self-reported anxiety symptoms and/or anxiety disorders and glycemic control in diabetes patients. Their review identified 11 studies meeting criteria for inclusion in the meta-analysis, for a total of 1413 participants. Self-report inventories included the SCL, 90-item version (SCL-90; Derogatis, Lipman, & Covis, 1973), the Zung Self-Rating Anxiety Inventory (ZSRA; Zung, 1971), the HADS, the State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lorshene, 1970) and the Taylor Manifest Anxiety Scale (TMAS; Taylor, 1953). Investigators converted study findings to a common metric, examining both the overall association between anxiety and HbA1c, as well as associations broken down by various categories, such as inclusion of diagnostic interviews.

The meta-analysis yielded a non-significant effect size across all 11 studies, suggesting that anxiety was not reliably associated with HbA1c levels. Among those studies using diagnostic interviews to assess anxiety disorders, a significant effect size was found for the association between anxiety disorders and HbA1c. Analysis of studies of self-report measures of anxiety did not yield a significant effect size for the association between anxiety and HbA1c levels. No other analyses of potential moderators (e.g. type of diabetes, age, gender, severity of diabetes) yielded significant effect sizes.

The significant effect size for the association between anxiety disorders and HbA1C can be interpreted in two primary ways. First, patients with anxiety disorders may have greater difficulty adhering to their self-care regimen and managing their diabetes, thus leading to higher blood glucose levels. Or, conversely, the higher levels of blood glucose may contribute to the patient's anxiety symptoms, given the overlap in autonomic arousal and nonspecific anxiety/depression symptoms, thereby making these

patients more likely to receive a diagnosis of anxiety disorders. The investigators also hypothesize that anxiety could contribute to hyperglycemia directly, through activation of the sympathetic nervous system and hypothalamic-pituitary adrenal axis, although this link has been more thoroughly established in animal models than in human models of diabetes. In fact, more evidence has accumulated suggesting that anxiety and acute stress do not reliably affect glucose in humans (Lustman, 1988). The finding that self-report assessment of anxiety symptoms is not associated with hyperglycemia suggests that certain anxiety symptoms typically associated with hyperglycemia are more strongly related to anxiety than to blood glucose levels. In addition, these findings are consistent with those of Friedman et al., 1998, suggesting a stronger relationship between diagnoses of anxiety disorders and HbA1c levels than between self-reported anxiety symptoms and HbA1c levels.

Summary

Results of studies using diagnostic measures of depression and anxiety suggest some similarities and differences between diabetes samples and various control groups. First, most symptoms of depression that overlap with symptoms of diabetes appear to perform similarly for depressed individuals with diabetes compared with depressed non-diabetics, including low mood/NA, irritability and concentration problems. Weight loss, however, has been found to be less related to depression in one study (Lustman et al., 1992). In addition, fatigue was found to be reported at higher levels among depressed patients with diabetes when compared with depressed non-diabetic patients (Lustman et al., 1992). Also, one review found a significant association between anxiety disorder diagnoses (but not self-reported symptoms) and HbA1c levels, which suggests a possible

different relationship between anxiety and diabetes, depending upon the anxiety severity. Anxiety captured by self-report measures did not appear to be a significantly affected by the level of control of diabetes. Thus, based on these diagnostic studies, it does not appear that the presence of diabetes affects the presentation of depression, although some individual symptoms (i.e. weight loss and fatigue) may be influenced by the disease. In addition, anxiety disorders may be influenced by the presence of diabetes or, conversely, may influence the disease process.

Self-Report Measures of Depression and Anxiety and Their Correlates

Ciechanowski, Katon, Russo and Hirsch, 2003. Ciechanowski and colleagues (2003) examined the relationship between depressive symptoms, diabetes symptoms, adherence to the diabetes regimen and HbA1c levels in 276 T1DM and 199 T2DM patients. The authors were interested in examining the impact of depression on self-care and health outcomes among individuals with diabetes and predicted that the presence of depressive symptoms would be significantly associated with poorer diabetes outcomes, particularly among T1DM patients. Participants completed a 20-item version of the SCL (SCL-20) assessing depression symptoms in addition to scales assessing (1) number of diabetes-related symptoms (e.g. fatigue, hunger), (2) number of diabetes-related complications, (3) number of comorbid medical conditions (e.g. heart disease), (4) physical functioning and (5) adherence. Data were analyzed using multiple regression with demographic characteristics, diabetes-complications and number of comorbid medical conditions as control variables; depression symptoms as predictors; and HbA1c levels, diabetes symptoms, adherence and physical functioning as dependent variables.

In addition, analyses were conducted using the interaction between diabetes type and depression symptoms (dichotomized based on clinical cut offs on the SCL-20).

In predicting HbA1c levels, there was a significant interaction between depression symptoms and diabetes type: T1DM patients with high SCL-20 scores had significantly higher HbA1c levels. Depression symptoms on their own were not a significant predictor of HbA1c levels. However, depression symptoms were a significant predictor of diabetes symptoms, even after controlling for number of diabetes-related complications; thus, the results suggest that individuals with higher depression scores report greater numbers of diabetes symptoms. Depression was also a significant predictor of adherence, with higher depression associated with poorer adherence. Finally, increased depression was also predictive of poorer physical functioning, even after controlling for medical comorbidity and diabetes-related complications.

The primary conclusion to be drawn from this study is that depression appears to be related to diabetes symptoms, even when controlling for diabetes severity indicators (e.g. number of complications). This finding was reflected previously in Ludman et al. (2004), using HbA1c levels as an indicator of diabetes severity, who found that depression was a greater predictor of some diabetes symptoms than HbA1c levels. Thus, diabetes symptoms may be more related to the presence of depression than to objective measures of diabetes. However, as in Ludman (2004), no control group was included by which to compare findings. In addition, these investigators did not include measures of individual symptoms of depression, which makes it difficult to examine relationships between symptoms and to identify overlapping item content across depression and diabetes symptom measures.

Lustman, Clouse, & Carney (1988). Lustman, Clouse and Carney (1988) investigated the relationship between depressive and diabetes symptoms in a sample of 114 T1DM and T2DM patients. Investigators measured hyperglycemic symptoms including thirst, frequent urination and losing weight, as well as hypoglycemic symptoms including hunger, sweating, trembling, fainting/dizziness, confused thoughts and loss of consciousness. In addition, they assessed fatigue and fever/malaise, which they classified as nonspecific symptoms of poor control. Each diabetes symptom was assessed with a single item in which participants indicated the extent to which they were bothered by these symptoms over the past week. Depression was assessed using the BDI and investigators also examined HbA1c levels. Correlational analyses were run between diabetes symptoms and BDI scores, as well as between diabetes symptoms and HbA1c scores.

Results indicated that all of the diabetes symptoms except loss of weight and loss of consciousness were moderately and significantly correlated with total BDI score and only loss of consciousness was significantly correlated with the objective measure of metabolic control – HbA1c. As seen previously, many diabetes symptoms appear to be more strongly related to depression than to objective measures of diabetes. However, this finding may be an artifact of the means of assessing these symptoms. Using the words "bothered by" may tap negative affect and distress more so than a question assessing frequency of presence of the symptoms, as is more commonly used. In addition, several BDI items overlap with the measured diabetes symptoms, making conclusions somewhat difficult to interpret, particularly in the absence of a control group.

Lustman, 1988. In a separate report on Lustman et al.'s (1988) sample of 114 T1DM and T2DM patients, Lustman (1988) examined the associations between self-reported anxiety (as measured with the SCL-90 anxiety scale), HbA1c levels and 11 diabetes symptoms. The 11 assessed diabetes symptoms again included 3 hyperglycemic symptoms (thirst, frequent urination and weight loss), 6 hypoglycemic symptoms (hunger, sweating, trembling, faintness or dizziness, confused thoughts and loss of consciousness) and 2 nonspecific diabetes symptoms (fatigue and fever/malaise). The study's objective was to examine the association between anxiety and diabetes symptom reporting as well as between HbA1c levels and diabetes symptom reporting.

Results of these analyses were similar to those seen earlier: most diabetes symptoms, with the exception of weight loss and loss of consciousness, were more strongly related to anxiety than to HbA1c levels. Loss of consciousness correlated similarly with anxiety ($r = .27$) and HbA1c levels (.26). Weight loss was not related to anxiety or to HbA1c levels. Again, one major limitation of the study is the means of measuring diabetes symptoms. Patients were asked to indicate how much they were "bothered by" the diabetes symptoms, which likely relates more to general distress/negative affect than a question assessing frequency of the symptoms. In addition, the overlap in content on both the anxiety questionnaire and diabetes symptom questionnaire may also have contributed to the higher correlations between anxiety and diabetes symptoms. In general, these results are congruent with those stated previously which have not found that the presence of diabetes affects the associations between individual depression and anxiety symptoms. However, conclusions are somewhat limited from this particular study by methodological issues.

Hermanns, Kubiak, Kulzer & Haak, 2003. Hermann and colleagues examined the effects of experimentally-induced hypoglycemia on mood in a sample of 22 T1DM patients. Participants were randomly assigned to either the experimental or control group, with 11 participants in each, and all were blind to group status. All participants received two antecubital venous tubes, one for measuring current blood glucose levels and one for controlling blood glucose levels. Hypoglycemia was induced in the experimental group and euglycemia was maintained throughout the study in the control group. Participants were administered the UWIST Mood Adjective Checklist, which contains a list of adjectives that assess energy (i.e., high or low PA), tension (i.e., high or low NA), and hedonic tone (i.e., pleasure versus displeasure, based on J. A. Russell's model of affect – see Matthews, Jones and Chamberlain, 1990, for more detail), as well as a series of adjectives assessing anger, at three time points: before inducing hypoglycemia, during hypoglycemia and after hypoglycemia. Mood measurements were taken at the same times in the control group. Investigators ran ANOVAs to compare for group differences in the effect of hypoglycemia on affect.

Results indicated an effect for phase (pre-, during or post-hypoglycemia) as well as group (experimental vs. control). The experimental group experienced greater NA (e.g. "tense," "anxious," "stressed") overall compared with the control group. In addition, experimental participants reported higher anger (e.g. "angry," "annoyed," "irritated") and NA and lower PA (e.g. "idle," "sluggish," "dull") during the hypoglycemic phase than during the pre- and post-hypoglycemic phases. There was no significant effect for phase or group on hedonic tone (e.g. "pleased," "depressed"). Although the similarity in subjective experience between experimentally induced

hypoglycemia and in vivo hypoglycemia is unclear, results suggest that hypoglycemia does induce a dysphoric mood, including higher NA (i.e. tension), anger and lower PA (i.e. sluggishness and fatigue). These experimental results suggest that some symptoms of anxiety and depression are affected by the complications associated with diabetes, although the clinical significance of this effect is unclear. In addition, although hypoglycemia may affect mood, it is unclear if it would affect the structure of mood and relationships among symptom dimensions.

Summary and Conclusions

With the exception of Hermanns et al., (2003), the studies of self-report symptoms of depression and anxiety generally have found that most overlapping symptoms of depression and diabetes appear more strongly related to mood than to objective measures of disease. One symptom appears to be less related to mood, however, namely weight loss. The data suggest that weight loss is unrelated to either depression/anxiety or diabetes. Hermanns et al. (2003), however, obtained contrary results in their experimental study of hypoglycemia. This study suggests that hypoglycemia may directly lead to feelings of tension, irritability and low energy/fatigue. One possible explanation for this discrepancy is that the study's findings may be less relevant to the in vivo experience of diabetes symptoms, given the controlled, artificial setting. In addition, although hypoglycemia may be directly related to these symptoms, the associations among these symptoms may be similar to those obtained in physically healthy samples.

Although the general consistency of results suggests a robust association between most depression/anxiety and overlapping diabetes symptoms, several steps could be taken

to further clarify the nature of the relations between symptoms, improve discriminability between disorders and assist in diagnostic questions. Here I will highlight a few key areas for improvement. First, most studies, including self-report and diagnostic/interview studies, use single items as measures of individual symptoms, which obviously decreases the reliability and validity of measurement. Adding additional reliable markers (i.e. in well-defined scales) of the symptoms of interest would greatly improve their measurement. In addition, modeling these symptoms as latent factors will increase the reliability of measurement.

Second, several studies measure depression/anxiety and diabetes symptoms by using scales with overlapping items and content. This increases correlations between measures and makes it difficult to interpret findings. Although many symptoms are strongly correlated (e.g. irritability and sad mood) and belong on similar scales, referring to scales as "depression" or "anxiety" scales versus "diabetes" scales when they have very similar content is an artificial distinction that is not easily justified. Instead, measuring unique content individually and then allowing for differences in relationships among symptoms to emerge between different samples (i.e. diabetes patients vs. nondiabetics) would improve our understanding of these overlapping symptoms.

Third, an array of analytic approaches have been used to determine whether a symptom is related to depression or anxiety. For example, some studies use depression as the dependent variable and diabetes symptoms as independent variables, while some predict diabetes symptoms from depression, and others still examine correlations among all symptoms. To date, there have been no structural analyses of symptoms with which to examine more fundamental associations among specific and nonspecific symptoms of

depression and anxiety. In addition, most studies do not test a particular model of depression or anxiety and the studies are generally atheoretical in approach. Most studies fail to discuss larger issues within the study of depression and anxiety, such as the nonspecificity of many symptoms or the problem of comorbidity of depression and anxiety. Examining depression and anxiety symptoms among diabetes patients in the context of structural analyses of the integrative model—using confirmatory factor analysis in particular—will help to address these last three concerns. Again, structural analyses will allow for robust modeling of the symptoms of interest, will eliminate the difficulty of comparing across studies due to different assessment/analytic approaches, and will allow for the test of the integrative model.

CURRENT STUDY

Goals

Understanding the structure of anxiety and depression symptoms is an important step for the identification, discrimination and treatment of such disorders in diabetes patients. This study provides the first examination of the integrative model within a specific, homogeneous medical sample (i.e. diabetes patients). As stated previously, testing this model in medical populations, such as diabetes patients, is important for two primary reasons. First, this will allow for an examination of the replicability of the integrative model's proposed symptom structure. This will help determine if those symptoms that have been shown to be nonspecific and strongly associated with general distress and NA are nonspecific in a diabetes sample as well. In addition, it allows for a test of relationships among relatively specific symptoms (i.e. AA, PA and fatigue) in a diabetes sample, which in turn allows for improved discrimination among depression and anxiety disorders.

The second (and related) reason for examining the structure of anxiety and depression symptoms in a diabetes sample is that this approach will help address the uncertainty surrounding overlapping symptoms. Often times when diabetes patients present with symptoms such as fatigue, irritability, concentration problems, psychomotor agitation, autonomic arousal, appetite gain or appetite loss, these symptoms are considered reflections of diabetes rather than of depression or anxiety. Some researchers have suggested that this leads to the under-diagnosis of such disorders (Lustman et al., 1997; D.A. Clark et al., 1998). Failing to identify and treat such disorders, as stated previously, can have severe negative consequences, such as poorer self-care behaviors,

increased diabetes-related complications and overall poorer health outcomes (Gonder-Frederick et al., 2002). Thus, this study's ultimate aim is to improve the identification and discrimination of such disorders, which will improve both mental and physical health outcomes among diabetes patients. Even though multiple studies, as described above, have studied the relationship of depression and anxiety symptoms in the presence of diabetes, none have done so within the context of a theoretical model, such as the integrative model; moreover, the proposed study incorporates several improved methodological features, which are discussed below. By examining depression and anxiety within the context of a structural model and with the inclusion of several improved design considerations, this study will uniquely contribute to our understanding of such symptoms among diabetes patients.

The current study tests the structure of specific and nonspecific symptoms of depression and anxiety, based on the integrative model, in a diabetes and community adult sample. More specifically, the following study examines six nonspecific symptoms including NA (i.e. dysphoria), irritability, concentration difficulties, appetite loss, appetite gain and psychomotor agitation. In addition, three relatively specific symptom dimensions are examined, including fatigue, PA and AA. With the exception of PA and dysphoria, these symptoms have been selected based on their presence in both diabetes (e.g. hypo- or hyperglycemia) and depression and/or anxiety. Dysphoria and PA have been included in order to more fully model the common and unique components of the integrative model and to maximize the possibility for this model to emerge. Symptom dimensions are assessed with a minimum of two markers per construct (see Table 1). For those measures that contain multiple symptom dimensions, content is divided within

measures in order to reduce overlap between constructs (see "Measures," below). Given these nine hypothesized symptom dimensions, the study examines (1) whether or not a nine-factor structure emerges in an community adult and diabetes sample given selected measures, (2) whether the same underlying factors emerge in both samples and (3) whether or not the same factor correlations emerge in a diabetes group compared with community adults. These tests will be conducted using multiple group confirmatory factor analyses (see "Analyses" for more detail). In addition, the study tests for mean level differences between samples.

Although no single study can address every possible methodological concern, the present study represents a significant improvement upon existing research of depression and anxiety symptoms in diabetes patients in several ways. First, the use of reliable measures of individual symptoms, rather than single items, is a more psychometrically sound measurement method. The use of well-validated measures of symptom dimensions improves the validity and reliability of the measurement model and allows for greater assurance in findings.

Second, symptoms are examined individually, rather than as overlapping content within similar measures, in order to better understand the nature of—and relations between—such symptoms. Overlapping content has been removed from broad measures of "depression" and "anxiety," which will reduce the chance of artificially inflated correlations among different symptom dimensions. In addition, multiple markers of each symptom dimension of interest are included in the study, which allows for an increased probability that unique factors emerge in analyses.

Third, the present study uses a structural approach to study symptom relationships by using the integrative model as a basis of understanding. Symptom markers (i.e. measures) will be subjected to factor analyses in order to identify latent factors that capture the symptom dimensions (see "Analyses" for more detail). This will further improve the robustness of measurement. In addition, using multiple group confirmatory factor analyses allows for testing of group differences on multiple levels, rather than just comparing correlational differences between groups.

Fourth, the use of a comparison group significantly aids in the interpretation of findings. The use of a community adult sample by which to compare the diabetes sample allows this study to (1) relate to previous studies of the integrative model in non-medical samples (e.g. community adults) to test for consistency of results and (2) attribute any findings unique to the diabetes sample to the presence of the medical condition rather than to this study's methodology.

Fifth, the present study measures depression and anxiety symptoms within the specific context of the integrative model. One key feature of this model is its recognition that the concepts of "depression" and "anxiety" actually are less distinct than previous studies might suggest.

Finally, the present study focuses on those symptoms that are of specific interest in a diabetes sample. Rather than examining "somatic" symptoms broadly among diabetes patients, this study targets specific symptoms which are also recognized manifestations of hypo- or hyperglycemia. This design is ideal for increasing the probability of differences to emerge between diabetes samples and a comparison group. "Somatic" symptoms more broadly include sleep disturbance and psychomotor

retardation, which are not typical symptoms of diabetes and would not conceptually be expected to behave differently in diabetes patients. These design characteristics allow for a significant contribution to our understanding of the nature of depression and anxiety symptoms among diabetes patients.

Hypotheses

Diabetes-related model. This study measures 6 nonspecific symptom dimensions including: (1) NA/dysphoria, (2) irritability, (3) concentration problems, (4) appetite loss, (5) appetite gain and (6) psychomotor agitation/restlessness. In addition, the study measures two specific depression symptom dimensions (PA and fatigue) as well as one specific anxiety symptom (AA). In making hypotheses regarding the nature of relationships among diabetes patients, there are several competing explanatory models that one can use as a framework for predictions. One model, which will be referred to as the diabetes-related model, predicts that those symptoms of diabetes that overlap with symptoms of depression and anxiety are more related to the disease than to mood or affect. This model would suggest significant differences in the relationships among symptoms between the diabetes group and community adult group. More specifically, the overlapping symptoms (e.g. irritability, concentration problems, etc.) would be expected to be less related to NA and PA among the diabetes group. As stated previously, this model has been suggested to prevail in many medical settings.

Affect-related model. A second model, which will be referred to as the affect-related model, hypothesizes that the specific and nonspecific symptom dimensions will relate similarly within both groups, regardless of differences in disease status. This model, based on the integrative hierarchical model, has considerable support from

general population studies (e.g. Mineka et al., 1998) and appears likely to be at least partially supported among diabetes patients as well, given the above review as well as the general robustness of structural models across other types of samples (e.g. Watson, 2005; O'Connor, 2002). Nonspecific symptom dimensions are expected to correlate significantly with one another, reflective of the influence of a more general negative affect factor, and specific symptom dimensions (i.e. PA, fatigue and AA) are expected to demonstrate some level of specificity in their correlations based on this model.

Recent research has demonstrated notable differences in the relative strength of relationships among some specific and nonspecific symptoms of depression and anxiety (Watson et al., 2007). Consistent with the model proposed by Mineka et al. (1998), this research has shown that certain nonspecific symptoms are more highly intercorrelated than others; dysphoria, irritability, concentration problems and psychomotor agitation show particularly strong interrelations. Other nonspecific symptoms—such as appetite loss and appetite gain—have been shown to correlate in the moderate to low range with other symptoms. In addition, positive affect, although it relates significantly with other symptoms of depression and anxiety, is more moderately correlated with other symptoms of depression/anxiety.

For example, Watson et al. (2007), in the development of the Inventory of Depression and Anxiety Symptoms (IDAS), found correlations between scales measuring dysphoric mood, irritability, concentration difficulties and psychomotor agitation/retardation ranging from .65 to .72. In contrast, scales tapping appetite changes had correlations ranging from .26 to .43 with scales measuring dysphoric mood and irritability. Finally, Watson et al. (2007) found that correlations between the IDAS Well-

Being and Dysphoria scales ranged from -.47 to -.50. Thus, although all of these symptom dimensions are significantly correlated with one another, the magnitude of these correlations has been found to differ widely and systematically in previous research.

Based on this model of affect, one would hypothesize similar patterns of correlations to emerge in both samples. More specifically, dysphoria, irritability, concentration problems and psychomotor agitation are expected to correlate highly with one another, whereas appetite loss, appetite gain and positive affect are expected to correlate significantly—yet more moderately—with the other symptom dimensions. In addition, based on the relative specificity of some symptoms, fatigue and PA are expected to demonstrate some specificity to depression and to correlate more strongly with dysphoria than with AA. Furthermore, as was found previously (Watson et al., 2007), fatigue is expected to correlate more strongly with nonspecific symptoms such as dysphoria than is PA. For the purposes of this study, the hypotheses will focus on some of these expected correlational differences among specific and nonspecific symptoms, rather than testing every possible pair of correlations (see "Hypotheses" for more detail).

Interaction model. Finally, results of some studies (e.g. Lustman et al., 1992; D.A. Clark et al., 1998) suggest what will be referred to as an interaction model. This model predicts that the presence of diabetes will lead to even higher correlations among symptom dimensions in the diabetes group when compared with the community adult participants, with a larger general distress factor emerging as seen in D.A. Clark et al. (1998). Given the general support found thus far, most of the following hypotheses are based on the affect-related and interaction models of symptom dimensions.

Formal hypotheses. Since much research has found higher prevalence rates of depression and anxiety disorders among diabetes patients, I predict significant mean level differences between the diabetes sample and community adult sample on measures of the symptom dimensions.

Hypothesis 1: Diabetes patients will score significantly higher on measures of dysphoria, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, fatigue and AA than the community adult sample.

Hypothesis 2: I predict that the diabetes sample will score significantly lower on measures of PA than the community adult sample.

Given the plethora of evidence suggesting that structural models are generally robust across samples (e.g. O'Connor, 2002), and given that at least two markers of each factor will be included in analyses to maximize the probability of its emergence, the study also predicts the following within-sample hypotheses:

Hypothesis 3a: In following with the affect-related model of symptoms, I predict that the a priori measurement model of the nine latent factors (dysphoria, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, PA, fatigue and AA) will fit the data for the selected measures (see Table 1 for more detail) in the community adult sample.

Hypothesis 3b: I predict that the a priori measurement model of the nine latent factors (dysphoria, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, PA, fatigue and AA) will fit the data for the selected measures (see Table 1) in the diabetes sample.

Hypothesis 4a: Given previous support for the integrative model and in following with the affect-related model of symptoms, I predict that among the community adult sample, all of the nonspecific and specific symptoms of depression and anxiety—including dysphoria, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, fatigue, PA and AA—will correlate significantly with one another. However, given the observed variability in the magnitude of correlations among these symptom dimensions, as discussed above, I predict some substantial differences in the strength of correlations in this sample. Rather than hypothesize specific differences for each possible combination of pairs of correlations, I will limit the hypotheses to the following: dysphoria will correlate significantly more highly with irritability than with appetite loss, appetite gain and PA.

Hypothesis 4b: In addition, given that (1) the studies reviewed above have found symptoms of depression (such as appetite loss, appetite gain and NA) to be more related to depression/anxiety than to diabetes and, (2) considerable support exists for the integrative model, I predict that among the diabetes sample, all of the nonspecific and specific symptoms of depression and anxiety including dysphoria, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, fatigue, PA and AA will be significantly correlated with one another. Again, given the predicted variability in the size of correlations among these symptoms, as previously discussed, I predict some significant differences in the strength of correlations in this sample. Rather than hypothesize specific differences for each possible combination of pairs of correlations, I will limit the hypotheses to the following in the diabetes sample as well:

dysphoria will correlate significantly more strongly with irritability than with appetite loss, appetite gain and PA, although all will correlate significantly with one another.

In addition, I predict the following between sample differences.

Hypothesis 5a: Before specific differences can be tested, I predict that an adequate fitting common 9-factor model will emerge for both groups. Once this common model is determined for both samples, Hypothesis 5b can be tested.

Hypothesis 5b: Two findings in support of the interaction model of symptoms lead me to predict differences in the strength of correlations between samples. First, depression and anxiety symptoms are more prevalent among diabetes patients compared with other samples (e.g. Lustman et al., 1992), which leads to increased variance in diabetes patient scores. Second, correlations among depression and anxiety scales in D. A. Clark et al. (1998) were generally higher among medical patients than among psychiatric patients (e.g., correlations between PA and dysphoria and between BDI somatic items and BDI cognitive items). Therefore, I expect correlations among factors in the diabetes sample to be greater than those seen in the community adult sample.

Methods

Participants

Diabetes Participants. 225 adults with Type 1 or Type 2 diabetes were recruited from January to May 2007 during clinic visits and through announcements and flyers. Given the similarities between T1DM and T2DM as described above, it was decided to include both disorders in the study. Patients were approached by a researcher during their visit to the University of Iowa Hospitals and Clinics Endocrinology Clinic or Family Practice Clinic or during their visit to the Iowa City VA Medical Center for a diabetes

appointment or educational group meeting. The study was briefly described to patients identified by their nurse or physician as having Type 1 or Type 2 diabetes and over age 18. Those patients who were interested in participating were consented in person and sent home with a questionnaire to complete at their convenience and return by mail. 313 patients expressed interest in participating during a clinic visit and 171 of these returned packets (55% return rate). Approximately 53% of patients recruited during clinic visits were recruited from the Endocrinology Clinic, approximately 27% were recruited from the Family Practice Clinic and approximately 20% were recruited from the VA Medical Center. Thirty three diabetes patients were recruited by mailing 250 patients seen in the past 12 months at the Family Practice Clinic who had been diagnosed with Type 1 or Type 2 diabetes (13% return rate). In addition, 21 patients were recruited through flyers and an announcement in the University of Iowa Hospitals and Clinics daily news sheet. Packets were received on average 10 days after they were given to patients. Participants received $20 for their participation. Two participants indicated in their returned questionnaire that they did not have diabetes, and thus were eliminated from the diabetes sample and transferred to the community sample, and one participant was eliminated for a large amount of incomplete data in the returned questionnaire. In addition, four community participants indicated that they had diabetes (see below), and thus were transferred to the diabetes sample, for a final n of 226. Diabetes patients included 113 males and 113 females (50% each), with an average age of 52.7 years. Most patients were Caucasian (92.5%), and educational level ranged from 7.5% with less than a high school diploma, to 3.5% with a doctorate degree. The majority of participants had either a high school diploma (20.4%), some college (31.4%) or a bachelor's degree (15%). The

majority of patients were married (54%), and total annual household income was on average between $40,000 to $49,999. See Table 3 for complete demographic information.

Community Adult Participants. 382 community adults were recruited from February to May of 2007 through announcements made in the University of Iowa Hospitals and Clinics daily news sheet, email announcements to University of Iowa employees, and a statewide newspaper ad printed in Friday, Saturday and Sunday editions of the Des Moines Register. Adults were eligible to participate if they were 35 or older and did not have diabetes or other major health conditions such as recent cancer treatment or other hospitalizations. 546 community adults responded to the announcements, ads and emails and 382 completed the study (70% return rate). Four of these participants indicated that they had diabetes in their return questionnaires and thus were transferred to the diabetes sample and eliminated from the community sample. In addition, as stated previously, two participants from the diabetes sample were transferred to the community sample, for a final n of 380.

Community adults included 78 males (20.5%) and 301 females (79.2%), with the gender unknown for one participant, and an average age of 51.1 years. Most community adults were Caucasian (97.4%), and educational level ranged from .8% with less than a high school diploma, to 5% with a doctorate degree. The majority of participants had either some college (19.4%), a bachelor's degree (33.7%), or a master's degree (20.5%). The majority of patients were married (67%), and total annual household income was on average between $60,000 to $69,999. See Table 3 for complete demographic information. Missing data were replaced for those diabetes patients and community

adults who were missing less than 10% of data; data were replaced using regression analysis computed with the SPSS linear trend at a point function.

Measures

Inventory of Depression and Anxiety Symptoms (IDAS; Watson et al., 2007) The IDAS contains 10 specific symptom scales that were created from a series of factor analyses: 8-item measures of Well-Being (e.g. "I felt optimistic") and Panic (e.g. "I felt faint"); 6-item measures of Suicidality (e.g. "I thought about hurting myself"), Insomnia (e.g. "I slept less than usual") and Lassitude ("I felt exhausted"); 5-item measures of Social Anxiety ("I felt self-conscious knowing that others were watching me") and Ill-Temper (e.g. "I felt like breaking things"); a 4-item measure of Traumatic Intrusions (e.g. "I had memories of something scary that happened"); and 3-item measures of Appetite Loss (e.g. "I felt like eating less than usual") and Appetite Gain (e.g. "I ate more often then usual"). In addition, the IDAS contains two broader scales: General Depression (20 items) includes overlapping items that also are contained in other scales, whereas Dysphoria (10 items) does not. Participants read a series of statements and indicate the extent to which they have experienced each symptom in the past two weeks. Responses are marked on a 5-point Likert scale, ranging from "not at all" to "extremely."

The specific and broader scales of the IDAS have been shown to have excellent internal consistency across multiple samples, with most showing coefficient alphas above .80 across college student, psychiatric patient, postpartum, young adult, community adult and high school student samples. In addition, the scales demonstrate good convergent validity with other self-report inventories such as the Beck Depression Inventory 2 (BDI-

II; Beck, Steer, and Brown, 1996) and Beck Anxiety Inventory (BAI; Beck & Steer, 1990), as well as with interview measures of depression and anxiety.

The IDAS was included in order to provide a marker/scale for all nine of the symptoms of interest including: dysphoria, irritability, fatigue, concentration difficulties, restlessness, appetite loss, appetite gain, positive affect and autonomic arousal. Extra items were retained in this version of the IDAS that reflect four of the DSM-IV symptom criteria for Major Depression, which were developed from the original pool based on agreement among 18 out of 23 expert raters (see Watson et al., 2007, for more detail). These retained items include 5 additional items for criterion 8 (Cognitive Problems). In addition, items were retained to capture the multiple aspects of criterion 3 (Appetite Disturbance), resulting in 2 additional items for Appetite Loss and 2 additional items for Appetite Gain for criterion 3. Also, criterion 5 (Psychomotor Agitation/Retardation) was captured with 3 retained items related to agitation only. In addition, 2 new appetite gain items were written for this study to allow for additional markers of the symptom. These 14 additional items allow for expanded modeling of the specific symptoms of interest for this study. In addition, items within the Dysphoria scale related to psychomotor agitation and concentration problems were removed from the Dysphoria score and instead combined with these additional items of similar content. This version of the IDAS contains 78 items. In this study, the IDAS scales and modified scales demonstrated good to excellent internal reliability, ranging from .70 (agitation items) to .94 (concentration items) in the diabetes sample, and from .77 (agitation items) to .94 (concentration items) in the community sample. The IDAS was used with permission from the authors.

Beck Depression Inventory-II (BDI-II; Beck, Steer, and Brown, 1996). The BDI-II is a well-known and well-validated measure of depression that consists of 23 items (to increase clarity, the sleep and appetite disturbance items are divided into 2 items in this version; however, responses to these items ultimately are combined into a single score). Each item consists of four statements reflecting varying degrees to which a participant may have been experiencing a particular symptom of depression. Participants circle the statement within each item that best reflects how they have felt in the past two weeks. Each item is scored between 0 and 3, for a maximum possible score of 63. Scores over 20 are typically considered to be in the clinical range for depressed mood. The BDI-II has been shown to have high internal consistency and to converge well with other measures of depressed and negative mood (Beck et al., 1996). The BDI-II was included in this study in order to provide a marker/scale for the symptom of dysphoria. Given the diverse content within the BDI-II, including items tapping fatigue, appetite change, concentration difficulty, loss of energy, irritability and psychomotor agitation, several items were removed from scoring, leaving the other 15 items tapping low mood, negative cognitions, etc. in the total score. In this sample, the 15 item version of the BDI-II demonstrated excellent internal consistency, with a coefficient alpha of .92 in both the diabetes sample and in the community sample.

Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The CES-D consists of 20 items that are scored on a scale of 0 (rarely or hardly ever) to 3 (most or all of the time). The item content assesses depressed mood, in addition to some positive affect and interpersonal difficulty-related items. The CES-D has been shown to have high internal consistency (e.g. alpha = .85 in a general population sample) and

correlate strongly with other measures of depression (Radloff, 1977). Scores over 16 are typically considered in the clinical range. The CES-D was included in the study in order to provide a measure for the following symptoms of interest: dysphoria, concentration difficulties, appetite loss, and positive affect. The scale includes one appetite loss item ("I did not feel like eating; my appetite was poor," which was split into two items) and one concentration difficulty item. Two additional appetite loss items and two additional concentration difficulty items were added to the CES-D to provide additional measurement of these constructs. This content was scored separately from the other items of the CES-D as measures of appetite loss and concentration difficulty, respectively. In addition, the 4 items tapping positive affect were also scored separately as a measure of positive affect. The CES-D scales demonstrated excellent internal consistency reliability in both samples, ranging from .85 (appetite items and positive affect items) to .89 (concentration items and dysphoria items) in the diabetes sample, and from .87 (appetite items) to .92 (dysphoria items) in the community sample. This scale is in the public domain and free to use without permission.

Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The HADS was developed for use in medical settings to screen for depression and anxiety among medical patients. It consists of 14 items of depression (e.g. "I have lost interest in my appearance.") and anxiety (e.g. "I get a sort of frightened feeling like something awful is about to happen.") that are rated on a scale of 0 to 3. Each number from 0 to 3 corresponds with a statement varying in either frequency or severity, such as "much of the time" or "yes, but not too badly." Evidence suggests that the HADS scores correlate highly with interview measures of anxiety and depression and that the depression and

anxiety scales are internally consistent (average alpha = .82 to .83, respectively; Bjelland, Dahl, Haug, & Neckelmann, 2002). The HADS was included in the study in order to provide a marker for the restlessness factor. The HADS was originally developed to measure depression and anxiety with 7 items scored for each subscale, although recent research suggests the presence of three factors: (1) low positive affect and anhedonia, (2) tension and somatic arousal and (3) psychomotor agitation (Friedman, Samuelian, Lancrenon, Even, & Chiarelli, 2001). For the purposes of this study, these three factors were scored as subscales in order to measure psychomotor agitation/restlessness. The low positive affect/anhedonia and tension/somatic arousal scales of the HADS were not included in analyses given the inclusion of several other well-validated scales in this study to measure these constructs. The restlessness items demonstrated acceptable internal consistency of .72 in the diabetes sample and .74 in the community sample.

The Expanded Form of the Positive and Negative Affect Schedule (PANAS –X; Watson & Clark, 1999). The PANAS-X is an expanded version of the original PANAS (Watson, Clark & Tellegen, 1988) that includes lower-order affect scales for measurement of specific affects. The PANAS-X contains 60 items that can be scored for the following scales: Fear, Sadness, Guilt, Hostility, Shyness, Fatigue, Surprise, Joviality, Self-Assurance, Attentiveness and Serenity, in addition to two higher order scales (PA and NA), which were included in the original PANAS. The PANAS-X scales were derived from factor analyses of both student and adult samples (see Watson & Clark, 1999).

The PANAS-X was included in this study to provide indicators for the following symptoms of interest: dysphoria, irritability, fatigue and positive affect. For the purposes

of this study, the following scales were used to allow for measurement of the variables of interest: (1) Sadness (5 items, e.g. "blue"), (2) Guilt (6 items, e.g. "ashamed"), (3) Hostility (6 items, e.g. "scornful"), (4) Fatigue (4 items, e.g. "sleepy"), (5) Joviality (8 items, e.g. "happy") and (6) Self-Assurance (6 items, e.g. "confident"), for a total of 35 items. "Past two weeks" instructions were given to participants. Participants completed the PANAS-X by responding to items on a five-point Likert scale ranging from 1 ("very slightly or not at all") to 5 ("extremely"). The PANAS-X scales have high internal consistency, including median alphas of Sadness = .87, Guilt = .88, Hostility = .86, Fatigue = .88, Joviality = .93 and Self-Assurance = .83 (Watson & Clark, 1999). In addition, the scales show strong convergent validity with other measures of specific affect, as well as with peer ratings of affect (Watson & Clark, 1999). In this study, similar alphas were demonstrated in each sample, ranging from .86 (Hostility) to .95 (Guilt and Joviality) in the diabetes sample, and from .86 (Self-Assurance) to .95 (Joviality) in the community sample. The PANAS-X was used with permission from the authors.

Mood and Anxiety Symptom Questionnaire (MASQ; Watson & Clark, 1991). The MASQ is a 90-item, factor-analytically derived self-report measure of depression and anxiety symptoms. The MASQ was rationally constructed in order to test the Tripartite Model by measuring the following scales: Anxious Arousal (MASQ-AA), Anhedonic Depression (MASQ-AD) – which can be further divided into Loss of Interest (MASQ-LI) and High Positive Affect (MASQ-PA)—General Distress-Depressed (MASQ-GD-D), General Distress-Anxious (MASQ-GD-A) and General Distress-Mixed (MASQ-GD-M). These scales have been shown to have high coefficient alpha reliabilities, ranging from

.86 to .93. The MASQ scales were included in this study in order to provide indicators for the following symptoms of interest: dysphoria, positive affect and autonomic arousal. In order to test the hypotheses of this study, the following scales of the MASQ were administered: (1) General Depression – Depressive Symptoms (9 items, e.g. "Was disappointed in myself"), (2) Anhedonic Depression – Positive Affectivity (14 items, e.g. "Felt really "up" or lively) and (3) Anxious Arousal (17 items, e.g. "Had hot or cold spells"), for a total of 43 items. These scales demonstrated excellent internal consistency reliabilities, ranging from .88 (Anxious Arousal) to .97 (Anhedonic Depression – Positive Affectivity) in the diabetes sample, and from .87 (Anxious Arousal) to .97 (Anhedonic Depression – Positive Affectivity) in the community sample. The MASQ was used with permission from the authors.

The Multiple Affect Adjective Check List, Revised (MAACL-R; Zuckerman & Lubin, 1985). The MAACL-R assesses both state and trait affect, depending on the instructions used, and contains five scales: Anxiety, Depression, Hostility, Positive Affect and Sensation Seeking. The scale consists of 132 adjectives reflecting different moods and feelings. Participants put a mark next to those words that reflect how they have been feeling lately, or in general, depending on the version administered. The MAACL-R has generally good internal consistency and test-retest reliabilities (Zuckerman & Lubin, 1985). The MAACL-R was included in this study in order to measure two symptoms of interest: irritability and positive affect. For this study, the state version of the following MAACL-R scales were administered: (1) Positive Affect (e.g. "Affectionate") and (2) Hostility (e.g. "Complaining"). In addition, instructions were modified so that participants indicated the extent to which they have felt each of the adjectives in the past

two weeks on a scale of 1 (not at all) to 5 (extremely), rather than just marking those adjectives that describe them. These items were combined with the PANAS-X items to create a single questionnaire. Items that repeat among both the MAACL-R and PANAS-X were listed only once and were scored for only one scale, rather than for both. This resulted in the removal of 2 items from the MAACL-R Positive Affect scale and 5 items from the Hostility scale, for a total of 19 Positive Affect items and 10 Hostility items. For both samples, the MAACL-R scales demonstrated excellent internal consistency reliabilities, including .93 (Hostility) and .97 (Positive Affect) in the diabetes sample, and .90 (Hostility) and .96 (Positive Affect) in the community sample.

The Profile of Mood States (POMS; McNair, Lorr and Droppleman, 1971). The POMS consists of 65 adjectives that are rated on a 4- or 5-point scale and has the following six scales: Anger-Hostility, Vigor-Activity, Fatigue-Inertia, Confusion-Bewilderment, Tension-Anxiety and Depression-Dejection. Evidence suggests that the POMS scales (a) have acceptable internal consistency reliabilities and moderate short-term stability, (b) are sensitive to changes due to therapy and (c) show good concurrent and predictive validity (Lane & Lane, 2002; McNair & Lorr, 1964; Payne, 2001). The POMS was included in this study to provide additional indicators of the following three symptoms of interest: irritability, fatigue and positive affect. In order to test the hypotheses of this study, the following scales were included: (1) Vigor/Activity (e.g. "Active"), (2) Fatigue/Inertia (e.g. "Listless") and (3) Anger/Hostility (e.g. "Bitter"). These items were also combined with the MAACL-R and PANAS-X to create a single questionnaire using past two week instructions and a 5-point Likert scale. Again, items that repeated among any two measures (e.g. POMS and MAACL-R) were listed once and

scored for only one scale. This resulted in the removal of 3 Vigor/Activity items, 1 Fatigue/Inertia item and 1 Anger/Hostility item, for a total of 5 Vigor/Activity items, 6 Fatigue/Inertia items and 11 Anger/Hostility items. The 3 POMS scales used in this study demonstrated excellent internal consistency reliabilities ranging from .90 (Vigor/Activity) to .93 (Fatigue/Inertia) in the diabetes sample, and from .89 (Vigor/Activity) to .95 (Joviality) in the community sample.

Beck Anxiety Inventory (BAI; Beck & Steer, 1990). The BAI consists of 21 items assessing symptoms of anxiety, and particularly symptoms of autonomic arousal and panic. Participants indicate the extent to which they have been bothered by each of the 21 symptoms on a scale of 1 to 4, with 1 indicating not being bothered by the symptom at all, and 4 indicating being severely bothered by the symptom. This scale was included in the study to measure autonomic arousal. For the purposes of this study, the more physiological items (e.g. "dizzy or lightheaded") were summed for a somatic total and the more cognitive or affective items (e.g. "unable to relax") were removed from the total score. The physiological items include: 1, 2, 3, 6, 7, 8, 11, 12, 13, 15, 18, 19, 20 and 21, for a total of 14 items, while the cognitive/affective items include: 4, 5, 9, 10, 14, 16 and 17 (see Appendix 1 for all scales and items). The entire BAI was administered, for a total of 21 items. The 14 somatic items demonstrated good internal consistency reliabilities of .88 in both samples.

Cognitive Failures Questionnaire (CFQ; Broadbent, Cooper, FitzGerald & Parkes, 1982). The CFQ measures self-reported errors in memory, perception and motor functioning. The questionnaire consists of 25 questions about common cognitive mistakes (e.g. "Do you find you forget appointments?"). Instructions ask participants to

read each question and indicate the frequency of occurrence of the mistake in the past 6 months. Responses are indicated on a 0 to 4 Likert scale, with 4 indicating very often and 0 indicating never. Evidence suggests that the scale is internally consistent, with an alpha coefficient of .89 and item intercorrelations ranging from .23 to .53 (with the exception of 2 items). In addition, the scale total score has been found to correlate .57 to .62 with other self-report measures of attention and memory problems (Broadbent et al., 1982). The CFQ was included in the questionnaire packet to measure concentration/cognitive difficulties. For this study, CFQ instructions were modified to indicate problems over the past 2 weeks, rather than the past 6 months, to maintain a general consistency of time frame across measures. The 25-item scale demonstrated excellent internal consistency reliabilities of .96 in the diabetes sample and .94 in the community sample.

The Indecisiveness Scale (IDS; Germeijs & De Boeck, 2002). The IDS is a factor-analytically derived scale containing 22 items that assess indecisiveness in general, across all situations. The content of the scale includes both positively and negatively framed items tapping multiple areas of indecision, such as difficulty deciding (e.g. "I find it easy to make decisions"), not knowing how to make decisions (e.g. "I don't know how to make decisions") and feeling uncertain about decisions (e.g. "I often reconsider my decision"). Participants read each statement and respond on a 7-point Likert scale, indicating the extent of agreement with each statement (e.g. 0 = strongly disagree, 6 = strongly agree). Principal components analyses determined a 1 factor solution for the items, with all but one item loading .40 or higher on the factor. Internal consistency reliability was found to be .91 and 4-month test-retest reliability on the scale was .67 for a

sample of 30 students (Germeijs & De Boeck, 2002). The scale has been found to correlate .41 with a measure of self-esteem (Germeijs & De Boeck, 2002). The IDS was included in the study to provide an additional marker of concentration/cognitive difficulties. For the purposes of this study, instructions and items were modified to measure indecisiveness as a state rather than as a trait-like characteristic. Participants responded to items indicating the extent to which the item was true for them in the past 2 weeks (e.g. 1 = not at all true, 5 = extremely true). An abbreviated, 12-item version of the IDS was administered to participants. This 12-item version demonstrated excellent internal consistency reliabilities of .94 in each sample.

The Multifactorial Memory Questionnaire (MMQ; Troyer & Rich, 2002) The MMQ assesses three dimensions of self-reported memory including satisfaction with memory (Contentment), memory ability (Ability) and memory strategies (Strategies). The MMQ was included in the study questionnaire as an indicator of cognitive difficulties. For the purposes of this study, only the Ability scale was included; it consists of 20 items measuring everyday memory situations (e.g. "How often do you forget to pay a bill on time?"). Participants read 20 questions and respond to the frequency of occurrence of the event over the past month, using a 5-point Likert scale (e.g. 1 = all of the time, 2 = often, 3 = sometimes, 4 = rarely or 5 = never). Higher scores indicate better subjective memory. Factor analyses of the MMQ found a 3 factor solution, with item loadings of .45 to .74 for all Ability items, and a mean loading of .59. The Ability scale also showed a 4-week retest correlation of .86 and a Cronbach's alpha coefficient of .93. In this study, the MMQ Ability scale demonstrated excellent

coefficient alphas of .96 in the diabetes sample and .95 in the community scale. The MMQ was used with permission from the author.

Mehrabian Fidgety Scale (MFS; Mehrabian & Friedman, 1986). The MFS is a 40-item measure of fidgeting tendency and assesses behavioral agitation such as feelings of physical restlessness and fidgeting involving, for example, the hands, legs, feet and clothing. The scale was found to have good internal consistency (coefficient alpha = .89) and correlates moderately with a peer version and with observer ratings of fidgeting. This scale was included as an indicator of restlessness. For the purposes of this study, those items assessing more general psychomotor agitation and restlessness were included, for a total of 6 items. The 6-item scale demonstrated good coefficient alphas of .86 in the diabetes sample and .87 in the community sample. The MFS was used with permission from the author.

Epworth Sleepiness Scale (ESS; Johns, 1991). The ESS is an 8-item measure of sleepiness and fatigue for use in adults. Each item consists of a different everyday situation such as "sitting & reading," "watching t.v." or "stopped for a few minutes in traffic while driving." Next to each situation, participants indicate the likelihood of dozing off in that situation on a 4-point Likert scale, with 0 = would never doze off, 1 = slight chance of dozing or sleeping, 2 = moderate chance of dozing or sleeping and 3 = high chance of dozing or sleeping. The ESS was included as a marker of fatigue in this study. The ESS has been found to have high internal consistency (Cronbach's alpha = .88) and 5-month retest reliability (r = .82). Factor analysis of the items revealed a one-factor solution, with all item loadings of .53 or higher among sleep apnea patients, and all but one item loading .37 or higher in a sample of medical students (Johns, 1991). The

ESS demonstrated acceptable internal consistency reliabilities in both samples, including .79 in the diabetes sample and .78 in the community sample. This scale was used with permission from the author.

Motivation to Eat Questionnaire. (MEQ; Hill & Blundell, 1986). The MEQ is a 4-item measure of appetite developed to assess changes in appetite for use in obesity and eating disorder research. The MEQ consists of 4 questions assessing appetite and fullness (e.g. "How strong is your desire to eat?") that are followed by a 100mm line with opposite anchors (e.g. "very weak" vs. "very strong") at each end. Participants indicate their responses by marking an "X" on the line that best reflects how they feel at the moment. The scale is designed to assess immediate appetite following or preceding meals and at other times throughout the day. No psychometric data have been reported on the scale, but the items were found to correlate |.6| to |.8| with one another. In addition, the scale has been found to be sensitive to the effects of palatability of food, the administration of appetite-suppressant medication and differences in nutrition content on appetite (Hill & Blundell, 1986).

The MEQ was included in this study as a measure of appetite disturbance. For the purposes of this study, questions were reframed to assess appetite over the past two weeks (e.g. "How strong has your desire to eat been?"). In addition, participants were given multiple choice responses, rather than a 100mm line, with which to indicate their response. For example, instead of the two anchors "very weak" or "very strong" in response to the question "How strong has your desire to eat been?," participants circled either (1) very weak, (2) somewhat weak, (3) somewhat strong or (4) very strong to indicate their desire over the past two weeks. This measure is initially listed in Table 1 as

an indicator of both appetite loss and appetite gain due to the uncertain nature of how it will perform in relation to other measures of appetite disturbance. I will report subsequent analyses to determine the appropriate placement of this scale in the structural models. In this study, the MEQ items demonstrated acceptable internal consistency reliabilities of .86 in the diabetes sample and .78 in the community sample.

RAND 36-Item Short Form Health Survey (RAND SF-36; McHorney, War, Lu, & Sherbourne, 1993). The RAND SF-36 is a 36-item measure of eight general health concepts including physical functioning (10 items), role limitations due to physical health problems (4 items), bodily pain (2 items), general health perceptions (5 items), vitality/energy (4 items), social functioning (2 items), role limitations due to emotional problems (3 items) and mental health/emotional well being (5 items). For physical functioning, participants read a series of activities (e.g. lifting or carrying groceries, climbing one flight of stairs) and indicate the extent to which their health has limited the ability to engage in the activities on a scale of 1 (yes, limited a lot) to 3 (no, not limited at all). For role limitations – physical health, participants indicate whether or not (yes or no) poor physical health has led to problems such as "accomplished less than you would like" or "were limited in the kind of work or other activities" in the past 4 weeks. Bodily pain includes 2 items for which participants indicate both extent of physical pain (1 = none, 6 = very severe) over the past 4 weeks, as well as extent of interference in daily life (1 = not at all, 5 = extremely) over the past 4 weeks. General health includes a series of statements (e.g. my health is excellent) for which participants indicate how true the statement is on a scale of 1 (definitely true) to 5 (definitely false). Vitality/energy is measured with 4 statements (e.g., did you have a lot of energy?") for which participants

indicate the extent of time over the past 4 weeks that he/she has felt this way on a scale of 1 (all of the time) to 6 (none of the time). The social functioning scale consists of 2 items which ask participants to indicate the extent of time their social activities over the past 4 weeks have been limited by physical or emotional health problems on a scale of 1 (all of the time) to 5 (none of the time) for one item, and on a scale of 1 (not at all) to 5 (extremely) for the other item. The role limitations – emotional health scale consists of 3 statements for which participants indicate whether or not (yes or no) their emotional health has led to problems (e.g., accomplished less than you would like) in the past 4 weeks. The mental health scale consists of 5 questions (e.g., have you been a very nervous person?) to which participants respond on a 1 (all of the time) to 6 (none of the time) scale for the past 4 weeks.

The scales have been found to have good internal consistency reliabilities, ranging from .82 (bodily pain) to .93 (physical functioning). In this study, coefficient alphas ranged from .83 (emotional well being) to .95 (physical functioning) in the diabetes sample, and from .80 (general health) to .89 (physical functioning) in the community sample. This scale is in the public domain.

Medical Questionnaire. A 15-item self-report medical comorbidity scale was created for use in this study that assessed both (a) the presence of 13 medical conditions and (b) treatment for these medical conditions. The 13 conditions included heart disease, high blood pressure, high cholesterol, lung disease, stroke, diabetes, ulcer or stomach disease, kidney disease, liver disease, cancer in the past 3 years, arthritis, depression and anxiety. Participants indicated whether or not they had the condition (yes or no), as well as whether or not they received treatment for the condition.

Demographics. Participants completed 6 demographic questions including the date of completing the questionnaire, age, gender, Hispanic/Latino status, race, current marital status, highest level of education and approximate total annual household income.

Measures of Diabetes Control

Hemoglobin A1C (HbA1c). As stated previously, HbA1c is a measure of average blood glucose control over the past 2 months that is typically assessed at least two times per year. This measure is generally agreed upon to be the best reflection of glucose control and thus diabetes control and self-care. All diabetes patients were asked to report their most recent HbA1c result, as well as the date of the lab, and HbA1c values were obtained from medical records as well when possible. The optimal range of HbA1c for an adult with diabetes is 5 to 7%.

In addition, individuals were asked to indicate the number of days they were hospitalized in the past two months, the number of days of missed work or school due to diabetes-related illness in the past two months and the date of their diabetes diagnosis, in order to obtain a relatively objective measure of disease severity. Patients also selected from a list any diabetes-related health complications that they had experienced, such as retinopathy, neuropathy, amputations, etc. These complications are additional indicators of disease severity and help characterize participants. Diabetes medication/treatment were reported by patients as well, chosen from a list of common medications. Finally, patients were asked to indicate the extent to which they had difficulties with hypo- or hyperglycemia in the past two weeks.

Self-Reported Diabetes Symptoms. In keeping with previous research on diabetes and depression/anxiety symptoms, participants completed a commonly used measure of

self-reported diabetes symptoms, the Self-Completion Patient Outcome instrument (SCPO; Whitty et al., 1997). The SCPO assesses nine common symptoms of diabetes including blurred vision, thirst, polyuria, excessive hunger, shakiness, fatigue, cold hands and feet, parathesias and feeling faint; each symptom is assessed using a single statement (e.g., "In the past month, on how many days have you felt abnormally thirsty?"). Participants respond on a five-point Likert scale where 1 = never and 5 = everyday. As stated previously, the scale has been found to correlate with both depression/anxiety symptoms as well as objective diabetes indicators (i.e. HbA1c; Ludman et al., 2004; Ciechanowski et al., 2003). Three-week retest reliability was found to have a 95% confidence interval of .9 to .96 and Cronbach's alpha was found to be .78. In addition, the measure has been found to be sensitive to expected changes in symptom reporting with the commencement of diabetes treatment such as insulin. Although these items overlap with other symptoms of interest, the inclusion of this measure allows for continuity with previous diabetes research.

Procedure

Community adults received questionnaires in the mail and completed questionnaires at home at their convenience and returned the packet by mail. Individuals with diabetes recruited in person received the questionnaires in person, completed them at home, and returned the packet through the mail. The 21 diabetes patients who were recruited through flyers and ads received the questionnaires through the mail, completed them at home and returned the packet by mail. HbA1c values were collected from the medical records of adults with diabetes at the time they returned their packets. Community adult participants completed a total of 431 items, which includes the

symptom dimension measures (365 items), diabetes questionnaire (SCPO; 9 items), RAND SF-36 and medical questionnaire (51 items total) and 6 demographic questions. Individuals with diabetes completed a total of 442 items, including the symptom dimension measures (365 items), diabetes questionnaire (SCPO; 9 items), RAND SF-36 and medical questionnaire (51 items total), 6 demographic questions and 11 questions characterizing disease severity.

Overview of Analyses

Elimination of Poor Markers. In order to compare factor structures between groups, reliable markers of the proposed factors must emerge. Thus, the first step in the analyses will be to identify psychometrically poor markers of the proposed factors (dysphoria, PA, irritability, concentration problems, appetite/weight loss, appetite gain, psychomotor agitation, fatigue and autonomic arousal), such as those with a poor coefficient alpha (e.g. less than .75). Scales with poor alphas will be subjected to exploratory factor analyses in order to identify any items which load lower than |.35|. These items will be eliminated in subsequent analyses.

Test for Mean Level Differences. In order to test hypotheses 1 and 2, mean comparison analyses will be conducted to test for mean level differences on each of the symptom scales between the diabetes and community samples. As stated previously, the diabetes sample is expected to have higher mean scores on the six nonspecific symptoms of depression and anxiety, as well as higher mean scores on fatigue and autonomic arousal. In contrast, the diabetes sample is expected to have lower mean scores on measures of PA.

Measurement Model Preliminary Analyses. Before running confirmatory factor analyses, some preliminary analyses will be conducted to test for any gross problems in the a priori measurement model. First, correlations between scales of the same symptom dimension will be examined. Any scale with low correlations (i.e. less than |.40|) with other putative indicators of the same symptom dimension in either sample will be considered for elimination from subsequent analyses. In addition, exploratory factor analyses will be conducted in each sample to eliminate any scales that do not load (or load poorly, such as a primary loading of less than .35) with other markers of the hypothesized symptom dimension. It is possible that one or more factors will not be modeled adequately in these data and will need to be dropped from subsequent consideration.

Initial Confirmatory Factor Analysis. Multiple group confirmatory factor analysis (CFA) allows for the testing of a pre-established model or structural theory and for the comparison of this model across samples. Nine correlated factors are proposed in this model (i.e. dysphoria, PA, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, fatigue and AA), and proposed indicators or markers of these factors have been described earlier under "Measures" (see Table 1 for proposed indicators). Ideally, each factor is marked by at least three indicators, although two indicators would be the minimum possible to identify a factor. The initial CFAs will be conducted separately within each sample to identify first if the a priori measurement model (9 correlated factors based on the Table 1 indicators; Hypotheses 3a and 3b) fits the data for each sample before comparing the model across samples.

If a factor does not emerge based on a priori hypotheses, adjustments will be made to eliminate poor markers (e.g. measures loading less than |.40|). CFA will be re-run with these changes. If a hypothesized factor still fails to emerge even after these modifications, it will be dropped from the measurement model.

In order to test the a priori measurement model described in Table 1 (i.e. Hypotheses 3a and 3b), the models will be tested for fit within each sample, separately, using covariance matrices and the maximum likelihood estimation method with EQS. Before testing for differences between samples, adequate-fitting models must be identified within each sample. Six different fit indices will be examined to determine the fit of the model within each sample: the overall model chi-square (χ^2), normed fit index (NFI), comparative fit index (CFI), goodness-of-fit index (GFI), standardized root-mean-square residual (SRMR) and root-mean-square error of approximation (RMSEA). There are no exact guidelines for interpreting the fit indices, yet there are generally agreed upon criteria. NFI, CFI, and GFI values of >.9 are generally considered a good fit, and >.95 is considered an excellent fit. In addition, SRMR values of <.1 are a good fit, and <.08 are an excellent fit. Finally, RMSEA values of <.08 are a good fit, and <.06 are an excellent fit (Simms, Watson, & Doebbeling, 2002). Again, if an adequate fitting model does not emerge in each sample, adjustments will be made to the model to improve fit and to retain as many proposed factors as possible.

Once an adequate fitting model has been determined for each sample (see Table 2 for a list of specific models), further within sample tests will be conducted on each of these models. In order to test hypotheses 4a and 4b (i.e. significant correlations that will vary in magnitude among symptom dimensions), correlations among factors will be

examined within each sample. Rather than test every possible pair of correlations for differences in relative size, analyses will be limited to a few select correlations. Specifically, I will test whether or not dysphoria correlates more highly with irritability than with appetite loss and positive affect (which will be transformed for these analyses to reflect low positive affect). These correlations will be tested by running models that constrain the following pairs of factor correlations to be equivalent in each sample:

1. $r_{dysphoria/irritability} = r_{dysphoria/appetite\ loss}$,
2. $r_{dysphoria/irritability} = r_{dysphoria/PA}$,

with the expectation that they are not equivalent and that:

$r_{dysphoria/irritability} > r_{dysphoria/appetite\ loss}$ & $r_{dysphoria/PA}$.

In order to test this hypothesis, I will compare the fit indices from each of these constrained models (1 and 2) with the fit indices of the initial models within each sample. If the constrained models prove to be a worse fit as indicated by fit indices, this will indicate that factor correlations are not equivalent.

Testing for Sample Differences using Confirmatory Factor Analysis. Before testing for differences, an adequate fitting, common structure will be determined for both groups by running an unconstrained, multiple sample nine-factor model and examining fit indices. Hypothesis 5a proposes that an adequate fitting common model will be found given the general robustness of structural models across samples (e.g., O'Connor, 2002). Factor correlation differences (Hypothesis 5b) will be tested by comparing a 9-factor model that is constrained to have equivalent factor correlations across samples with the unconstrained model, again using the chi-square difference test and examining the fit indices of the constrained model. As described above, I expect factor correlations among

some symptoms to be higher among diabetes patients and thus expect a constrained model to perform more poorly than an unconstrained model. If non-equivalence across samples is found for this parameter, I will identify specific constraints which decrease the fit of the model as indicated by the multi-group CFA program (i.e. the cumulative multivariate statistics).

Summary

These analyses allow for a comparison of the structure of depression and anxiety symptoms among diabetes patients and community adults by testing 5 specific hypotheses. First, tests for mean level differences in the two samples will reveal if adults with diabetes evidence greater levels of depression and anxiety, as suggested by prevalence and incidence data discussed above (Hypotheses 1 and 2). Second, preliminary correlational analyses and exploratory factor analyses will allow for a test of any gross problems with the proposed measurement model of the 9 symptoms of depression and anxiety. Third, Hypotheses 3a and 3b will be tested using single sample CFA to test for the presence of 9 symptoms of depression and anxiety within each sample. Fourth, key aspects of the integrative model will be tested (Hypothesis 4a and 4b) by running constrained within sample CFAs and examining changes in fit indices within each sample when certain correlations are constrained to be equivalent with one another. Finally, the replicability of the 9 factor model of depression and anxiety symptoms will be examined with both samples by running a multiple sample CFA and examining fit indices (Hypothesis 5a). In addition, all of the symptom correlations will be constrained to be equivalent across the 2 groups and the chi square will be examined to test for a decrease in model fit (Hypothesis 5b) given these equality constraints. In

conclusion, results of these analyses will reveal the presence or absence of structural differences between the 2 samples in the specified symptoms of depression and anxiety.

RESULTS

Descriptive Statistics

Demographics. As seen in Table 3, differences between groups in demographic characteristics were examined with chi square tests, and several significant differences ($p < .05$) were noted. Gender, ethnicity, marital status, education and income frequency distributions were significantly different between groups, with the community sample more likely to be female, white and married, and reporting more education and greater annual income than the diabetes sample. A significant difference was not found for age ($t = 1.53$, $p = .13$).

Health Information. Diabetes information was available only for those diabetes patients who completed the diabetes questionnaires. As seen in Table 4, participants had been diagnosed with diabetes an average of 13 years, and 64.2% of participants had T2DM, 27% with T1DM, and 1.3% with gestational. Although T1DM typically represents only 5-10% of adults with diabetes nationwide, the number of T1DM recruited for this study is much higher, most likely because of the recruitment sites (i.e., diabetes and endocrinology clinics.) Although only 27% of participants had T1DM, 59.3% were on insulin, which likely reflects the changing treatment practices for adults with T2DM. Participants endorsed a range of complications from their diabetes, with the most common complication being high blood pressure (44.2%), followed by skin problems (38.1%) and neuropathy (29.2%). The least common complications included blindness (1.3%) and kidney failure (1.8%).

125 patients reported their HbA1c (56%), and 120 reported the date (year and month) of their most recent HbA1c (54%). In addition, lab results from medical records

were returned for 184 patients (83%). The average HbA1c results based on medical records for this sample was 7.7%. As stated previously, the ADA recommends HbA1c levels of less than 7%, with 5% representing the normal range. Consequently, this sample's average of 7.7% reflects less than optimal control over blood glucose levels. There was an average of 36.6 days between the time the patient had his/her most recent HbA1c lab and completed the questionnaire. The correlation between self-reported HbA1c and medical records was .93 (n = 67 observations from the same month). In addition, 45 patients reported an HbA1c lab result from a lab test date earlier than that returned from the medical records (e.g., a lab result from January was reported by patient, and a lab result from April was returned from medical records). The correlation between these two values at different time points was .82. Thus, even at 2 different time points, HbA1c self-report and medical records were highly concordant with one another. Table 4 includes HbA1c from medical records alone.

Self-reported medical conditions also were examined and are reported in Table 5. Significant differences were found between samples for most self-reported medical conditions and medical treatments. Adults with diabetes were more likely than community adults to report the presence of all conditions except anxiety and arthritis. Adults with diabetes were also more likely than community adults to report receiving treatment for all conditions except anxiety.

Self-reported diabetes symptoms from the SCPO were examined and are reported in Table 6; as expected, significant differences were noted between the two groups across all 9 items of the SCPO. Diabetes patients were more likely than community adults to report experiencing all nine symptoms/items of the SCPO.

In summary, diabetes patients on average reported a greater number of physical comorbidities and more frequent treatment for these conditions. Diabetes patients were also more likely to experience the symptoms measured by the SCPO, presumably due to the presence of diabetes. Descriptive statistics suggest that diabetes patients in general had a higher number of medical conditions, medical treatments and physical symptoms than community adults.

Test for Mean Level Differences in Depression and Anxiety Symptoms

Hypotheses 1 and 2 proposed higher means for the diabetes patients across dysphoria, irritability, concentration problems, restlessness, fatigue, appetite loss, appetite gain and AA symptom scales, and lower means on PA scales for diabetes patients compared with community adults. To test these hypotheses, independent samples t-tests were conducted on each of the symptom scales between the diabetes and community adult samples; several significant differences in scale means were noted (see Table 7). Diabetes patients had significantly higher means on 4 out of 6 dysphoria scales, 2 out of 3 appetite loss scales, 4 out of 5 concentration difficulties scales, 2 out of 3 restlessness scales, one of the 2 appetite gain scales, 4 out of 4 fatigue scales and 3 of 3 AA scales. Community adults had higher means on 6 out of 7 PA scales and on all 8 RAND SF-36 scales. No significant differences were found between samples for irritability scales. Thus, Hypotheses 1 and 2 were generally confirmed, with diabetes patients exhibiting higher levels of symptoms and community adults demonstrating higher levels of PA.

Cohen's d effect sizes are shown on Table 7; they generally were small in magnitude (Cohen, 1992), with values ranging from a low of .01 to a high of .40 for most

symptoms of depression and anxiety. However, the notable exceptions are the effect sizes for the AA scales, which range from .51 to .57; these indicate moderate effects (Cohen, 1992). In addition, the effect sizes for the RAND SF-36 scales varied from .23 to 1.24. Thus, mean levels of general physical health were quite different between the two samples, with the greatest differences seen on levels of Physical Functioning (d = 0.*96) and* General Health (d = 1.24); these scales showed large effect sizes (Cohen, 1992).

Structural Analyses

Elimination of Poor Markers

In order to compare factor structures between groups, reliable markers of the proposed factors must be included in factor analyses. Thus, steps were taken to identify any poor markers of the 9 proposed factors (dysphoria, PA, irritability, concentration problems, appetite/weight loss, appetite gain, psychomotor agitation, fatigue and autonomic arousal), such as those with a poor coefficient alpha (e.g. less than .75). Scales with poor alphas were subjected to exploratory factor analyses in order to identify any items which load lower than |.35| on the first unrotated factor, in order to eliminate these items from subsequent analyses. As seen in Table 8, two scales in the diabetes sample had coefficient alphas of less than .75 including the IDAS agitation items (.70) and the HADS restlessness items (.72). In the community sample, only the HADS restlessness items had a poor coefficient alpha of .74. Thus, exploratory analyses (principal axis factor analyes) were run on these two scales in both samples. The weakest item factor loading in one-factor solutions for the HADS restlessness items was .54 in the diabetes sample and .53 in the community sample. Thus, no items were eliminated from

the HADS restlessness items scale. The weakest item factor loading in one-factor solutions for the IDAS agitation items was .56 in the diabetes sample and .65 in the community sample. Again, no items were eliminated at this stage of analyses from the IDAS agitation items scale.

Preliminary Correlational Analyses

Before running confirmatory factor analyses, additional preliminary analyses were conducted to test for any gross problems in the a priori measurement model. First, correlations between putative scales of the same symptom dimension were examined to identify any scales with low correlations (i.e. less than .40) with other hypothesized markers of the same symptom dimension in either sample. These scales could then be considered for elimination in subsequent analyses. Table 9 contains correlations among scales measuring the same symptom dimension.

For the positive affect, dysphoria, concentration difficulties, irritability and autonomic arousal scales, all correlations were .60 and greater. Among the PA scales, the average correlation among scales was .75 in the diabetes sample and .73 in the community sample. Among the dysphoria scales, the average correlation among scales was .84 in the diabetes sample and .83 in the community sample. The average correlation among concentration difficulties scales was .72 in the diabetes sample and .71 in the community sample. For irritability, average correlations were .82 in the diabetes sample and .84 in the community sample. Average correlations for the autonomic arousal scales were .85 in the diabetes sample and .86 in the community sample. Thus, for these 5 symptom dimensions, the candidate scales were generally highly correlated with one another.

Among the restlessness and appetite gain scales, correlations were lower. The restlessness scales correlated .64 on average in the diabetes sample and .55 in the community sample. The appetite gain scales correlated .48 with one another in the diabetes sample and .57 with one another in the community sample. Among the appetite loss scales, correlations varied from a low -.51 in both samples and a high of .71 in the diabetes sample and .77 in the community sample. The average correlation was .60 in both samples. The MEQ scale in particular was less related to the other two appetite loss scales (IDAS Appetite Loss and the CES-D appetite loss items). The fatigue scales also demonstrated variability in correlations, ranging from a low of .42 to a high of .88 in the diabetes sample, and a low of .38 and a high of .87 in the community sample. The average correlation among fatigue scales was .58 in the diabetes sample and .56 in the community sample. However, the Epworth Sleepiness Scale demonstrated consistently lower correlations with the other three fatigue scales, with coefficients ranging from .42 to .44 in the diabetes sample and from .38 to .44 in the community sample.

Although the symptom dimension scales demonstrated variable correlations, and appetite loss, appetite gain and restlessness showed consistently lower correlations among their respective scales, these preliminary analyses did not suggest any gross problems with the model. All correlations were above .40, with the exception of a .38 correlation between the Epworth Sleepiness Scale and POMS Fatigue/Inertia in the community sample. Thus, no scales were eliminated from subsequent analyses based on these correlational results.

Exploratory Factor Analyses

Next, exploratory factor analyses were conducted in each sample to eliminate any scales that did not load (or loaded poorly, such as a primary loading of less than .35) with other scales of the hypothesized symptom dimension. In each sample, a principal factor analysis was conducted on the proposed set of indicators for each symptom factor. One-factor solutions were examined for each of the nine symptoms. Across most symptom dimensions, exploratory analyses revealed that loadings in single-factor analyses were generally between .74 and .96 in both samples. A few scales had loadings less than .74, however. In the diabetes sample, these included the MEQ on the appetite loss and appetite gain factors (loadings of -.65 and .69, respectively), the Epworth Sleepiness Scale on the fatigue factor (.47), and IDAS Appetite Gain on the appetite gain factor (.69). Within the community sample, scales with the lowest loadings included the MFS on the restlessness factor (.67), the MEQ on the appetite loss factor (-.58) and the Epworth Sleepiness Scale on the fatigue factor (.47). Although these scales were identified as potentially less related to the symptom factors of interest, no scales were eliminated at this stage given that all scales loaded well above .35 in both samples. However, this stage of analyses helped identify potential problems with the proposed model given the relatively low factor loadings of the MEQ, Epworth Sleepiness Scale, IDAS Appetite Gain and MFS on their related factors. Results from this series of preliminary analyses suggested that the next stage of analyses, CFA, could proceed using the originally specified model without any modifications.

Initial Confirmatory Factor Analysis

As stated previously, multiple group confirmatory factor analysis (CFA) allows for the testing of a pre-established model or structural theory and for the comparison of this model across samples. Nine correlated factors were proposed in this model (i.e., dysphoria, PA, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, fatigue and AA), and proposed indicators or markers of these factors have been described above under "Measures" (see Table 1 for proposed indicators). Ideally, each factor is marked by at least three indicators, although two indicators are the minimum possible to identify a factor. The initial CFAs were conducted separately within each sample to identify whether the a priori measurement model (9 correlated factors with Table 1 indicators; Hypotheses 3a and 3b) fits the data for each sample before attempting to compare the model across samples.

To test Hypotheses 3a and 3b, this nine-factor CFA was run in each sample using all specified markers described previously, and is labeled Model 1 in Table 10. Again, no markers were removed from this initial CFA model based on preliminary analyses. Using the criteria described above for interpreting the fit indices, the fit indices for this nine-factor model were not in the adequate range. As seen in Table 10, only one of the fit indices for Model 1 for the diabetes sample was in the adequate range (SRMR). For the community sample, only two of the five fit indices were in the adequate range (SRMR and CFI). Thus, the results of the nine-factor CFAs did not fully support hypotheses 3a and 3b.

Steps were then taken to improve the model by examining a nine-factor exploratory principal factor analysis with Varimax rotation in each sample. Results of

these analyses in the diabetes sample revealed an eight-factor solution, with an uninterpretable ninth factor (i.e., loadings on this factor were all less than .20). As seen in Table 11, the eight identifiable factors in this nine-factor solution were (in this order): Positive Affect, Irritability, Cognitive Difficulties, Autonomic Arousal, Fatigue, Dysphoria, a combined Appetite Loss and Gain factor (with loss scales loading positively on the factor and gain scales loading negatively), and Agitation/Restlessness. In the community sample, the 9-factor solution failed to converge and extraction was automatically terminated by SPSS after 50 iterations. Given that the diabetes EFA suggested an 8 factor solution, the EFA was re-run in the community sample extracting 8 rather than 9 factors. Both Varimax and Promax rotations were examined; the Promax rotation revealed the most interpretable solution in the community sample and is presented in Table 12. The factors in this solution, in order, were: Positive Affect, Irritability, Autonomic Arousal, Cognitive Difficulties (plus the Epworth Sleepiness Scale, which also loaded with the Fatigue factor), Fatigue, Dysphoria, another bipolar Appetite Loss and Gain factor (with positive loadings for loss scales and negative loadings for gain scales), and a combination of the Restlessness scales and Concentration Difficulties scales. An 8-factor EFA (using principal axis factoring, examining Promax and Varimax rotations) was then run in the diabetes sample as well to compare 8-factor structures, and the Promax solution is presented in Table 13. The 8-factor solution was very similar to that of the community sample 8-factor solution, using both Varimax and Promax rotations. The 8-factor Varimax solutions for the community and diabetes samples are presented in Tables 14 and 15, respectively.

These EFA results therefore suggested that an 8-factor solution may provide an improved fit for the data compared with the hypothesized 9-factor model. Thus, the next series of CFAs were based on an 8-factor rather than 9-factor model. The eight-factor model included all of the following proposed symptoms: Positive Affect, Dysphoria, Irritability, Concentration Difficulties, Restlessness, Fatigue and Autonomic Arousal. In addition, the 8-factor model included a bipolar Appetite factor, based on EFA results; this included both the appetite loss and gain scales, which were free to load positively or negatively on this factor. The fit indices for the 8 factor solution are displayed under Model 2 in Table 10. As seen in the table, the fit indices were worse for this model than for Model 1, and only one index was in the adequate range (the SRMR for the community sample).

Steps were taken to improve the fit for this model by examining the standardized residual matrix output. These data revealed that the appetite gain scales, particularly IDAS Appetite Gain, were generally contributing the largest residuals to the model, and thus were the greatest contributors to the poor fit in both the diabetes and community samples. Based on these results, the decision was made to eliminate the appetite gain scales (IDAS Appetite Gain and the MEQ) and the Appetite Gain factor from the model.

In addition to the appetite gain scales, several other scales with large residuals were identified and eliminated as well. These included: CES-D negative affect, CES-D positive affect, Multifactorial Memory Questionnaire, MEQ (on the appetite loss factor as well), HADS restlessness, and Epworth Sleepiness Scale.

Accordingly, Model 3 was created by eliminating the appetite gain variables (MEQ & IDAS Appetite Gain) and these 6 scales from other factors (Dysphoria, Positive

Affect, Concentration Difficulties, Appetite Loss, Restlessness and Fatigue, respectively). As seen in Table 10, the fit indices were significantly improved in this revised model. Four of the 5 fit indices were in the adequate or excellent range from the community sample, and 2 of the 5 fit indices were in the adequate or excellent range for the diabetes sample; moreover, 2 additional fit indices were close to being adequate in the latter sample, with only GFI appearing to be problematic.

Although this model appeared to provide an adequate fit for the data, several other models were run to examine potential improvements in the model fit. Specifically, standardized residuals were examined and markers contributing the largest residuals to the model were eliminated. Model 4 is identical to Model 3 except that PANAS Guilt and PANAS Self Assurance were eliminated from the Dysphoria and PA factors, respectively. This resulted in slightly improved fit indices. Model 5 was based on Model 4 but also eliminated the PANAS Hostility scale from the Irritability factor. This adjustment also lead to a modest improvement in fit indices. Similar steps were taken with Model 6, which eliminated the MAACL-PA scale from the Positive Affect factor, and Model 7, which eliminated IDAS Ill Temper from the Irritability factor. Again, modest improvements in fit were seen for each of these subsequent model adjustments.

Although eliminating more and more factor indicators improved the fit slightly, each adjustment also resulted in fewer degrees of freedom for the model, as well as greater changes from the originally hypothesized model. Thus, the decision was made to proceed with Model 3, which eliminates the Appetite Gain factor and related scales, as well as the 6 other previously specified scales contributing the largest residuals to the model. Consequently, the next sets of analyses were conducted using Model 3 as

specified in Table 16. Correlations among symptom factors for Model 3 may be seen for both samples in Table 17. Factor loadings of this model for the diabetes and community sample are in Tables 18 and 19, respectively.

Testing Model Constraints Within Samples

Using Model 3, further within sample tests were conducted in order to test hypotheses 4a and 4b, that is, whether or not correlations between factors varied in magnitude. As stated previously, instead of comparing every possible pair of correlations, analyses were limited to a few select correlations. That is, the correlation between Dysphoria and Irritability was compared to those between Dysphoria and (1) Appetite Loss and (2) Positive Affect. Again, the Positive Affect factor was transformed for these analyses given that the hypotheses concerned whether or not correlations varied in magnitude, not sign. Two separate models were run constraining these pairs of correlations to be equivalent with one another (e.g., $r_{dysphoria/irritability} = r_{dysphoria/appetite\ loss}$) and fit indices were compared with those from the initial Model 3 in each sample.

First, a model with constraint 1 ($r_{dysphoria/irritability} = r_{dysphoria/appetite\ loss}$) was run in each sample; the chi square difference was significant in the community sample (chi square difference (1) = 17.33, $p < .001$), but not in the diabetes sample (chi square difference (1) = .485, $p = .486$, ns). The correlations (as seen in Table 20) in the community sample were .81 ($r_{dysphoria/irritability}$) vs. .53 ($r_{dysphoria/appetite\ loss}$) whereas in the diabetes sample the corresponding values were .70 ($r_{dysphoria/irritability}$) vs. .63 ($r_{dysphoria/appetite\ loss}$). Next, the second constraint ($r_{dysphoria/irritability} = r_{dysphoria/low\ PA}$) was run in each sample, with transformed correlations of .72 ($r_{dysphoria/low\ PA}$) in each sample.

The difference in chi square was significant in both the community sample (chi square difference (1) = 61.006, $p < .001$) and the diabetes sample (chi square difference (1) = 40.498, $p < .001$).

Thus, hypothesis 4a, comparing these symptom correlations within the community sample, was confirmed. Constraining these pairs of correlations to be equivalent significantly decreased the fit of the model, indicating that the correlation between Dysphoria and Irritability (.81) was not equivalent to the correlations between Dysphoria and Appetite Loss (.53) or Dysphoria and low Positive Affect (.72). However, hypothesis 4b, which compares these same symptom correlations in the diabetes sample, was not confirmed. Although the correlation between Dysphoria and Irritability (.70) was somewhat higher than the correlation between Dysphoria and Appetite Loss (.63), constraining these correlations to be equivalent did not significantly decrease the fit of the model. In addition, constraining the correlation between Dysphoria and Irritability (.70) to be equivalent to the correlation between Dysphoria and low Positive Affect (.72) did significantly decrease the fit of the model, yet the difference between correlations was not in the expected direction. That is, the correlation between Dysphoria and Positive Affect was not predicted to be greater than that between Dysphoria and Irritability.

Testing for Sample Differences using Confirmatory Factor Analysis

The last hypothesis (hypothesis 5) was tested in two steps. First, an adequate fitting, common structure had to be determined for both groups by running an unconstrained, multiple sample model and examining fit indices. The original hypothesis for an adequate fitting multiple sample 9-factor model had to be adjusted based on earlier

failures to identify such a model within each sample. As stated previously, the Appetite Gain factor was removed from single sample CFAs due to its significant contribution to a poor model fit. Thus, hypothesis 5 was revised to test for the presence of an adequate fitting 8-factor multiple sample model. As stated above, Model 3 was selected for final analyses within each sample given its adequate fit indices, closeness to the hypothesized model and greater degrees of freedom. This model was used to test the first step of hypothesis 5 by running a multiple sample CFA of Model 3.

As seen in Table 10, this multiple sample CFA of Model 3 was found to have fit indices in the excellent range for 2 out of 5 indices (SRMR and RMSEA) and in the adequate range for one out of 5 indices (CFI). In addition, NFI (.893) was close to being adequate. Thus, the multiple sample 8-factor CFA generally provided a good fit for the data and confirmed this revised hypothesis. See Table 20 for symptom factor correlations for this model in both samples. Factor loadings for the diabetes and community samples are seen in Tables 21 and 22, respectively.

The second component of hypothesis 5 examined whether or not this common model, when constrained to have equivalent factor correlations across both samples, proved to be a worse fit for the data. The original hypothesis proposed that constraining these factor correlations to be equivalent across samples would decrease the fit of the model. Specifically, it was proposed that that factor correlations among some symptoms would be higher among diabetes patients than among community adults. Thus, a multiple sample CFA of Model 3 was run that constrained all 28 possible pairs of correlations to be equivalent across samples. As seen in Table 10 (under Model 3, Multisample Constr.), fit indices for this CFA largely were in the adequate to excellent

range. In order to compare the fit with the unconstrained multiple sample CFA, chi-squares were compared; the difference in chi squares (8.175, 28 d.f.) was not significant. Thus, contrary to hypotheses, constraining factor correlations to be equivalent across groups did not reduce the fit of the model. This result indicates that factor correlations were generally equivalent across the two samples. The presence of diabetes does not appear to decrease or increase correlations among these 8 symptoms of depression and anxiety when compared with a community sample. See Table 23 for symptom factor correlations for this model and Tables 24 and 25 for factor loadings for this model in the diabetes and community samples, respectively.

DISCUSSION

This study tested the replicability of structural models of depression and anxiety symptoms among adults with diabetes and an age-matched community sample. The purpose of this study was twofold. First, it helped to determine if those symptoms that have been shown to be nonspecific or specific in nonmedical samples demonstrate similar nonspecificity or specificity in a diabetes sample as well, as proposed by the integrative model. Second, this study helped address the uncertainty surrounding overlapping symptoms of depression/anxiety and diabetes. Symptoms such as fatigue, irritability, concentration problems, psychomotor agitation, autonomic arousal, appetite gain and appetite loss are at times considered reflections of diabetes rather than of depression or anxiety. As stated previously, researchers have suggested that this leads to the under-diagnosis of such disorders (Lustman et al., 1997; D.A. Clark et al., 1998), which can have severe negative consequences for diabetes patients (Gonder-Frederick et al., 2002). Thus, this study's ultimate aim was to improve the identification and discrimination of depression and anxiety disorders by examining the nature of several etiologically ambiguous symptoms.

Three competing explanatory models were described for predicting and interpreting results. First, the *diabetes-related model* suggested that those overlapping symptoms of both diabetes and depression/anxiety would be more strongly related to the presence of diabetes than to mood. Thus, the diabetes-related model suggests that significant differences in the correlations among symptoms would emerge between samples and that the overlapping symptoms mentioned above would be less related to mood within the diabetes group. This model has been suggested to predominate in many

medical settings but was not predicted to be reflected in results from this study given previous research examining symptom correlations among adults with diabetes (e.g., Lustman et al., 1992; Ciechanowski et al., 2003).

The second explanatory model hypothesized that the symptoms of interest would relate similarly in both groups despite differences in health status, and was referred to as the *affect-related model.* As described previously, this model is based on the integrative hierarchical model, which has been validated in general population studies (Mineka et al., 1998); it was predicted to be at least partially supported in this study given the general replicability of structural models across various samples (e.g. Watson, 2005; O'Connor, 2002). The affect-related model predicted that the nonspecific symptoms of depression and anxiety that also overlap with diabetes (e.g., irritability, concentration problems and restlessness) would correlate strongly with one another and with mood. In addition, this model predicted that the relatively specific symptom dimension (i.e. PA, fatigue and AA) would demonstrate specificity in their correlations with other symptoms.

The third and final explanatory model has been referred to as the *interaction model* and is based on results of a few studies (e.g., Lustman et al., 1992; D.A. Clark et al., 1998) that have found that the presence of diabetes or medical conditions leads to even higher correlations among symptom dimensions when compared with non-medical samples. Thus, this model proposed that the presence of diabetes would lead to significantly higher correlations among symptoms in the diabetes sample compared with the community sample.

This study examined 5 specific hypotheses (generally based on the affect-related model and the interaction model) to address the two goals described above. Hypothesis

1, based on higher prevalence rates of depression and anxiety among adults with diabetes, proposed that the diabetes sample would have higher means than the community sample on scales measuring dysphoria, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, fatigue and AA. This hypothesis was generally confirmed across these symptom scales, with diabetes patients demonstrating significantly higher means across most scales, with one exception: On measures of irritability, means were not significantly different across the two groups. Hypothesis 2, based on the same prevalence rate differences, proposed that the community adult sample would demonstrate significantly higher means on positive affect scales, which also was confirmed. As hypothesized, the adults with diabetes endorsed higher levels of depression and anxiety symptoms and lower levels of positive affect compared with an age-matched community sample, with the exception of irritability, which did not differ significantly across the two groups.

Hypothesis 3 proposed that an adequate fitting 9-factor model of depression and anxiety symptoms would be identified within each sample, based on the affect-related explanatory model of depression/anxiety symptoms. This hypothesis was not entirely confirmed, as one of the 9 symptoms (appetite gain) failed to emerge as a reliable factor; adjustments were then made to this original factor model in order to test additional hypotheses. Although appetite gain did not emerge, 8 of the 9 proposed symptoms were able to be reliably modeled within each sample using the indicators (scales) included in this study. The adequate fitting model, as described in Table 14, included the following 8 factors: Dysphoria, Appetite Loss, Irritability, Concentration Difficulties, Psychomotor

Agitation/Restlessness, Positive Affectivity, Fatigue and Autonomic Arousal. Thus, the originally hypothesized model and proposed indicators proved to be reasonably accurate.

This broad support for Hypothesis 3 allowed for the examination of subsequent hypotheses, yet also provided valuable information of its own. First, evidence supporting this hypothesis suggests that the subsequent Hypothesis 5a, which proposed a well-fitting common model for both groups, was more likely to be confirmed. Put differently, identifying 8-factor models within each sample was essential to finding a common 8-factor model. Second, the confirmation of Hypothesis 3 suggests that depression and anxiety symptoms that overlap with diabetes symptoms (e.g., appetite loss, autonomic arousal and concentration problems) can be reliably distinguished from one another and, therefore, can be modeled as individual symptoms, rather than forming a broader, diabetes-related factor. In other words, the identification of a well-fitting 8-factor model in the diabetes sample suggests that these symptoms are not necessarily representative of a more heterogeneous phenomenon such as hyperglycemia, which, as was discussed in the Introduction, can cause many of the 8 modeled symptoms. Thus, this finding provides initial support for the affect-related model of these overlapping symptoms, rather than supporting the diabetes-related model of symptoms.

Hypothesis 4 tested specific aspects of the integrative model by constraining pairs of correlations among symptom factors to be equivalent with one another within each sample. Specifically, Hypothesis 4 proposed that the correlation between Dysphoria and Irritability would not be equivalent to the correlations between Dysphoria and Positive Affect, Dysphoria and Appetite Loss and Dysphoria and Appetite Gain, given that 1) Dysphoria and Irritability are both components of the broader factor of negative affect,

whereas 2) Appetite Loss, Appetite Gain and Positive Affect are distinct and relatively specific symptoms of depression (Watson et al. 1995).

Given that Appetite Gain did not emerge as a reliable factor, the comparison between Dysphoria/Irritability vs. Dysphoria/Appetite Gain was not carried out in either sample; consequently, analyses were limited to comparisons of the 2 other pairs of correlations: Dysphoria/Irritability vs. 1) Dysphoria/(low) Positive Affect and 2) Dysphoria/Appetite Loss. Hypothesis 4 was confirmed in community sample but, contrary to expectations, was not confirmed in the diabetes sample. Results indicated that constraining the correlations between Dysphoria/Irritability vs. 1) Dysphoria/(low) Positive Affect and 2) Dysphoria/Appetite Loss to be equivalent in the community sample significantly reduced the fit of the model. Examination of the correlation matrix (Table 15) revealed that the correlation between Dysphoria and Irritability was greater than that between Dysphoria and (low) Positive Affect and Dysphoria and Appetite Loss in this group. These results provide support for the integrative model within the community sample by indicating a stronger correlation between components of negative affect than between Dysphoria and the relatively specific symptoms of Positive Affect and Appetite Loss.

However, in the diabetes sample, this same pattern of results did not emerge. Constraining the correlations between Dysphoria/Irritability and Dysphoria/Appetite Loss to be equivalent did not significantly reduce the fit of the model, suggesting that these correlations are not significantly different from one another. Constraining the correlations between Dysphoria/Irritability and Dysphoria/(low) Positive Affect to be equivalent with one another did significantly reduce the fit of the model. However, an

examination of the correlation matrix (Table 15) indicates that the correlation between Dysphoria and (low) Positive Affect actually was greater than the correlation between Dysphoria and Irritability in this sample.

One possible explanation for the difference between samples in the equivalence of the Dysphoria/Irritability vs. Dysphoria/Appetite Loss is the difference in sample size between the two groups. The community sample is substantially larger than the diabetes sample (n = 380 and n = 226, respectively); therefore, analyses in this group had more power to detect significant differences in the chi-square. However, it is unclear why the Dysphoria/(low) Positive Affect correlation was significantly greater in the diabetes sample relative to the Dysphoria/Irritability correlation. One may initially assume that this is related to differences in the overall magnitude of symptom correlations, as hypothesized (Hypothesis 5b) based on the interaction model. However, as discussed below, subsequent analyses testing Hypothesis 5b revealed that the two samples had generally equivalent correlations across all symptom factors. This difference between samples may reflect a unique characteristic of this particular diabetes sample or could indicate that Positive Affect is more strongly related to Dysphoria among adults with diabetes. Addressing this issue will require further research to examine the replicability of this finding.

The final set of analyses (Hypotheses 5a and 5b) tested whether or not a well-fitting common model would emerge; as seen in Table 10, an adequate fitting multisample 8-factor model was found. Thus, the presence (or absence) of diabetes did not affect the replicability of the 8-factor model in this study. Contrary to the diabetes-related model of the 6 overlapping symptoms of depression and anxiety (Appetite Loss,

Fatigue, Irritability, Concentration Difficulties, Restlessness, and Autonomic Arousal), the presence of diabetes did not alter the structure of these symptoms when compared with an age-matched community sample. This finding provides support for the affect-related model of depression and anxiety symptoms, suggesting that regardless of the presence of the diabetes, these overlapping symptoms have a similar structure and form relatively distinct yet related symptoms.

The second aspect of this set of analyses (Hypothesis 5b) tested whether or not constraining the 28 factor correlations of the 8-factor model to be equivalent across samples significantly reduced the fit of the model. It was hypothesized, based on the interaction model, that results may reveal higher correlations among these symptoms in a diabetes sample, given the greater prevalence of depression and anxiety in diabetes samples and the larger general distress factor found in previous research (i.e., D.A. Clark et al., 1998). Therefore, it was expected that constraining equivalence across samples would lead to a reduced fit in the model. Contrary to expectations, this hypothesis was not confirmed and constraining equivalence in correlations across samples did not reduce the fit of the model. Thus, results indicate that correlations between these 8 symptoms of depression and anxiety are essentially equivalent with one another in these two samples. This finding suggests that the presence of diabetes does not affect the strength of correlations among these symptoms and provides further support for the affect-related model of depression and anxiety symptoms.

This finding, although contrary to hypotheses, does provide overall support for the one of study's primary objectives. That is, this equivalence in correlations indicates that these 6 overlapping symptoms (Appetite Loss, Fatigue, Irritability, Concentration

Difficulties, Restlessness, and Autonomic Arousal) do not appear to be significantly affected by the presence of diabetes. This suggests that these symptoms, when present among adults with diabetes, should not be immediately attributed to the disease process (i.e., hyperglycemia or hypoglycemia). Rather, as indicated by the results of this study, these 6 overlapping symptoms are as strongly correlated with mood in the diabetes sample as in the age-matched community sample, with correlations with Dysphoria ranging from .59 to .81 in the diabetes sample (M = .69), versus .59 to .82 in the community sample (M = .71).

In examining the factor correlations for the final model (Model 3, Table 15), certain patterns can be seen across the two samples that provide some support for the integrative model. For example, Dysphoria demonstrates the highest correlations on average with the other factors in the diabetes and community samples, with mean coefficients of .70 and .73, respectively. Cognitive Difficulties demonstrates the second highest correlations on average across the two groups, with a mean correlation of .67 with other symptoms in the diabetes sample, and a corresponding value of .72 in the community sample. This observation makes sense given the broad, relatively nonspecific negative affect component of both Dysphoria and Cognitive Difficulties, contributing to their overall higher correlations with the other symptoms of depression and anxiety, as would be predicted based on the integrative model (Mineka et al., 1998). Another commonality between samples is the generally lower correlations demonstrated between the Appetite Loss and Positive Affect factors and the other 6 symptom factors. Average correlations with Appetite Loss were .50 and .49 in the diabetes and community samples, respectively. For Positive Affect, average correlations were .51 and .53 in the diabetes

and community samples, respectively. Thus, these symptoms demonstrated relative specificity, as would be predicted based on Mineka et al. (1998) and Watson et al. (2007). Irritability and Fatigue had high correlations on average with the other symptoms, yet demonstrated their highest correlations with Dysphoria in both samples, with correlations of .76 and .78 in the diabetes and community samples, respectively (although Fatigue also correlated .78 with Cognitive Difficulties in the community sample). Restlessness demonstrated generally high correlations, particularly with other nonspecific symptoms such as Dysphoria and Cognitive Difficulties, yet also demonstrated high correlations with Autonomic Arousal in both samples.

Thus, certain aspects of the integrative model appeared to have replicated in this study in both samples, such as the nonspecificity of Dysphoria and Cognitive Difficulties, and the relative specificity of Appetite Loss and Positive Affect. However, other aspects of the integrative model were not as clearly replicated in both samples. In particular, Irritability was not as clear an indicator of a broad negative affect factor as would have been expected based on the integrative model. Irritability correlated .65 on average with other symptoms in the community sample, but only .52 on average in the diabetes sample, which is close to the average correlations for Positive Affect (.51) and Appetite Loss (.50). In addition, Autonomic Arousal, thought to be relatively specific, proved to correlate fairly strongly with the other symptoms and had a relatively high average correlation in both the diabetes (.60) and community (.64) samples. Fatigue also proved to be relatively nonspecific and had an average correlation of .64 and .65 in the diabetes and community samples, on average. In summary, Irritability proved to be somewhat less related to a broad negative affect factor in the diabetes sample, and Autonomic

Arousal and Fatigue proved to be more nonspecific than expected in both samples. Although several characteristics of the integrative model were replicated, a few symptoms did not relate with other symptoms depression and anxiety as expected. Importantly, however, all symptoms correlated strongly with Dysphoria in both samples.

Although previous research also has suggested that these overlapping symptoms are more correlated with mood than with diabetes (e.g., Lustman et al., 1992; Ciechanowski et al., 2003), results from this study improve on earlier studies in a number of ways. First, this study included reliable, multiple-item measures of the individual symptoms of interest, which allowed for greater validity and reliability of the measurement model, as well as greater assurance in its findings. A second significant and related improvement is the examination of symptoms individually without overlapping content across distinct constructs. In other words, this study removed relatively heterogeneous content from broad measures of "depression" such as the BDI. In addition, each symptom was modeled with a minimum of two separate indicators/scales. Third, the use of structural models to measure the symptoms of interest not only improved the robustness of measurement but also allowed for the quantification of differences (or lack thereof) between samples in the structure of these symptoms.

Fourth, this study included an age-matched comparison group of 380 community adults, which improved the interpretability of results. Although significant differences emerged between the samples on demographic variables other than age (see below for more discussion of this topic), the results indicated replicability of the structural model and factor correlations across samples, emphasizing the overall similarity of these symptoms despite demographic differences between groups. Fifth, this study examined a

very practical question (i.e., does depression/anxiety differ in the presence of diabetes?) within the theoretical framework of the integrative model. This theoretical model emphasizes the importance of considering the constructs of depression and anxiety as inherently related, as well as highlighting the relative specificity of distinct symptoms of depression and anxiety. Finally, this study represents an improvement upon previous research by attempting to model several symptoms of interest that are specifically related to hypo- or hyperglycemia. Although Appetite Gain did not emerge as a reliable factor, all 6 other symptoms of interest were modeled and replicated across groups. The inclusion of these design characteristics helps this study make a significant contribution to our understanding of depression and anxiety symptoms among diabetes patients and increases confidence in the results.

The major findings from this study are the following. First, 8 distinct symptoms of depression and anxiety were able to be reliably measured within each sample. Second, one element of the integrative model, the higher correlation among symptoms that share a common underlying factor (Negative Affect), was confirmed within the community sample, but not in the diabetes sample. Third, a well-fitting 8-factor common model emerged, indicating that the structure of depression and anxiety symptoms did not significantly vary across these two distinct samples. Fourth, and possibly most importantly, correlations among symptom factors did not differ significantly across the two groups. In other words, the correlations between the 6 overlapping symptoms (e.g. Fatigue, Autonomic Arousal) and Dysphoria were not significantly different across the two samples. In this regard, it is noteworthy that these similar correlations were found despite the presence of diabetes and the diabetes sample's generally high levels of

hyperglycemia (as indicated by overall high means of HbA1c), as well as higher levels of general medical conditions compared with the community sample. Thus although the two samples were significantly different on a number of medical indicators, these differences did not impact the strength of correlations across samples.

Limitations

One limitation of the current study is the significant demographic differences between groups, with the community sample being predominantly female, and also having higher education and income levels. These differences may have emerged as a result of the specific recruitment methods undertaken for this study. Specifically, 20% of diabetes patients were recruited from the VA hospital, which resulted in a smaller percentage of female participants relative to the community sample, and may have contributed to other socioeconomic differences between the groups. Similarly, 27% of diabetes patients were recruited from the University of Iowa Hospitals and Clinics Family Practice Clinic, which serves low income patients with Medicaid and Medicare healthcare coverage. In addition, the community sample was recruited in part through announcements to employees of the University of Iowa, which may also have contributed to the socioeconomic differences between groups. Finally, the significant differences in health status, as seen in Table 5, may also have contributed to the economic differences between samples, given that individuals with multiple medical problems may be less likely to be employed. These demographic differences could have proven problematic if significant differences emerged in the CFAs between the two samples. Such differences could then have been interpreted as either reflections in differences in disease status, demographics or both. However, as stated previously, the measurement model proved

reliable and robust across the two groups despite both the planned and unplanned differences between samples.

In addition, it should be noted that the structural invariance between these two groups is consistent with previous research establishing factor structure replicability across groups despite clinical and demographic differences. For example, O'Connor (2002) conducted a statistical review comparing factor structures between clinical and nonclinical samples for a number of personality and psychopathology inventories. He concluded that structures were highly similar in terms of both the number of factors that emerged as well as factor patterns across both types of samples. Similarly, Watson et al. (1995) replicated the tripartite model of depression and anxiety using the MASQ across five different samples, including college students, community adults and male patients. The factor structure of the Anxiety Sensitivity Index (Peterson & Reiss, 1992) was tested across samples of male and female students (Stewart, Taylor and Baker, 1997) and the results indicated that both lower- and higher-order structures replicated well across gender groups. Finally, V.A. Clark, Aneshensel and Frerichs (1981) compared the factor structure of the CES-D across male and female community adults and found that a similar underlying depression dimension emerged in both sexes. Thus, the findings from the current study fit in well with previous research that has identified structural invariance across samples that vary in clinical and demographic characteristics.

A second limitation of the current study is the failure to model appetite gain in the main analyses. This symptom can be related to depression/anxiety as well as diabetes and can also be of clinical concern to patients and providers when present. Thus, improving our understanding of this symptom represents an important goal at a

theoretical as well as practical level. Appetite gain's failure to emerge as a reliable factor is likely due at least in part to the limited availability of measures of this symptom. Thus, future research would benefit from the development and subsequent inclusion of additional valid measures of appetite gain.

Additional limitations inherent to the design of the present study include the exclusive use of self-report measures as well as the use of cross-sectional data. Including multimodal assessment (e.g., interview, peer-report) of the symptoms of interest would potentially strengthen the measurement model considerably in future research. Assessing the symptoms of interest with more than one method would allow for a potentially more valid modeling of the symptoms as factors. Assessing depression and anxiety symptoms at multiple time points would also strengthen the findings of this study in a number of ways. First, longitudinal comparisons of structural models would allow for a test of the replicability of the models within the same samples across time. Second, collecting this data at multiple time points would allow for an examination of potential changes in the symptom structure as the disease progresses, improves or remains stable. For example, longitudinal assessment would allow for a test of potential differences in symptom structure with changes in HbA1c levels and blood glucose control. Although the current study provides a strong test of the structure of these symptoms of depression and anxiety, conclusions from this study are limited by the use of cross-sectional and self-report data only.

Future Directions

The research questions of this study could be expanded in future research in a number of directions. First, this study used a combination of T1DM and T2DM patients.

Although this study provides additional support for the general robustness of structural models, testing for potential differences across different types of diabetes patients would be an obvious extension of this project. Future research that examined similar issues comparing these two groups would likely be of considerable interest to diabetes researchers. As stated in the Results section, this sample of patients had a range of HbA1c values, and, on average, HbA1c values were high. Future research could extend this project by comparing structural models across participants with different HbA1c lab results. This design would allow any potential effects of hyper- or hypoglycemia on the symptoms of interest to emerge and would likely be of interest to diabetes researchers as well.

This study examined the nature of depression and anxiety symptoms among adults with diabetes and a natural extension of this project would be to examine this issue in adults with other medical conditions. Several other medical conditions present a similar dilemma of etiologically ambiguous symptoms such as various types of cancer, coronary artery disease, hepatitis C, HIV, multiple sclerosis and chronic fatigue syndrome. The structural approach taken in this study could be applied to other samples of medical patients to address the same issue and determine whether or not the nature of these overlapping depression and anxiety symptoms is affected by the presence of physical disease.

An important clinical extension of this project is to examine the impact of these findings on patient outcomes. In other words, it would be helpful to examine the current clinical practice in the identification of depression and anxiety among diabetes patients to determine how often overlapping symptoms are identified (or disqualified) as indicators

of depression/anxiety. Results of this study suggest that depression and anxiety may be underdiagnosed in diabetes patients, particularly among those with poorly controlled diabetes. In addition, these results have implications for the DSM-IV medical exclusion rule that excludes a symptom criterion from a potential psychiatric diagnosis if it is due to the physiological effects of a medical condition. That is, the results of this study suggest that although these overlapping symptoms can be due to physiological changes associated with diabetes (i.e., hyper- or hypoglycemia), they nevertheless are strongly related to mood and distress. These findings therefore suggest that such symptoms should not be excluded from a diagnosis of depression or anxiety for adults with diabetes. Along these lines, researchers could examine whether or not including these etiologically ambiguous symptoms in the diagnosis of depression/anxiety leads to improved identification of these disorders among diabetes patients. Similarly, it would be interesting to determine if informing medical providers of the connection between these overlapping symptoms and dysphoria would lead to an increase in screening for depression/anxiety when a patient presents with, for example, complaints of fatigue or irritability. If such symptoms are often attributed to diabetes rather than to mood, results of this study could help change clinical practice and improve patient outcomes.

APPENDIX A: TABLES

Table A1 *Specified indicators of the factor model to be tested*

Non-Specific Symptoms of Depression and Anxiety & Corresponding Measures

1. Dysphoria – 57 items
    a. PANAS-X Sadness – 5 items
    b. PANAS-X Guilt – 6 items
    c. IDAS Dysphoria (minus 3 agitation & concentration items) – 7 items
    d. MASQ GD – Depression – 12 items
    e. BDI (minus 8 items of fatigue, appetite change, concentration problems, loss of energy, irritability and psychomotor agitation) – 15 items
    f. CES-D (minus 4 PA items, 1 appetite loss item, 1 concentration problems item, and 2 repeating items) – 12 items
2. Loss of appetite* - 13 items
    a. IDAS Appetite Loss (plus 2 added items) - 5 items
    b. Motivation to Eat – 4 items
    c. CES-D appetite items (plus 2 new items) – 4 items
3. Irritability* - 32 items
    a. IDAS Ill Temper – 5 items
    b. PANAS-X Hostility – 6 items
    c. MAACL-R Hostility (minus 5 repeating items) - 10 items
    d. POMS Anger/Hostility (minus 1 repeating items) – 11 items
4. Concentration difficulties* - 67 items
    a. Indecisiveness scale (abbreviated) – 12 items
    b. Cognitive Failures Questionnaire – 25 items
    c. Multifactorial Memory Questionnaire, Ability scale – 20 items
    d. CES-D items (plus 2 new items) – 3 items
    e. IDAS Concentration items – 7 items

Table 1 (cont.)

5. Psychomotor agitation/restlessness* - 14 items
    a. HADS Restlessness Items – 4 items
    b. Mehrabian Fidgety Scale, Restlessness subscale – 6 items
    c. IDAS agitation items – 4 items
6. Appetite Gain* - 11 items (although only 7 are counted toward the total number of items, due to the repeat of the Motivation to Eat Questionnaire)
    a. IDAS Appetite Gain (plus 2 added & 2 newly written) – 7 items
    b. Motivation to Eat – 4 items

Specific Symptoms of Depression:

1. Positive Affectivity – 64 items
    a. PANAS-X: Joviality scale – 8 items
    b. PANAS-X: Self-Assurance scale – 6 items
    c. MASQ: Anhedonic Depression-Positive Affectivity scale – 14 items
    d. IDAS Well Being – 8 items
    e. MAACL-R Positive Affect (minus 2 repeating items) – 19 items
    f. POMS Vigor/Activity (minus 3 repeating items) – 5 items
    g. CES-D PA items – 4 items
2. Fatigue/Lethargy* - 24 items
    a. IDAS Lassitude – 6 items
    b. PANAS-X Fatigue – 4 items
    c. Epworth Sleepiness Scale – 8 items
    d. POMS Fatigue/Inertia (minus 1 repeating item) – 6 items

Specific Symptoms of Anxiety

1. Autonomic Arousal/Tension* - 39 items
    a. MASQ: Anxious Arousal scale – 17 items
    b. IDAS Panic – 8 items
    c. BAI (minus 7 cognitive/affective items) – 14 items

Note. * indicates the symptom is also a common symptom of diabetes (e.g. hypo- or hyperglycemia). Item total for symptom dimensions is 319 items, although complete versions of some questionnaires (i.e. IDAS, HADS, BDI-II, BAI, and CES-D) will be given for a total of 365 affective items. This will include 21 extra IDAS items, 10 extra HADS items, 8 extra BDI-II items, 7 extra BAI items, and 2 extra CES-D items.

Table A2 *Specified Hypotheses and Models in Analyses*

Hypothesis 1:

A. Diabetes means > Community means dysphoria, irritability, concentration problems, appetite loss, appetite gain, psychomotor agitation, fatigue and AA scales.

Hypothesis 2:

A. Diabetes mean < Community mean on measures of PA.

Hypotheses 3a and 3b:

A. Model 1, Community = Adequate fitting 9-factor model (with above indicators) for community adult sample.

B. Model 1, Diabetes = Adequate fitting 9-factor model (with above indicators) for diabetes sample.

Hypotheses 4a and 4b:

A. Community Constrained Model = Poorer fitting model constraining the following equal correlations among factors within community sample:

$r_{dysphoria/irritability} = r_{dysphoria/appetite\ loss} = r_{dysphoria/appetite\ gain} = r_{dysphoria/PA.}$

B. Diabetes Constrained Model = Poorer fitting model constraining the following equal correlations among factors within community sample:

$r_{dysphoria/irritability} = r_{dysphoria/appetite\ loss} = r_{dysphoria/appetite\ gain} = r_{dysphoria/PA.}$

Hypothesis 5:

A. Multiple Sample Model = Adequate fitting common model.

B. Multiple Sample Constrained Model = Model constrained to have equivalent factor correlations between samples.

Table A3 *Patient and Community Demographic Characteristics*

	Patient		Community		
	Number	(%)	Number	(%)	Chi Square
Gender					56.74**
Male	113	(50)	78	(20.5)	
Female	113	(50)	301	(79.2)	
Age					
M	52.7		51.1		
SD	14.0		11.0		
Ethnicity					17.34*
Hispanic	7	(3.1)	5	(1.3)	
Am. Indian/Alaskan Native	3	(1.3)	0		
Asian	1	(0.4)	4	(1.1)	
Black or African Am.	7	(3.1)	3	(0.8)	
Caucasian	209	(92.5)	370	(97.4)	
Multiracial	4	(1.8)	0		
Education Level					84.29**
Less than H.S. diploma	17	(7.5)	3	(0.8)	
GED	11	(4.9)	8	(2.1)	
H.S. diploma	46	(20.4)	36	(9.5)	
Voc./Tech./Associate's degree	21	(9.3)	34	(8.9)	
Some college	71	(31.4)	73	(19.2)	
Bachelor's degree	34	(15.0)	128	(33.7)	
Master's degree	13	(5.8)	78	(20.5)	
Doctorate	8	(3.5)	19	(5.0)	

Table A3 (cont.)

	Patient		Community		
	Number	(%)	Number	(%)	Chi Square
Marital Status					16.08*
Married	122	(54.0)	255	(67.1)	
Divorced/Separated	53	(23.0)	55	(14.5)	
Widowed	17	(7.5)	13	(3.4)	
Single, never married	26	(11.5)	37	(9.7)	
Not married, cohabitating w/ partner	8	(3.5)	13	(3.4)	
Total Annual Household Income					88.85**
Less than $9,999	29	(12.8)	11	(2.9)	
$10,000-$19,999	33	(14.6)	24	(6.3)	
$20,000-$29,999	33	(14.6)	22	(5.8)	
$30,000-$39,999	24	(10.6)	29	(7.6)	
$40,000-$49,999	13	(5.8)	39	(10.3)	
$50,000-$59,999	17	(7.5)	37	(9.7)	
$60,000-$69,999	18	(8.0)	28	(7.4)	
$70,000-$79,999	10	(4.4)	41	(10.8)	
$80,000-$89,999	9	(4.0)	45	(11.8)	
$90,000+	16	(7.1)	89	(23.4)	

Note. * = $p < .01$, ** = $p < .001$.

Table A4 *Self-Reported Diabetes Characteristics*

		Number	%
Years Since Diagnosis			
	M 13.0		
	SD 11.8		
Type of Diabetes			
	Type 1	61	(27.0)
	Type 2	145	(64.2)
	Gestational	3	(1.3)
Current Diabetes Treatment			
	Insulin	134	(59.3)
	Anti-Hyperglycemics	104	(46.0)
	No Medication	20	(8.8)
	Insulin Pump	20	(8.8)
Complications from Diabetes			
	Skin Problems	86	(38.1)
	Heart Disease	37	(16.4)
	Stroke	12	(5.3)
	High Blood Pressure	100	(44.2)
	Kidney Disease	14	(6.2)
	Kidney Failure	4	(1.8)
	Neuropathy	66	(29.2)
	Retinopathy	34	(15.0)
	Blindness	3	(1.3)
	Periodontal Disease	31	(13.7)
	Amputation	7	(3.1)
	DKA	26	(11.5)
	HHNC	7	(3.1)

Table A4 (cont.)

		Number	%
Days of Missed Work (past 2 mo.s)			
	M 1.97		
	SD 9.43		
Days of Hospitalization (past 2 mo.s)			
	M 0.19		
	SD 1.11		
Number of Health Care Visits (past 2 mo.s)			
	M 1.12		
	SD 1.08		
Days Since Most Recent HbA1c			
	M 36.6		
	SD 72.9		
HbA1c Lab Result			
	< 6.0	25	(11.1)
	6.0-7.0	67	(29.6)
	7.1-8.0	52	(23.0)
	> 8.0	65	(28.8)
	M 7.7		
	SD 1.8		
	Range 5.0-14.3		

Note. N = 226 diabetes patients.

Table A5 *Self-Reported Medical Conditions*

	Patient		Community		Cohen's
Condition	Number	%	Number	%	d
Heart Disease	58**	(25.7)	12	(3.2)	.72
Treatment	53**	(23.5)	11	(2.9)	1.02
High Blood Pressure	150**	(66.4)	57	(15.0)	1.11
Treatment	136**	(60.2)	54	(14.2)	1.24
High Cholesterol	142**	(62.8)	84	(22.1)	.87
Treatment	111**	(49.1)	44	(11.6)	1.08
Lung Disease/Problems	35*	(15.5)	34	(8.9)	.22
Treatment	32*	(14.2)	32	(8.4)	.39
Stroke	18**	(8.0)	6	(1.6)	.31
Treatment	17**	(7.5)	4	(1.1)	.54
Ulcer/Stomach Disease	44**	(19.5)	20	(5.3)	.49
Treatment	42**	(18.6)	21	(5.5)	.64
Kidney Disease	17**	(7.5)	2	(0.5)	.40
Treatment	16**	(7.1)	3	(0.8)	.52
Liver Disease	10**	(4.4)	2	(0.5)	.21
Treatment	4**	(1.8)	1	(0.3)	.30
Cancer (past 3 yrs.)	14*	(6.2)	7	(1.8)	.22
Treatment	15**	(6.6)	6	(1.6)	.40
Depression	85**	(37.6)	100	(26.3)	.26
Treatment	67**	(29.6)	67	(17.6)	.50
Anxiety	53	(23.5)	80	(21.1)	.07
Treatment	40	(17.7)	43	(11.3)	.38
Arthritis	74	(32.7)	101	(26.6)	.13
Treatment	39*	(17.3)	54	(14.2)	.21

Note. N = 226 diabetes patients, 380 community adults. Mean differences between samples significant * $p<.05$, ** $p<.01$.

Table A6 *Self-Reported Diabetes Symptoms from SCPO*

Item	Patient Mean	Patient SD	Community Mean	Community SD	Cohen's d
1. Felt abnormally thirsty	2.50**	(1.21)	1.74	(0.92)	.72
2. Had blurred vision	1.96**	(1.09)	1.36	(0.77)	.64
3. Passed a lot of water	2.70**	(1.24)	2.01	(1.11)	.59
4. Felt unusually hungry	2.33**	(1.12)	1.90	(0.95)	.42
5. Felt shaky	1.72**	(0.88)	1.31	(0.68)	.53
6. Cold hands & feet	2.31**	(1.30)	2.02	(1.10)	.24
7. Felt sleepy during day	2.84**	(1.22)	2.42	(1.04)	.37
8. Feeling pins & needles	2.03**	(1.27)	1.33	(0.75)	.68
9. Felt faint, fainted, passed out	1.27*	(0.59)	1.18	(0.52)	.18

Note. N = 222-220 diabetes patients, 382-381 community adults. * = p <.05, ** = p< .01.

Table A7 *Scale Means & Standard Deviations*

	Diabetes		Community		Cohen's
	Mean	(SD)	Mean	(SD)	d
Dysphoria Scales					
PANAS-X Sadness	10.4*	(5.6)	9.2	(4.8)	.22
PANAS-X Guilt	10.6	(5.9)	9.8	(4.7)	.16
IDAS Dysphoria[1]	14.0**	(5.9)	12.7	(5.2)	.24
MASQ GD – Depression	22.8	(10.4)	21.8	(9.7)	.10
BDI[2]	23.7**	(8.6)	21.3	(7.2)	.31
CES-D[3]	8.2**	(7.5)	6.3	(6.7)	.28
Mean					**.22**
Loss of appetite					
IDAS Appetite Loss[4]	8.0*	(3.6)	6.9	(3.3)	.32
Motivation to Eat	12.0	(2.3)	12.0	(2.0)	.01
CES-D appetite items[5]	1.3**	(2.1)	0.7	(1.6)	.31
Mean					**.21**
Irritability					
IDAS Ill Temper	8.1	(3.8)	7.6	(3.3)	.12
PANAS-X Hostility	10.5	(4.3)	9.9	(4.1)	.14
MAACL-R Hostility[6]	16.4	(7.3)	15.8	(6.0)	.08
POMS Anger/Hostility[7]	18.3	(7.9)	17.6	(7.5)	.09
Mean					**.11**

Table A7 (cont.)

	Diabetes		Community		Cohen's
	Mean	(SD)	Mean	(SD)	d
Concentration difficulties					
Indecisiveness scale[8]	25.6	(10.8)	23.8	(10.1)	.17
Cognitive Failures Ques.	37.2*	(18.9)	34.1	(15.5)	.18
MMQ, Ability scale	30.0**	(17.2)	23.7	(14.0)	.40
CES-D items[9]	2.8*	(2.8)	2.2	(2.5)	.22
IDAS Concentration items	13.8*	(6.4)	12.6	(5.3)	.19
Mean					**.23**
Restlessness					
HADS Restlessness Items	4.3*	(2.5)	3.9	(2.3)	.17
Mehrabian Fidgety Scale, Restlessness subscale	16.8	(6.8)	15.1	(6.5)	.26
IDAS agitation items	5.0**	(2.3)	4.5	(2.0)	.24
Mean					**.22**
Appetite Gain					
IDAS Appetite Gain[10]	13.9*	(6.3)	12.6	(5.3)	.22
Motivation to Eat	12.0	(2.3)	12.0	(2.0)	.01
Mean					**.12**

Table A7 (cont.)

	Diabetes		Community		Cohen's
	Mean	(SD)	Mean	(SD)	d
Positive Affectivity					
PANAS-X: Joviality	21.3	(7.7)	23.6**	(7.0)	.30
PANAS-X: Self-Assurance	14.5	(5.6)	15.2	(4.9)	.12
MASQ: Anhedonic Depression, Positive Affectivity scale	39.6	(13.5)	42.0**	(12.4)	.39
IDAS Well Being	21.8	(7.0)	24.6**	(6.5)	.41
MAACL-R Positive Affect[11]	59.4	(17.1)	62.9*	(15.1)	.22
POMS Vigor/Activity[12]	12.0	(4.7)	13.2**	(4.6)	.26
CES-D PA items	7.6	(3.7)	9.0**	(3.2)	.39
Mean					**.30**
Fatigue/Lethargy					
IDAS Lassitude	12.5**	(4.6)	11.3	(4.3)	.26
PANAS-X Fatigue	11.0**	(4.4)	9.6	(4.2)	.32
Epworth Sleepiness Scale	8.5**	(4.4)	6.8	(3.9)	.40
POMS Fatigue/Inertia[13]	14.6**	(6.5)	12.6	(6.1)	.31
Mean					**.32**
Autonomic Arousal/Tension					
MASQ: Anxious Arousal	26.4**	(9.1)	21.8	(6.8)	.57
IDAS Panic	12.3**	(4.8)	10.0	(3.9)	.51
BAI[14]	21.2**	(6.8)	17.9	(5.1)	.54
Mean					**.54**

Table A7 (cont.)

	Diabetes		Community		Cohen's
	Mean	(SD)	Mean	(SD)	d
RAND SF-36					
Physical Functioning	62.6	(31.8)	87.2**	(17.9)	.96
Role Limits – Phys. Health	50.5	(42.6)	79.8**	(32.9)	.77
Role Limits – Emo. Health	63.3	(42.1)	75.0**	(35.6)	.30
Energy/Fatigue	44.5	(25.1)	56.2**	(23.0)	.49
Emotional Well-Being	68.4	(21.9)	73.1**	(19.4)	.23
Social Functioning	65.4	(29.5)	78.2**	(25.4)	.46
Pain	60.8	(28.0)	77.3**	(20.1)	.68
General Health	48.2	(22.6)	74.0**	(18.8)	1.24
Mean					**.64**

Note. N = 222-226 diabetes patients, 378-380 community adults. * = $p < .05$; ** = $p < .01$.
[1] minus 3 agitation & concentration items. [2] minus 8 items of fatigue, appetite change, concentration problems, loss of energy, irritability and psychomotor agitation. [3] minus 4 PA items, 1 appetite loss item and 1 concentration problems item = 12 items although I wrote 14 in prospectus, which included 2 repeating items. [4] plus 2 added items. [5] plus 2 new items. [6] minus 5 repeating items. [7] minus 1 repeating items. [8] abbreviated. [9] plus 2 new items. [10] plus 2 added & 2 newly written. [11] minus 2 repeating items. [12] minus 3 repeating items. [13] minus 1 repeating item. [14] minus 7 cognitive/affective items.

Table A8 *Scale Internal Consistency Reliabilities*

		Diabetes		Community	
	# of Items	Alpha	AIC	Alpha	AIC
Dysphoria Scales					
PANAS-X Sadness	5	.92	.70	.92	.70
PANAS-X Guilt	6	.95	.76	.92	.66
IDAS Dysphoria[1]	7	.88	.51	.89	.54
MASQ GD – Depression	12	.94	.57	.95	.61
BDI[2]	15	.92	.43	.92	.43
CES-D[3]	12	.89	.40	.90	.43
Loss of appetite					
IDAS Appetite Loss[4]	5	.88	`.59	.93	.73
Motivation to Eat	4	.83	.55	.78	.47
CES-D appetite items[5]	3	.85	.65	.87	
Irritability					
IDAS Ill Temper	5	.87	.57	.85	.53
PANAS-X Hostility	6	.86	.51	.88	.55
MAACL-R Hostility[6]	10	.93	.57	.90	.47
POMS Anger/Hostility[7]	11	.92	.51	.93	.55
Concentration difficulties					
Indecisiveness scale[8]	12	.94	.57	.94	.57
Cognitive Failures Ques.	25	.96	.49	.94	.39
MMQ, Ability scale	20	.96	.55	.95	.49
CES-D items[9]	3	.89	.73	.92	.79
IDAS Concentration items	7	.94	.69	.94	.69

Table A8 (cont.)

		Diabetes		Community	
	# of Items	Alpha	AIC	Alpha	AIC
Restlessness					
HADS Restlessness Items	4	.72	.39	.74	.42
Mehrabian Fidgety Scale, Restlessness subscale	6	.86	.51	.87	.53
IDAS agitation items	3	.70	.44	.77	.53
Appetite Gain					
IDAS Appetite Gain[10]	7	.92	.62	.90	.56
Motivation to Eat	4	.83	.55	.78	.47
Positive Affectivity					
PANAS-X: Joviality	8	.95	.79	.95	.70
PANAS-X: Self-Assurance	6	.90	.60	.86	.51
MASQ: Anhedonic Depression, Positive Affectivity scale	14	.97	.70	.97	.70
IDAS Well Being	8	.91	.56	.91	.56
MAACL-R Positive Affect[11]	19	.97	.63	.96	.56
POMS Vigor/Activity[12]	5	.90	.64	.89	.62
CES-D PA items	4	.85	.59	.90	.69
Fatigue/Lethargy					
IDAS Lassitude	6	.81	.42	.82	.43
PANAS-X Fatigue	4	.92	.74	.93	.77
Epworth Sleepiness Scale	8	.79	.32	.78	.31
POMS Fatigue/Inertia[13]	6	.93	.69	.95	.76

Table A8 (cont.)

		Diabetes		Community	
	# of Items	Alpha	AIC	Alpha	AIC
Autonomic Arousal/Tension					
MASQ: Anxious Arousal	17	.88	.30	.87	.28
IDAS Panic	8	.81	.35	.86	.43
BAI[14]	14	.88	.34	.88	.34
RAND SF-36					
Physical Functioning	10	.95	.66	.89	.45
Role Limits – Phys. Health	4	.88	.65	.85	.59
Role Limits – Emo. Health	3	.85	.65	.79	.56
Energy/Fatigue	4	.87	.63	.88	.65
Emotional Well-Being	5	.83	.49	.84	.51
Social Functioning	2	.91	.83	.87	.77
Pain	2	.87	.77	.81	.68
General Health	5	.83	.49	.80	.44

Note. N = 222-226 diabetes patients, 378-380 community adults. [1] minus 3 agitation & concentration items. [2] minus 8 items of fatigue, appetite change, concentration problems, loss of energy, irritability and psychomotor agitation. [3] minus 4 PA items, 1 appetite loss item and 1 concentration problems item = 12 items although I wrote 14 in prospectus, which included 2 repeating items. [4] plus 2 added items. [5] plus 2 new items. [6] minus 5 repeating items. [7] minus 1 repeating items. [8] abbreviated. [9] plus 2 new items. [10] plus 2 added & 2 newly written. [11] minus 2 repeating items. [12] minus 3 repeating items. [13] minus 1 repeating item. [14] minus 7 cognitive/affective items.

Table A9 *Correlations among Symptom Scales*

Scale	1	2	3	4	5	6	7
Positive Affectivity							
1. PANAS-X Joviality	—	**.87**	**.80**	**.83**	**.78**	**.79**	**.76**
2. MASQ AD-PA Scale	**.89**	—	**.77**	**.78**	**.79**	**.85**	**.72**
3. MAACL-R PA	**.81**	**.76**	—	**.77**	**.74**	**.72**	**.71**
4. POMS Vigor/Activity	**.85**	**.81**	**.78**	—	.65	**.70**	**.75**
5. CES-D PA items	**.77**	**.79**	**.70**	.68	—	**.74**	.60
6. IDAS Well-Being	**.80**	**.88**	.69	**.75**	**.73**	—	.69
7. PANAS-X Self-Assurance	**.81**	**.74**	**.74**	**.83**	.63	**.70**	—
Dysphoria							
1. PANAS-X Sadness	—	**.74**	**.79**	**.85**	**.78**	**.83**	
2. PANAS-X Guilt	**.85**	—	**.76**	**.81**	**.78**	**.72**	
3. IDAS Dysphoria	**.78**	**.76**	—	**.90**	**.83**	**.82**	
4. MASQ GD - Depression	**.89**	**.84**	**.84**	—	**.88**	**.86**	
5. BDI Cog./Affective items	**.85**	**.82**	**.80**	**.88**	—	**.85**	
6. CES-D Depression items	.84	.79	.82	.88	.86	—	
Concentration Problems							
1. Indecisiveness Scale	—	**.70**	.61	**.71**	**.76**		
2. Cognitive Failures Ques.	**.73**	—	**.78**	.65	**.70**		
3. MMQ, Ability Scale	.62	**.73**	—	.61	.65		
4. CES-D Concentration items	**.74**	**.73**	.61	—	**.80**		
5. IDAS Concentration items	**.79**	**.72**	.62	**.81**	—		

Table A9 (cont.)

Scale	1	2	3	4	5	6	7
Fatigue							
1. IDAS Lassitude	—	**.75**	**.74**	.43			
2. PANAS-X Fatigue	**.78**	—	**.87**	.44			
3. POMS Fatigue/Inertia	**.80**	**.88**	—	.38			
4. Epworth Sleepiness Scale	.42	.44	.42	—			
Irritability							
1. IDAS Ill Temper	—	**.77**	**.77**	**.76**			
2. PANAS-X Hostility	**.75**	—	**.85**	**.85**			
3. MAACL-R Hostility	**.70**	**.81**	—	**.89**			
4. POMS Anger/Hostility	**.79**	**.87**	**.87**	—			
Loss of Appetite							
1. IDAS Appetite Loss	—	-.51	**.77**				
2. Motivation to Eat Ques.	-.51	—	-.51				
3. CES-D Appetite items	**.71**	-.57	—				
Restlessness							
1. IDAS Agitation items	—	.53	.62				
2. Mehrabian Fidgety Scale	.62	—	.53				
3. HADS Restlessness items	.62	.65	—				
Autonomic Arousal							
1. IDAS Panic	—	**.87**	**.82**				
2. MASQ Anxious Arousal	**.87**	—	**.88**				
3. BAI	.83	.85	—				
Appetite Gain							
1. IDAS Appetite Gain	—	.57					
2. Motivation to Eat Ques.	.48						

Note. N = 220-226 Adults with diabetes, 383 adults without diabetes. Correlations below the diagonal are diabetes patients, above the diagonal are community adults. Correlations of .70 and greater are highlighted.

Table A10 *Fit Indices for CFA Models*

Model	n	df	χ^2	SRMR	RMSEA	NFI	CFI	GFI
		Adequate Fit Indices:		≤.10	≤.08	≥.90	≥.90	≥.90
		Excellent Fit Indices:		≤.08	≤.06	≥.95	≥.95	≥.95
Model 1								
Diabetes	213	558	1439.428	**.093**	.086	.845	.898	.722
Community	366	558	1965.135	**.073**	.083	.868	**.901**	.759
Model 2								
Diabetes	213	566	1555.061	.111	.091	.832	.885	.706
Community	366	566	2160.048	**.099**	.088	.855	.888	.746
Model 3								
Diabetes	216	349	954.629	**.049**	.090	.875	**.916**	.763
Community	370	349	1131.929	**.042**	**.078**	**.909**	**.935**	.815
Multisample	586	698	2125.765	**.046**	**.059**	.893	**.925**	.796
Multi. Constr.	586	726	2133.940	**.055**	**.058**	.893	**.926**	.795

Table A10 (cont.)

Model	n	df	χ^2	SRMR	RMSEA	NFI	CFI	GFI
Model 4								
Diabetes	216	296	783.135	**.045**	.087	.887	**.926**	.787
Community	370	296	969.727	**.041**	**.079**	**.915**	**.939**	.826
Multisample	586	592	2641.877	**.037**	**.054**	**.926**	**.942**	.846
Model 5								
Diabetes	216	271	705.777	**.040**	.086	.891	**.930**	.797
Community	370	271	901.336	**.042**	**.079**	**.916**	**.940**	**.830**
Multisample	586	542	2417.192	**.036**	**.054**	**.929**	**.944**	.851
Model 6								
Diabetes	216	247	619.952	**.039**	.084	**.900**	**.937**	.806
Community	370	247	831.781	**.042**	**.080**	**.919**	**.941**	.833
Multisample	586	494	2196.279	**.036**	**.054**	**.932**	**.946**	.856

Table A10 (cont.)

Model	n	df	χ^2	SRMR	RMSEA	NFI	CFI	GFI
Model 7								
Diabetes	216	224	540.420	**.037**	.081	**.908**	**.944**	.826
Community	370	224	718.585	**.039**	**.077**	**.927**	**.948**	.852
Multisample	586	448	1931.080	**.033**	**.053**	**.938**	**.951**	.872

Table A11 *9-Factor EFA in Diabetes Sample*

Scale	1	2	3	4	5	6	7	8	9
PANAS-X Joviality	**-.89**	-.14	-.12	-.14	-.13	-.10	-.12	-.07	-.04
MASQ AD - PA	**-.87**	-.16	-.12	-.12	-.14	-.13	-.09	-.10	-.07
POMS Vigor/Activity	**-.87**	-.08	-.16	-.13	-.26	.01	-.05	-.05	.06
PANAS-X Self-Assurance	**-.84**	.04	-.13	-.08	-.11	-.14	-.13	.01	-.01
IDAS Well-Being	**-.81**	-.13	-.07	-.10	-.15	-.17	-.11	-.08	-.02
MAACL-R PA	**-.79**	-.22	-.22	-.08	-.02	-.11	-.06	-.10	.06
CES-D PA Items	**-.69**	-.24	-.19	-.21	-.14	-.27	-.12	-.09	-.10
IDAS Dysphoria	**.46**	.31	.24	.27	.26	**.46**	.05	.26	.11
POMS Anger	.12	**.92**	.17	.13	.15	.12	.02	.07	.02
MAACL-R Hostility	.14	**.82**	.15	.06	.24	.13	.00	.07	-.09
PANAS-X Hostility	.23	**.80**	.23	.16	.18	.23	.10	.08	-.01
IDAS Ill Temper	.13	**.75**	.15	.11	.09	.09	-.04	.28	.15
Cognitive Failures Ques.	.25	.26	**.74**	.20	.25	.13	.04	.15	-.10
MMQ Ability Scale	.23	.23	**.68**	.27	.28	.05	.03	.09	-.09
CES-D Concen. Items	.22	.22	**.62**	.19	.24	.25	.08	.30	.18
IDAS Concen. Items	.24	.24	**.60**	.34	.19	.24	.02	.30	.28
Indecisiveness Scale	.32	.26	**.59**	.22	.11	**.35**	.08	.21	.11
MASQ Autonomic Arousal	.20	.17	.25	**.82**	.23	.20	.10	.16	-.03
BAI	.17	.15	.25	**.80**	.20	.07	.12	.20	-.01
IDAS Panic	.24	.11	.18	**.78**	.22	.18	.09	.22	.09
PANAS-X Fatigue	.28	.22	.25	.22	**.79**	.14	.07	.14	.02
POMS Fatigue/Inertia	.30	.31	.25	.29	**.67**	.21	.06	.19	.04
IDAS Lassitude	.32	.24	.17	.29	**.61**	.29	-.05	.21	.20
Epworth Sleepiness	.13	.16	.19	.13	**.40**	.04	-.15	.03	-.07
MASQ GD - Depression	**.45**	.35	.25	.23	.27	**.61**	.11	.14	.00
PANAS-X Sadness	**.45**	.41	.24	.19	.22	**.57**	.18	.11	-.05
BDI	**.49**	.30	.29	.34	.18	**.54**	.13	.12	.03
PANAS-X Guilt	**.37**	**.48**	.33	.19	.17	**.51**	.13	.10	.03
CES-D NA Items	**.44**	.32	.30	.26	.29	**.49**	.18	.20	.04
MEQ	-.14	.05	.05	-.02	.14	-.01	**-.81**	.05	.07
CES-D Appetite Items	.32	.09	.20	.19	.12	.13	**.68**	.01	.09
IDAS Appetite Loss	.19	.22	.13	.21	.13	.19	**.66**	.20	.12
IDAS Appetite Gain	.12	.28	.19	.20	.29	.13	**-.45**	.16	.19
IDAS Agitation Items	.06	.22	.25	.37	.11	.15	.06	**.68**	.19
Mehrabian Fidgety Scale	.14	.23	.29	.32	.21	.06	-.07	**.62**	-.15
HADS Restlessness Items	.30	.28	.37	.23	.28	.23	.02	**.47**	-.12

Note. N = 226 diabetes patients. EFA done with principal axis factoring and Varimax rotation. Loadings of .35 or higher are in **bold.**

Table A12 *8-Factor EFA in Community Sample, Promax Rotation*

Scale	1	2	3	4	5	6	7	8
PANAS-X Joviality	**-.93**	-.03	-.01	.08	-.06	.01	-.01	.02
PANAS-X Self-Assurance	**-.92**	.00	-.05	-.08	.19	.03	.01	.05
MASQ-AD PA	**-.91**	-.03	.07	.04	-.04	.01	.00	-.06
POMS Vigor/Activity	**-.86**	.13	-.05	-.13	-.17	.14	.00	.07
IDAS Well-Being	**-.85**	.00	-.12	.11	.03	-.02	.04	-.05
MAACL-R PA	**-.79**	-.09	.02	-.06	.01	-.06	-.06	.08
CES-D PA Items	**-.53**	-.06	.10	.06	-.03	-.38	-.03	-.08
MAACL-R Hostility	.09	**.91**	-.01	.04	-.02	-.08	-.04	.07
POMS Anger	.03	**.87**	-.02	-.07	-.02	.02	-.01	.16
PANAS-X Hostility	-.01	**.78**	-.05	.08	.12	.18	.01	-.13
IDAS Ill Temper	-.07	**.66**	.19	.02	-.06	.06	.03	.08
MASQ Autonomic Arousal	.00	.01	**.95**	.02	.04	-.07	-.03	.00
IDAS Panic	.02	-.01	**.89**	-.03	.02	.09	-.02	-.08
BAI	.06	.04	**.89**	.03	-.02	-.15	-.01	.11
Cognitive Failures Ques.	.01	.00	.00	**.91**	.03	.09	.07	-.07
MMQ Ability Scale	.10	.00	.06	**.66**	-.04	-.03	.06	.15
Epworth Sleepiness	-.09	.13	.06	**.36**	**.35**	-.13	-.06	-.08
PANAS-X Fatigue	.05	-.01	-.04	.09	**.96**	-.03	-.01	-.07
POMS Fatigue/Inertia	.06	.00	.01	-.07	**.81**	.10	.02	.05
IDAS Lassitude	.00	.00	.27	.05	**.57**	.05	.00	.00
MASQ GD - Depression	.01	.08	.00	-.04	.04	**.99**	-.03	-.13
PANAS-X Sadness	.11	.12	-.10	-.10	.02	**.86**	.02	-.05
PANAS-X Guilt	.01	.23	-.03	.16	-.09	**.81**	-.05	-.19
IDAS Dypshoria	.04	-.01	.08	-.05	.03	**.80**	-.02	.08
BDI	.13	.10	.12	.08	-.01	**.67**	-.01	-.07
CES-D NA Items	.08	.09	.09	-.07	.13	**.57**	.02	.13
Indecisiveness Scale	.11	.00	-.02	.28	-.06	**.41**	-.07	.24
MEQ	-.03	.04	.11	-.11	.01	.11	**-.86**	-.06
IDAS Appetite Gain	-.07	.02	.17	.08	.01	.21	**-.66**	.18
IDAS Appetite Loss	-.10	.03	.24	.00	.01	.25	**.60**	.01
CES-D Appetite Items	-.03	.08	.19	-.03	.00	.12	**.59**	.10
IDAS Agitation Items	-.03	.13	.19	-.03	-.13	-.15	.03	**.84**
CES-D Concentration Items	.08	-.15	-.03	.15	.08	.22	.01	**.55**
Mehrabian Fidgety Scale	-.06	.13	-.08	.31	.09	-.26	.01	**.51**
HADS Restlessness Items	.01	.12	-.13	.08	.31	.04	.01	**.50**
IDAS Concentration Items	.00	-.12	.10	.20	-.06	.33	.00	**.49**

Note. N = 380 community adults. EFA done with principal axis factoring and Promax rotation. Loadings of ≥ .35 are in **bold.**

Table A13 *8-Factor EFA in Diabetes Sample, Promax Rotation*

Scale	1	2	3	4	5	6	7	8
POMS Vigor/Activity	**-.97**	.01	-.08	-.03	-.20	.27	.01	.06
PANAS-X Joviality	**-.95**	-.02	.05	-.02	.02	.01	-.03	-.02
MASQ-AD PA	**-.91**	-.03	.06	.02	.01	-.04	.00	-.06
PANAS-X Self-Assurance	**-.87**	.19	-.03	.03	.00	-.12	-.03	.10
MAACL-R PA	**-.86**	-.13	-.14	.03	.20	.02	.02	-.03
IDAS Well-Being	**-.82**	.01	.12	.04	-.04	-.13	-.02	-.01
CES-D PA Items	**-.57**	-.04	.02	-.06	.06	-.35	-.01	.00
POMS Anger	-.05	**.99**	.00	.04	-.02	.02	.01	-.04
MAACL-R Hostility	-.02	**.87**	.00	-.05	.16	.01	.00	-.09
PANAS-X Hostility	-.01	**.78**	.06	.03	-.01	.21	.07	-.08
IDAS Ill Temper	.05	**.75**	-.08	-.06	-.10	-.05	-.04	.37
Cognitive Failures Ques.	.01	.04	**.92**	-.01	.07	-.03	.01	-.08
MMQ Ability Scale	.03	.05	**.85**	.13	.13	-.16	.01	-.14
CES-D Concentration Items	-.08	-.11	**.59**	-.15	.08	.25	.04	.27
Indecisiveness Scale	.01	-.06	**.56**	-.04	-.16	.48	-.01	.10
IDAS Concentration Items	-.04	-.07	**.49**	.07	-.05	.27	-.05	.30
MASQ Autonomic Arousal	-.06	.01	.04	**.90**	.00	.13	.00	-.05
BAI	-.01	.03	.07	**.90**	-.01	-.13	.05	.07
IDAS Panic	.03	-.08	-.09	**.82**	.01	.12	-.01	.12
PANAS-X Fatigue	-.01	-.02	.08	-.05	**1.01**	-.06	.09	-.05
POMS Fatigue/Inertia	-.01	.08	.03	.04	**.78**	.07	.05	.01
IDAS Lassitude	.03	-.06	-.14	.03	**.65**	.31	-.09	.13
Epworth Sleepiness	.01	.07	.16	.05	**.47**	-.07	-.16	-.16
MASQ GD-Depression	.05	.03	-.02	.00	.07	**.95**	-.03	-.10
PANAS-X Sadness	.07	.14	-.01	-.03	.02	**.86**	.06	-.13
BDI	.13	-.01	.04	.18	-.09	**.84**	-.03	-.11
PANAS-X Guilt	.01	.23	.13	-.02	-.08	**.80**	.01	-.13
CES-D NA Items	.08	.01	.05	.00	.13	**.68**	.07	.03
IDAS Dysphoria	.17	.01	-.07	.01	.07	**.64**	-.07	.18
MEQ	-.05	.00	.03	-.01	.11	.07	**-.85**	.03
CES-D Appetite Items	.09	-.03	.13	.05	.09	.09	**.67**	-.03
IDAS Appetite Loss	-.07	.09	-.07	.02	.10	.13	**.66**	.26
IDAS Appetite Gain	.02	.11	.03	.07	.21	.16	**-.49**	.13
IDAS Agitation Items	-.07	.00	-.05	.08	-.10	-.10	.07	**1.03**
Mehrabian Fidgety Scale	.07	.09	.17	.14	.06	-.28	-.06	**.62**
HADS Restlessness Items	.12	.07	.24	-.01	.11	.04	-.01	**.40**

Note. N = 226 adults with diabetes. EFA done with principal axis factoring and Promax rotation. Loadings of ≥ .35 are in **bold.**

Table A14 *8-Factor EFA in Community Sample, Varimax Rotation*

Scale	1	2	3	4	5	6	7	8
PANAS-X Joviality	**-.88**	-.18	-.11	-.09	-.18	-.10	-.03	-.08
MASQ-AD PA	**-.87**	-.18	-.06	-.12	-.16	-.10	-.02	-.11
POMS Vigor/Activity	**-.82**	-.04	-.11	-.22	-.23	-.04	.02	-.04
PANAS-X Self-Assurance	**-.81**	-.11	-.10	-.15	.01	-.07	.01	-.03
IDAS Well-Being	**-.80**	-.17	-.19	-.08	-.12	-.12	.00	-.11
MAACL-R PA	**-.79**	-.22	-.10	-.17	-.13	-.12	-.07	-.04
CES-D PA Items	**-.68**	-.30	-.15	-.15	-.19	-.29	-.08	-.17
BDI	**.47**	**.41**	**.37**	.27	.21	**.43**	.05	.13
CES-D NA Items	**.42**	**.41**	**.38**	.20	.29	**.41**	.10	.24
MAACL-R Hostility	.27	**.82**	.21	.20	.14	.08	.05	.13
POMS Anger	.24	**.82**	.22	.14	.15	.13	.10	.19
PANAS-X Hostility	.26	**.77**	.20	.21	.23	.19	.08	.05
IDAS Ill Temper	.14	**.68**	.35	.18	.11	.15	.12	.15
PANAS-X Guilt	**.37**	**.48**	.25	.28	.13	**.46**	-.01	.05
MASQ Autonomic Arousal	.15	.26	**.82**	.22	.19	.12	.06	.13
BAI	.18	.28	**.79**	.23	.15	.09	.08	.18
IDAS Panic	.18	.26	**.78**	.17	.17	.18	.07	.09
Cognitive Failures Ques.	.32	.23	.24	**.79**	.20	.17	-.01	.09
MMQ Ability Scale	.32	.20	.26	**.63**	.15	.12	.03	.19
Indecisiveness Scale	**.41**	.29	.28	**.43**	.17	.33	-.04	.28
Mehrabian Fidgety Scale	.10	.22	.15	**.40**	.19	.01	.02	.34
Epworth Sleepiness Scale	.12	.20	.16	**.37**	.32	.03	-.09	.03
PANAS-X Fatigue	**.39**	.21	.18	.28	**.75**	.13	-.03	.10
POMS Fatigue	**.40**	.25	.25	.20	**.67**	.20	.04	.17
IDAS Lassitude	.30	.25	**.41**	.26	**.52**	.17	.03	.14
MASQ GD - Depression	**.45**	**.44**	.32	.20	.24	**.56**	.04	.12
IDAS Dysphoria	**.42**	**.37**	**.38**	.21	.24	**.50**	.06	.22
PANAS-X Sadness	**.47**	**.43**	.22	.13	.21	**.50**	.09	.14
MEQ	-.02	-.01	.02	-.02	.02	.03	**-.83**	-.04
IDAS Appetite Loss	.08	.25	**.36**	.09	.10	.20	**.64**	.11
CES-D Appetite Items	.11	.25	.31	.07	.09	.15	**.63**	.14
IDAS Appetite Gain	.11	.14	.24	.23	.14	.17	**-.61**	.17
IDAS Agitation Items	.12	.32	**.42**	.25	.10	.12	.14	**.56**
CES-D Concentration Items	**.35**	.18	.29	**.37**	.26	.27	.06	**.44**
IDAS Concentration Items	.31	.23	**.39**	.41	.18	.32	.06	**.42**
HADS Restlessness Items	.30	.34	.21	.32	**.38**	.19	.05	**.40**

Note. N = 380 community adults. EFA done with principal axis factoring and Varimax rotation. Loadings of ≥ .35 are in **bold.**

Table A15 *8-Factor EFA in Diabetes Sample, Varimax Rotation*

Scale	1	2	3	4	5	6	7	8
PANAS-X Joviality	**-.89**	-.14	-.12	-.14	-.13	-.11	-.12	-.08
MASQ-AD PA	**-.87**	-.16	-.12	-.12	-.14	-.14	-.09	-.11
POMS Vigor/Activity	**-.87**	-.08	-.17	-.14	-.25	.02	-.05	-.03
PANAS-X Self-Assurance	**-.84**	.04	-.13	-.08	-.11	-.14	-.13	.01
IDAS Well-Being	**-.81**	-.13	-.07	-.10	-.15	-.17	-.11	-.07
MAACL-R PA	**-.80**	-.22	-.22	-.08	-.01	-.09	-.06	-.08
CES-D PA Items	**-.68**	-.24	-.18	-.20	-.14	-.29	-.12	-.12
POMS Anger	.12	**.92**	.18	.13	.14	.12	.02	.08
MAACL-R Hostility	.14	**.82**	.16	.07	.24	.11	.00	.04
PANAS-X Hostility	.23	**.81**	.24	.16	.17	.23	.10	.08
IDAS Ill Temper	.13	**.74**	.14	.10	.09	.11	-.05	.32
Cognitive Failures Ques.	.25	.27	**.76**	.20	.24	.12	.04	.12
MMQ Ability Scale	.23	.23	**.69**	.27	.27	.04	.03	.07
CES-D Concentration Items	.22	.21	**.61**	.18	.24	.28	.08	.34
Indecisiveness Scale	.31	.25	**.58**	.21	.11	**.37**	.08	.24
IDAS Concentration Items	.24	.23	**.56**	.32	.20	.29	.02	**.37**
HADS Restlessness Items	.30	.30	**.40**	.25	.27	.19	.02	**.40**
MASQ Autonomic Arousal	.20	.17	.26	**.82**	.23	.19	.11	.15
BAI	.17	.15	.26	**.80**	.20	.07	.12	.19
IDAS Panic	.24	.10	.18	**.77**	.22	.19	.09	.23
PANAS-X Fatigue	.28	.22	.26	.22	**.79**	.13	.07	.13
POMS Fatigue/Inertia	.30	.32	.26	.29	**.67**	.20	.06	.18
IDAS Lassitude	.32	.23	.17	.28	**.60**	.31	-.05	.25
Epworth Sleepiness	.13	.16	.20	.13	**.39**	.03	-.15	.00
MASQ-GD Depression	**.45**	.36	.26	.23	.27	**.59**	.11	.13
PANAS-X Sadness	**.45**	**.42**	.25	.19	.22	**.54**	.18	.09
BDI	**.49**	.31	.29	.34	.18	**.54**	.13	.12
PANAS-X Guilt	**.37**	**.49**	.33	.19	.16	**.51**	.13	.10
CES-D NA Items	**.44**	.32	.30	.26	.29	**.48**	.18	.20
IDAS Dysphoria	**.46**	.32	.23	.26	.26	**.47**	.05	.28
MEQ	-.14	.05	.04	-.02	.14	.00	**-.82**	.07
CES-D Appetite Items	.31	.09	.19	.18	.12	.15	**.68**	.04
IDAS Appetite Loss	.19	.21	.12	.21	.14	.20	**.66**	.23
IDAS Appetite Gain	.11	.27	.18	.19	.29	.16	**-.44**	.21
IDAS Agitation Items	.06	.21	.24	**.36**	.12	.15	.06	**.75**
Mehrabian Fidgety Scale	.14	.24	.33	.34	.21	.03	-.07	**.50**

Note. N = 226 adults with diabetes. EFA done with principal axis factoring, Varimax rotation. Factor loadings ≥ .35 are in **bold**.

Table A16 *Specified indicators of the final factor model (Model 3)*

1. Dysphoria
    c. PANAS-X Sadness
    d. PANAS-X Guilt
    e. IDAS Dysphoria (minus 3 agitation & concentration items)
    f. MASQ GD – Depression
    g. BDI (minus 8 items of fatigue, appetite change, concentration problems, loss of energy, irritability and psychomotor agitation)
2. Loss of appetite
    a. IDAS Appetite Loss (plus 2 added items)
    b. CES-D appetite items (plus 2 new items)
3. Irritability
    a. IDAS Ill Temper
    b. PANAS-X Hostility
    c. MAACL-R Hostility (minus 5 repeating items)
    d. POMS Anger/Hostility (minus 1 repeating items)
4. Concentration difficulties
    a. Indecisiveness scale (abbreviated)
    b. Cognitive Failures Questionnaire
    c. CES-D items (plus 2 new items)
    d. IDAS Concentration items
5. Psychomotor agitation/restlessness
    a. Mehrabian Fidgety Scale
    b. IDAS agitation items

Table A16 (cont.)

6. Positive Affectivity
    a. PANAS-X: Joviality scale
    b. PANAS-X: Self-Assurance scale
    c. MASQ: Anhedonic Depression-Positive Affectivity scale
    d. IDAS Well Being
    e. MAACL-R Positive Affect (minus 2 repeating items)
    f. POMS Vigor/Activity (minus 3 repeating items)
7. Fatigue/Lethargy
    a. IDAS Lassitude
    b. PANAS-X Fatigue
    c. POMS Fatigue/Inertia (minus 1 repeating item)
8. Autonomic Arousal/Tension
    a. MASQ: Anxious Arousal scale
    b. IDAS Panic
    c. BAI (minus 7 cognitive/affective items)

Table A17 *Correlations among Symptom Factors for Model 3*

Factor	1	2	3	4	5	6	7	8
1. Dysphoria	—	.72	.81	.87	.69	.53	-.72	.78
2. Autonomic Arousal	.67	—	.65	.74	.76	.58	-.42	.63
3. Irritability	.70	.44	—	.70	.68	.54	-.53	.65
4. Cognitive Difficulties	.81	.69	.60	—	.82	.49	-.66	.78
5. Restlessness	.62	.74	.53	.79	—	.56	-.40	.61
6. Appetite Loss	.63	.53	.39	.54	.42	—	-.30	.40
7. Positive Affect	-.72	-.45	-.39	-.55	-.36	-.51	—	-.68
8. Fatigue	.76	.68	.60	.74	.66	.49	-.58	—

Note. Correlations below the diagonal are diabetes patients, above the diagonal are community adults.

Table A18 *CFA Factor Loadings for Model 3, Diabetes Sample*

Factor	1	2	3	4	5	6	7	8
MASQ GD - Depression	.95							
BDI	.93							
PANAS-X Sadness	.93							
PANAS-X Guilt	.90							
IDAS Dysphoria	.87							
MASQ Autonomic Arous.		.96						
IDAS Panic		.92						
BAI		.91						
POMS Anger			.96					
PANAS-X Hostility			.92					
MAACL-R Hostility			.90					
IDAS Ill Temper			.81					
IDAS Concen. Items				.91				
Indecisiveness Scale				.87				
CES-D Concen. Items				.87				
Cognitive Failures Ques.				.81				
IDAS Agitation Items					.83			
Mehrabian Fidgety Scale					.79			
IDAS Appetite Loss						.84		
CES-D Appetite Items						.83		
PANAS-X Joviality							.95	
MASQ-AD PA							.93	
POMS Vigor/Activity							.90	
IDAS Well-Being							.87	
PANAS-X Self-Assurance							.84	
MAACL-R PA							.84	
POMS Fatigue/Inertia								.96
PANAS-X Fatigue								.91
IDAS Lassitude								.85

Table A19 *Factor Loadings for Model 3, Community Sample*

Factor	1	2	3	4	5	6	7	8
MASQ GD - Depression	.96							
IDAS Dysphoria	.92							
BDI	.92							
PANAS-X Sadness	.87							
PANAS-X Guilt	.84							
MASQ Autonomic Arous.		.96						
BAI		.92						
IDAS Panic		.90						
POMS Anger			.94					
MAACL-R Hostility			.93					
PANAS-X Hostility			.91					
IDAS Ill Temper			.84					
IDAS Concen. Items				.91				
Indecisiveness Scale				.85				
CES-D Concen. Items				.85				
Cognitive Failures Ques.				.79				
IDAS Agitation Items					.87			
Mehrabian Fidgety Scale					.60			
IDAS Appetite Loss						.87		
CES-D Appetite Items						.87		
PANAS-X Joviality							.94	
MASQ AD – PA							.92	
POMS Vigor/Activity							.87	
IDAS Well-Being							.86	
MAACL-R PA							.85	
PANAS-X Self-Assurance							.82	
POMS Fatigue/Inertia								.93
PANAS-X Fatigue								.92
IDAS Lassitude								.81

Table A20 *Correlations among Symptom Factors for Model 3, Multiple Sample*

Factor	1	2	3	4	5	6	7	8
1. Dysphoria	—	.66	.74	.82	.62	.57	-.73	.77
2. Autonomic Arousal	.67	—	.48	.69	.71	.53	-.45	.66
3. Irritability	.70	.44	—	.64	.55	.43	-.46	.61
4. Cognitive Difficulties	.81	.69	.60	—	.80	.50	-.60	.75
5. Restlessness	.62	.74	.53	.79	—	.42	-.38	.64
6. Appetite Loss	.63	.53	.39	.54	.42	—	-.44	.46
7. Positive Affect	-.72	-.45	-.39	-.55	-.36	-.51	—	-.61
8. Fatigue	.76	.68	.60	.74	.66	.49	-.58	—

Note. Correlations below the diagonal are diabetes patients, above the diagonal are community adults.

Table A21 *Factor Loadings for Model 3, Multiple Sample CFA, Diabetes Sample*

Factor	1	2	3	4	5	6	7	8
MASQ GD - Depression	.95							
BDI	.93							
PANAS-X Sadness	.93							
PANAS-X Guilt	.90							
IDAS Dysphoria	.87							
MASQ Autonomic Arous.		.96						
IDAS Panic		.92						
BAI		.91						
POMS Anger			.96					
PANAS-X Hostility			.92					
MAACL-R Hostility			.90					
IDAS Ill Temper			.81					
IDAS Concen. Items				.91				
Indecisiveness Scale				.87				
CES-D Concen. Items				.87				
Cognitive Failures Ques.				.81				
IDAS Agitation Items					.83			
Mehrabian Fidgety Scale					.79			
IDAS Appetite Loss						.84		
CES-D Appetite Items						.83		
PANAS-X Joviality							.95	
MASQ AD – PA							.93	
POMS Vigor/Activity							.90	
IDAS Well-Being							.87	
PANAS-X Self-Assurance							.84	
MAACL-R PA							.84	
POMS Fatigue/Inertia								.96
PANAS-X Fatigue								.91
IDAS Lassitude								.85

Table A22 *Factor Loadings for Model 3, Multiple Sample CFA, Community Sample*

Factor	1	2	3	4	5	6	7	8
MASQ GD - Depression	.95							
BDI	.93							
PANAS-X Sadness	.90							
IDAS Dysphoria	.88							
PANAS-X Guilt	.87							
MASQ Autonomic Arous.		.96						
BAI		.92						
IDAS Panic		.92						
POMS Anger			.95					
PANAS-X Hostility			.91					
MAACL-R Hostility			.90					
IDAS Ill Temper			.82					
IDAS Concen. Items				.91				
CES-D Concen. Items				.88				
Indecisiveness Scale				.87				
Cognitive Failures Ques.				.81				
IDAS Agitation Items					.82			
Mehrabian Fidgety Scale					.75			
IDAS Appetite Loss						.87		
CES-D Appetite Items						.86		
PANAS-X Joviality							.93	
MASQ AD – PA							.93	
POMS Vigor/Activity							.88	
IDAS Well-Being							.88	
MAACL-R PA							.85	
PANAS-X Self-Assurance							.83	
POMS Fatigue/Inertia								.94
PANAS-X Fatigue								.92
IDAS Lassitude								.84

Table A23 *Correlations among Symptom Factors for Model 3, Multiple Sample Constrained*

Factor	1	2	3	4	5	6	7	8
1. Dysphoria	—	.67	.74	.82	.62	.59	-.73	.77
2. Autonomic Arousal	.66	—	.48	.70	.73	.53	-.46	.68
3. Irritability	.70	.44	—	.64	.55	.43	-.45	.62
4. Cognitive Difficulties	.81	.67	.60	—	.80	.52	-.59	.76
5. Restlessness	.62	.71	.52	.78	—	.42	-.38	.65
6. Appetite Loss	.59	.52	.41	.51	.42	—	-.47	.48
7. Positive Affect	-.71	-.43	-.41	-.56	-.37	-.46	—	-.61
8. Fatigue	.76	.65	.58	.73	.64	.47	-.58	—

Note. Correlations below the diagonal are diabetes patients, above the diagonal are community adults.

Table A24 *Factor Loadings for Model 3, Multiple Sample Constrained CFA, Diabetes Sample*

Factor	1	2	3	4	5	6	7	8
MASQ GD - Depression	.95							
PANAS-X Sadness	.93							
BDI	.92							
PANAS-X Guilt	.89							
IDAS Dysphoria	.86							
MASQ Autonomic Arous.		.95						
IDAS Panic		.91						
BAI		.90						
POMS Anger			.96					
PANAS-X Hostility			.91					
MAACL-R Hostility			.89					
IDAS Ill Temper			.81					
IDAS Concen. Items				.91				
Indecisiveness Scale				.87				
CES-D Concen. Items				.86				
Cognitive Failures Ques.				.81				
IDAS Agitation Items					.81			
Mehrabian Fidgety Scale					.78			
IDAS Appetite Loss						.85		
CES-D Appetite Items						.81		
PANAS-X Joviality							.95	
MASQ AD – PA							.93	
POMS Vigor/Activity							.89	
IDAS Well-Being							.87	
PANAS Self-Assurance							.84	
MAACL-R PA							.84	
POMS Fatigue/Inertia								.96
PANAS-X Fatigue								.91
IDAS Lassitude								.84

Table A25 *Factor Loadings for Model 3, Multiple Sample Constrained CFA, Community Sample*

Factor	1	2	3	4	5	6	7	8
MASQ GD - Depression	.95							
BDI	.93							
PANAS-X Sadness	.90							
IDAS Dysphoria	.89							
PANAS-X Guilt	.88							
MASQ Autonomic Arous.		.97						
BAI		.92						
IDAS Panic		.92						
POMS Anger			.95					
PANAS-X Hostility			.91					
MAACL-R Hostility			.90					
IDAS Ill Temper			.83					
IDAS Concen. Items				.91				
CES-D Concen. Items				.88				
Indecisiveness Scale				.87				
Cognitive Failures Ques.				.82				
IDAS Agitation Items					.83			
Mehrabian Fidgety Scale					.75			
IDAS Appetite Loss						.87		
CES-D Appetite Items						.87		
PANAS-X Joviality							.93	
MASQ AD – PA							.93	
POMS Vigor/Activity							.88	
IDAS Well-Being							.88	
MAACL-R PA							.85	
PANAS-X Self-Assurance							.83	
POMS Fatigue/Inertia								.95
PANAS-X Fatigue								.92
IDAS Lassitude								.84

APPENDIX B: SELECTED MEASURES

1. Demographic Questionnaire
2. IDAS
3. MASQ
4. CES-D
5. Motivation to Eat Questionnaire
6. Indecisiveness Scale
7. Multifactorial Memory Questionnaire
8. PANAS-X, MAACL-R, POMS combined questionnaire
9. Cognitive Failures Questionnaire
10. Hospital Anxiety and Depression Scale
11. Mehrabian Fidgety Scale
12. Epworth Sleepiness Scale
13. Self-Completion Patient Outcome instrument
14. RAND 36-Item Health Survey
15. Medical Questionnaire
16. Health Information Questionnaire

Demographic Information

1. Today's Date_____

2. Your Age_____

3. Gender:
    a. Male
    b. Female

    4. Are you Hispanic/ Latino?
        1. Yes
        2. No

    5. What is your race?
        1. American Indian/ Alaska Native
        2. Asian
        3. Native Hawaiian or Other Pacific Islander
        4. Black or African American
        5. White
        6. Multiracial

4. What is your current marital status?
    a. Single (Never Married)
    b. Married
    c. Widowed
    d. Separated
    e. Divorced
    f. Not Married, Cohabitating with Partner

5. What is the highest level of education you've attained?
    a. High School Dropout
    b. GED
    c. High School Diploma
    d. Vocational, Technical, Associate's Degree
    e. Some College
    f. Bachelor's Degree
    g. Master's Degree
    h. Doctorate

6. What is your approximate total household income per year? (include all sources, child support, alimony, unemployment)
    a. less than $9,999
    b. $10,000-$19,999
    c. $20,000-$29,999
    d. $30,000-$39,999
    e. $40,000-$49,999
    f. $50,000-$59,999
    g. $60,000-$69,999
    h. $70,000-$79,999
    i. $80,000-$89,999
    j. $90,000+

IDAS

Below is a list of feelings, sensations, problems, and experiences that people sometimes have. Read each item to determine how well it describes your recent feelings and experiences. Then select the option that best describes **how much** you have felt or experienced things this way **during the past two weeks, including today**. Use this scale when answering:

1	2	3	4	5
Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**

_____ 1. I was proud of myself

_____ 2. I felt exhausted

_____ 3. I felt depressed

_____ 4. I felt inadequate

_____ 5. I slept less than usual

_____ 6. I felt fidgety, restless

_____ 7. I had thoughts of suicide

_____ 8. I slept more than usual

_____ 9. I hurt myself purposely

_____10. I slept very poorly

_____ 11. I blamed myself for things

_____ 12. I had trouble falling asleep

_____ 13. I felt discouraged about things

_____ 14. I thought about my own death

_____ 15. I thought about hurting myself

1	2	3	4	5
Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**

_____ 16. I did not have much of an appetite

_____ 17. I felt like eating less than usual

_____ 18. I thought a lot about food

_____ 19. I did not feel much like eating

_____ 20. I ate when I wasn't hungry

_____ 21. I felt optimistic

_____ 22. I ate more than usual

_____ 23. I felt that I had accomplished a lot

_____ 24. I looked forward to things with enjoyment

_____ 25. I was furious

_____ 26. I felt hopeful about the future

_____ 27. I felt that I had a lot to look forward to

_____ 28. I felt like breaking things

_____ 29. I had disturbing thoughts of something bad that happened to me

_____ 30. Little things made me mad

_____ 31. I felt enraged

_____ 32. I had nightmares that reminded me of something bad that happened

_____ 33. I lost my temper and yelled at people

_____ 34. I felt like I had a lot of interesting things to do.

_____ 35. I felt like I had a lot of energy

_____ 36. I had memories of something scary that happened

1	2	3	4	5
Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**

_____ 37. I felt self-conscious knowing that others were watching me

_____ 38. I felt a pain in my chest

_____ 39. I was worried about embarrassing myself socially

_____ 40. I felt dizzy or light headed

_____ 41. I cut or burned myself on purpose

_____ 42. I had little interest in my usual hobbies or activities

_____ 43. I thought that the world would be better off without me

_____ 44. I felt much worse in the morning than later in the day

_____ 45. I felt drowsy, sleepy

_____ 46. I woke up early and could not get back to sleep

_____ 47. I had trouble concentrating

_____ 48. I had trouble making up my mind

_____ 49. I talked more slowly than usual

_____ 50. I had trouble waking up in the morning

_____ 51. I found myself worrying all the time

_____ 52. I woke up frequently during the night

_____ 53. It took a lot of effort for me to get going

_____ 54. I woke up much earlier than usual

_____ 55. I was trembling or shaking

_____ 56. I became anxious in a crowded public setting

_____ 57. I felt faint

1	2	3	4	5
Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**

_____ 58. I found it difficult to make eye contact with people

_____ 59. My heart was racing or pounding

_____ 60. I got upset thinking about something bad that happened

_____ 61. I found it difficult to talk with people I did not know well

_____ 62. I had a very dry mouth

_____ 63. I was short of breath

_____ 64. I felt like I was choking

_____ 65. I didn't have much interest in food. (added)

_____ 66. I had a poor appetite. (added)

_____ 67. I felt like eating more than usual. (added)

_____ 68. I felt like eating much of the time. (added)

_____ 69. I felt hungry a lot. (newly written)

_____ 70. I had a big appetite. (newly written)

_____ 71. I had trouble making decisions. (added)

_____ 72. I had trouble paying attention to things. (added)

_____ 73. I was forgetful. (added)

_____ 74. I felt confused. (added)

_____ 75. I had trouble remembering things. (added)

_____ 76. I talked more quickly than usual. (added)

_____ 77. I had trouble sitting still. (added)

_____ 78. I was told that I seemed more restless than usual. (added)

MASQ

Please read each statement and indicate the extent to which you have experienced the symptom in the past two weeks, including today. Please use the following scale:

1	2	3	4	5
Not at all	A little bit	Moderately	Quite a bit	Extremely

1.	Felt cheerful	1	2	3	4	5
2.	Startled easily	1	2	3	4	5
3.	Felt sad	1	2	3	4	5
4.	Felt discouraged	1	2	3	4	5
5.	Felt like crying	1	2	3	4	5
6.	Felt worthless	1	2	3	4	5
7.	Felt depressed	1	2	3	4	5
8.	Felt really happy	1	2	3	4	5
9.	Felt optimistic	1	2	3	4	5
10.	Felt faint	1	2	3	4	5
11.	Felt like I was having a lot of fun	1	2	3	4	5
12.	Felt hopeless	1	2	3	4	5
13.	Felt numbness or tingling in my body	1	2	3	4	5
14.	Seemed to move quickly and easily	1	2	3	4	5
15.	Looked forward to things with enjoyment	1	2	3	4	5
16.	Blamed myself for a lot of things	1	2	3	4	5
17.	Felt like I had accomplished a lot	1	2	3	4	5
18.	Felt like I had a lot of interesting things to do	1	2	3	4	5

	1	2	3	4	5
	Not at all	A little bit	Moderately	Quite a bit	Extremely
19. Felt like I had a lot to look forward to	1	2	3	4	5
20. Felt pessimistic about the future	1	2	3	4	5
21. Had pain in my chest	1	2	3	4	5
22. Felt like a failure	1	2	3	4	5
23. Had hot or cold spells	1	2	3	4	5
24. Was proud of myself	1	2	3	4	5
25. Felt dizzy or lightheaded	1	2	3	4	5
26. Was short of breath	1	2	3	4	5
27. Felt sluggish or tired	1	2	3	4	5
28. Hands were shaky	1	2	3	4	5
29. Felt really "up" or lively	1	2	3	4	5
30. Felt like I was choking	1	2	3	4	5
31. Felt inferior to others	1	2	3	4	5
32. Had a very dry mouth	1	2	3	4	5
33. Muscles twitched or trembled	1	2	3	4	5
34. Felt like I had a lot of energy	1	2	3	4	5
35. Was afraid I was going to die	1	2	3	4	5
36. Was disappointed in myself	1	2	3	4	5
37. Heart was racing or pounding	1	2	3	4	5
38. Felt hopeful about the future	1	2	3	4	5
39. Was trembling or shaking	1	2	3	4	5
40. Felt really good about myself	1	2	3	4	5
41. Had to urinate frequently	1	2	3	4	5
42. Had trouble swallowing	1	2	3	4	5
43. Hands were cold or sweaty	1	2	3	4	5

CES-D

INSTRUCTIONS: For each statement, please circle the number in the column that best describes how you have been feeling in the past two weeks.

0 = Rarely or none of the time (less than 2 days)

1 = Some or a little of the time (2 to 4 days)

2 = Occasionally or a moderate amount of the time (5-8 days)

3 = Most or all of the time (9-14 days)

1. I was bothered by things that usually don't bother me.	0	1	2	3
2. I did not feel like eating	0	1	2	3
3. I felt that I could not shake off the blues, even with the help from family or friends.	0	1	2	3
4. I felt that I was just as good as other people.	0	1	2	3
5. I had trouble keeping my mind on what I was doing.	0	1	2	3
6. I felt depressed.	0	1	2	3
7. I felt that everything I did was an effort.	0	1	2	3
8. I felt hopeful about the future.	0	1	2	3
9. I thought my life had been a failure.	0	1	2	3
10. I felt fearful.	0	1	2	3
11. My sleep was restless.	0	1	2	3
12. I was happy.	0	1	2	3
13. I talked less than usual.	0	1	2	3
14. I felt lonely.	0	1	2	3
15. People were unfriendly.	0	1	2	3
16. I enjoyed life.	0	1	2	3
17. I had crying spells.	0	1	2	3

0 = Rarely or none of the time (less than 2 days)

1 = Some or a little of the time (2 to 4 days)

2 = Occasionally or a moderate amount of the time (5-8 days)

3 = Most or all of the time (9-14 days)

18. I felt sad.	0	1	2	3
19. I felt that people dislike me.	0	1	2	3
20. I could not get "going".	0	1	2	3
21. I had to force myself to eat.	0	1	2	3
22. I hardly felt hungry.	0	1	2	3
23. My appetite was poor.	0	1	2	3
24. It was difficult to focus my attention.	0	1	2	3
25. My mind wandered off when I was trying to concentrate.	0	1	2	3

Motivation to Eat Questionnaire

Please read each of the following questions and circle the response that is most true for you for the past two weeks, including today.

1. How strong has your urge to eat been?
    a. Very weak.
    b. Somewhat weak.
    c. Somewhat strong.
    d. Very strong.
2. How much food have you felt you could eat lately (in general)?
    a. Nothing at all.
    b. Very little.
    c. A moderate amount.
    d. A very large amount.
3. What has your urge to eat been?
    a. No urge to eat.
    b. A small urge to eat.
    c. A moderate urge to eat.
    d. A strong urge to eat.
4. What has been your preoccupation with food lately?
    a. No thoughts of food.
    b. Very few thoughts of food.
    c. Occasional thoughts of food.
    d. Very preoccupied with food, frequent thoughts of food.

Indecisiveness Scale

The following questionnaire concerns your decision making in general, across most situations, for the PAST TWO WEEKS. Please indicate the extent to which the statement seems true for you for the PAST TWO WEEKS. Please circle a number between 1 and 5.

1	2	3	4	5
Not at all true for me	a little true	moderately true	quite a bit true	extremely true

1.	I felt like it was easy to make a choice.	1	2	3	4	5
2.	It seemed hard for me to come to a decision.	1	2	3	4	5
3.	I felt like I didn't know how to make decisions.	1	2	3	4	5
4.	I felt indecisive.	1	2	3	4	5
5.	I hesitated more than usual when I had to decide.	1	2	3	4	5
6.	I was uncertain when making decisions.	1	2	3	4	5
7.	It took me a long time to weigh the pros and cons before making a choice.	1	2	3	4	5
8.	I postponed making decisions to a later time.	1	2	3	4	5
9.	I didn't avoid making decisions. (R)	1	2	3	4	5
10.	I tended to leave the choices to someone else.	1	2	3	4	5
11.	I have second-guessed my decisions.	1	2	3	4	5
12.	After making a decision, I regretted it.	1	2	3	4	5

MMQ

Please read each statement and indicate the frequency with which the mistake has occurred to you in the past two weeks. Please use the following scale when responding:

1	2	3	4	5
all the time	often	sometimes	rarely	never

1. How often did you forget to pay a bill on time?	1	2	3	4	5
2. How often did you misplace something you use daily, like your keys or glasses?	1	2	3	4	5
3. How often did you have trouble remembering a telephone number you just looked up?	1	2	3	4	5
4. How often did you not recall the name of someone you just met?	1	2	3	4	5
5. How often did you leave something behind when you meant to bring it with you?	1	2	3	4	5
6. How often did you forget an appointment?	1	2	3	4	5
7. How often did you forget what you were just about to do; for example, walk into a room and forget what you went there for?	1	2	3	4	5
8. How often did you forget to run an errand?	1	2	3	4	5
9. How often did you have difficulty coming up with a specific word that you want?	1	2	3	4	5
10. How often did you have trouble remembering details from a newspaper or magazine article you read earlier that day?	1	2	3	4	5
11. How often did you forget to take medication?	1	2	3	4	5

	1 all the time	2 often	3 sometimes	4 rarely	5 never
12. How often did you not recall the name of someone you have known for some time?	1	2	3	4	5
13. How often did you forget to pass on a message?	1	2	3	4	5
14. How often did you forget what you were going to say in a conversation?	1	2	3	4	5
15. How often did you forget a birthday or anniversary that you usually remember?	1	2	3	4	5
16. How often did you forget a telephone number you use frequently?	1	2	3	4	5
17. How often did you retell a story or joke to the same person because you forgot that you had already told him or her?	1	2	3	4	5
18. How often did you misplace something that you put away a few days ago?	1	2	3	4	5
19. How often did you forget to buy something you intended to buy?	1	2	3	4	5
20. How often did you forget details about a recent conversation?	1	2	3	4	5

Mood Questionnaire

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past two weeks. Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

1) _____ cheerful
2) _____ disgusted
3) _____ joyful
4) _____ tired
5) _____ sluggish
6) _____ daring
7) _____ happy
8) _____ scornful
9) _____ irritable
10) _____ delighted
11) _____ bold
12) _____ disgusted with self
13) _____ sad
14) _____ guilty
15) _____ downhearted
16) _____ hostile
17) _____ lonely
18) _____ sleepy
19) _____ excited
20) _____ alone
21) _____ lively
22) _____ angry
23) _____ energetic
24) _____ blue
25) _____ angry at self
26) _____ enthusiastic
27) _____ drowsy
28) _____ confident
29) _____ ashamed
30) _____ blameworthy
31) _____ strong
32) _____ proud
33) _____ loathing
34) _____ fearless
35) _____ dissatisfied with self
36) _____ Active
37) _____ Peeved
38) _____ Worn Out
39) _____ Grouchy
40) _____ Alert
41) _____ Spiteful
42) _____ Listless
43) _____ Annoyed
44) _____ Bushed
45) _____ Full of pep
46) _____ Resentful
47) _____ Fatigued
48) _____ Bitter
49) _____ Carefree
50) _____ Ready to fight
51) _____ Rebellious
52) _____ Vigorous
53) _____ Deceived
54) _____ Exhausted
55) _____ Furious
56) _____ Weary
57) _____ Bad-tempered
58) _____Complaining

59) _____Affectionate

60) _____Loving

61) _____Critical

62) _____Interested

63) _____Cross

64) _____Polite

65) _____Good-natured

66) _____Mad

67) _____Friendly

68) _____Free

69) _____Mean

70) _____Cruel

71) _____Whole

72) _____Warm

73) _____Secure

74) _____Glad

75) _____Satisfied

76) _____Tender

77) _____Disagreeable

78) _____Good

79) _____Steady

80) _____Peaceful

81) _____Enraged

82) _____Pleased

83) _____Incensed

84) _____Understanding

85) _____Pleasant

86) _____Irritated

CFQ

The following questions are about minor mistakes which everyone makes from time to time, but some of which happen more often than others. We want to know how often these things have happened to your in the past 6 months. Please circle the appropriate number.

4	3	2	1	0
Very often	Quite often	Occasionally	Very rarely	Never

1. Do you read something and find you haven't been thinking about it and must read it again? 4 3 2 1 0
2. Do you find you forget why you went from one part of the house to the other? 4 3 2 1 0
3. Do you fail to notice signposts on the road? 4 3 2 1 0
4. Do you find you confuse right and left when giving directions? 4 3 2 1 0
5. Do you bump into people? 4 3 2 1 0
6. Do you find you forget whether you've turned off a light or a fire or locked the door? 4 3 2 1 0
7. Do you fail to listen to people's names when you are meeting them? 4 3 2 1 0
8. Do you say something and realize afterwards that it might be taken as insulting? 4 3 2 1 0
9. Do you fail to hear people speaking to you when you are doing something else? 4 3 2 1 0
10. Do you lose your temper and regret it? 4 3 2 1 0
11. Do you leave important letters unanswered for days? 4 3 2 1 0
12. Do you find you forget which way to turn on a road you know well but rarely use? 4 3 2 1 0
13. Do you fail to see what you want in a supermarket (although it's there)? 4 3 2 1 0
14. Do you find yourself suddenly wondering whether you've used a word correctly? 4 3 2 1 0
15. Do you have trouble making up your mind? 4 3 2 1 0
16. Do you find you forget appointments? 4 3 2 1 0
17. Do you forget where you put something like a newspaper or a book? 4 3 2 1 0

4	3	2	1	0
Very often	Quite often	Occasionally	Very rarely	Never

18. Do you find you accidentally throw away the thing you want and keep what you meant to throw away – as in the example of throwing away the matchbox and putting the used match in your pocket? 4 3 2 1 0

19. Do you daydream when you ought to be listening to something? 4 3 2 1 0

20. Do you find you forget people's names? 4 3 2 1 0

21. Do you start doing one thing at home and get distracted into doing something else (unintentionally)? 4 3 2 1 0

22. Do you find you can't quite remember something although it's "on the tip of your tongue"? 4 3 2 1 0

23. Do you find you forget what you came to the shops to buy? 4 3 2 1 0

24. Do you drop things? 4 3 2 1 0

25. Do you find you can't think of anything to say? 4 3 2 1 0

HADS

Read each item and circle the reply which comes closest to how you have been feeling in the past 2 weeks. Don't take too long over your replies, your immediate reaction to each item will probably be more accurate than a long thought out response.

1. I feel tense or "wound up."
    a. Most of the time
    b. A lot of the time
    c. Time to time, occasionally
    d. Not at all
2. I still enjoy the things I used to enjoy.
    a. Definitely as much
    b. Not quite so much
    c. Only a little
    d. Not at all
3. I get a sort of frightened feeling like 'butterflies in the stomach.'
    a. Not at all
    b. Occasionally
    c. Quite often
    d. Very often
4. I get a sort of frightened feeling like something awful is about to happen.
    a. Very definitely and quite badly
    b. Yes, but not too badly
    c. A little, but it doesn't worry me
    d. Not at all

5. I have lost interest in my appearance
    a. Definitely
    b. I don't take as much care as I should
    c. I may not take quite as much care
    d. I take just as much care as ever
6. I feel as if I am slowed down.
    a. Nearly all of the time
    b. Very often
    c. Sometimes
    d. Not at all
7. I can laugh and see the funny side of things:
    a. As much as I always could
    b. Not quite so much now
    c. Definitely not so much now
    d. Not at all
8. Worrying thoughts go through my mind:
    a. A great deal of the time
    b. A lot of the time
    c. From time to time but not too often
    d. Only occasionally
9. I look forward with enjoyment to things
    a. A much as I ever did
    b. Rather less than I used to
    c. Definitely less than I used
    d. Hardly at all

10. I feel restless as if I have to be on the move.
    a. Very much indeed
    b. Quite a lot
    c. Not very much
    d. Not at all
11. I feel cheerful
    a. Not at all
    b. Not often
    c. Sometimes
    d. Most of the time
12. I get sudden feelings of panic
    a. Very often indeed
    b. Quite often
    c. Not very often
    d. Not at all
13. I can enjoy a good book or radio or TV program
    a. Often
    b. Sometimes
    c. Not often
    d. Very seldom
14. I can sit at ease and feel relaxed
    a. Definitely
    b. Usually
    c. Not often
    d. Not at all

MFS

Please indicate the extent to which the following statements have been true for you in the past two weeks using the following scale.

1	2	3	4	5
strongly disagree	disagree	neither agree or disagree	agree	strongly agree

1.	When seated, I haven't been moving around restlessly in my seat.	1 2 3 4 5
2.	It seems like I have to have something in my hands to play with.	1 2 3 4 5
3.	I've had a lot of restless movements.	1 2 3 4 5
4.	I've noticed I've been tapping my fingers or drumming on things lately.	1 2 3 4 5
5.	I've been tapping my foot a lot lately.	1 2 3 4 5
6.	When standing, I've been shifting my weight a lot, from one leg to another.	1 2 3 4 5

Epworth Sleepiness Scale

The Epworth Sleepiness Scale is used to determine the level of daytime sleepiness. A score of 10 or more is considered sleepy. A score of 18 or more is very sleepy. If you score 10 or more on this test, you should consider whether you are obtaining adequate sleep, need to improve your sleep hygiene and/or need to see a sleep specialist. These issues should be discussed with your personal physician.

Use the following scale to choose the most appropriate number for each situation:

0 = would *never* doze or sleep.

1 = *slight* chance of dozing or sleeping

2 = *moderate* chance of dozing or sleeping

3 = *high* chance of dozing or sleeping

Situation	***Chance of Dozing or Sleeping***
1. Sitting and reading	____
2. Watching TV	____
3. Sitting inactive in a public place	____
4. Being a passenger in a motor vehicle for an hour or more	____
5. Lying down in the afternoon	____
6. Sitting and talking to someone	____
7. Sitting quietly after lunch (no alcohol)	____
8. Stopped for a few minutes in traffic while driving	____

SCPO

Please read each statement and indicate the extent to which you have experienced the following symptoms in the past month. Please use the following scale when responding:

1. Never
2. On one or a few days.
3. On several days.
4. On most days.
5. Every day

1. In the past month, on how many days have you felt abnormally thirsty?

1 2 3 4 5

2. In the past month, on how many days have you had blurred vision?

1 2 3 4 5

3. In the past month, on how many days have you passed a lot of water during the day?

1 2 3 4 5

4. In the past month, on how many days have you felt unusually hungry?

1 2 3 4 5

5. In the past month, on how many days have you felt shaky?

1 2 3 4 5

6. In the past month, on how many days have you had cold hands and feet?

1 2 3 4 5

7. In the past month, on how many days have you felt very sleepy during the day?

1 2 3 4 5

8. In the past month, on how many days have you had a feeling of pins and needles?

1 2 3 4 5

9. In the past month, on how many days have you felt faint, fainted or passed out?

1 2 3 4 5

RAND 36-Item Health Survey

1. In general, would you say your health is:

    1. Excellent
    2. Very good
    3. Good
    4. Fair
    5. Poor

2. **Compared to one year ago**, how would your rate your health in general **now**?

    1. Much better now than one year ago.
    2. Somewhat better now than one year ago.
    3. About the same.
    4. Somewhat worse now than one year ago.
    5. Much worse now than one year ago.

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much? **(Circle One Number on Each Line)**

	Yes, limited a lot [1]	Yes, limited a little [2]	No, not limited at all [3]
3. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports ……...	[1]	[2]	[3]
4. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf …….....	[1]	[2]	[3]
5. Lifting or carrying groceries……....	[1]	[2]	[3]

	Yes, limited a lot [1]	Yes, limited a little [2]	No, not limited at all [3]
6. Climbing **several** flights of stairs……	[1]	[2]	[3]
7. Climbing **one** flight of stairs……...	[1]	[2]	[3]
8. Bending, kneeling, or stooping……...	[1]	[2]	[3]
9. Walking **more than a mile**…….	[1]	[2]	[3]
10. Walking **several blocks**……	[1]	[2]	[3]
11. Walking **one block**……	[1]	[2]	[3]
12. Bathing or dressing yourself…….	[1]	[2]	[3]

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**? **(Circle One Number on Each Line)**

	Yes	No
13. Cut down the amount of time you spent on work or other activities	1	2
14. **Accomplished less** than you would like	1	2
15. Were limited in the **kind** of work or other activities	1	2
16. Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)? **(Circle One Number on Each Line)**

	Yes	No
17. Cut down the **amount of time** you spent on work or other activities	1	2
18. **Accomplished less** than you would like	1	2
19. Didn't do work or other activities as **carefully** as usual	1	2

20. During the **past 4 weeks,** to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups? **(Circle One Number)**

1. Not at all
2. Slightly
3. Moderately
4. Quite a bit
5. Extremely

21. How much **bodily** pain have you had during the **past 4 weeks**? **(Circle One Number)**

1. None
2. Very mild
3. Mild
4. Moderate
5. Severe
6. Very severe

22. During the **past 4 weeks,** how much did **pain** interfere with your normal work (including both work outside the home and housework)? **(Circle One Number)**

1. Not at all
2. A little bit
3. Moderately
4. Quite a bit
5. Extremely

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

Circle One Number on Each Line. Please use this scale when answering:

1 = All of the time
2 = Most of the time
3 = A Good Bit of the time
4 = Some of the Time
5 = A Little of the Time
6 = None of the Time

How much of the time during the **past 4 weeks** . . .

23. Did you feel full of pep?	1	2	3	4	5	6
24. Have you been a very nervous person?	1	2	3	4	5	6

1 = All of the time

2 = Most of the time

3 = A Good Bit of the time

4 = Some of the Time

5 = A Little of the Time

6 = None of the Time

25. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
26. Have you felt calm and peaceful?	1	2	3	4	5	6
27. Did you have a lot of energy?	1	2	3	4	5	6
28. Have you felt downhearted and blue?	1	2	3	4	5	6
29. Did you feel worn out?	1	2	3	4	5	6
30. Have you been a happy person?	1	2	3	4	5	6
31. Did you feel tired?	1	2	3	4	5	6

32. During the **past 4 weeks,** how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)? **(Circle One Number)**

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

How TRUE or FALSE is <u>each</u> of the following statements for you. **(Circle One Number on Each Line)**

	Definitely True 1	Mostly True 2	Don't Know 3	Mostly False 4	Definitely False 5
33. I seem to get sick a little easier than other people	1	2	3	4	5
34. I am as healthy as anybody I know	1	2	3	4	5
35. I expect my health to get worse	1	2	3	4	5
36. My health is excellent	1	2	3	4	5

Medical Questionnaire

Please read each of the following conditions and indicate whether or not you have the condition described by circling YES or NO in the column on the right. If you have the condition, please also indicate whether or not you are currently receiving treatment (such as medication) for the condition by circling YES or NO in the column on the right.

Medical Conditions

1. Heart disease or problems (such as angina, congestive heart failure, coronary artery disease)?..... YES NO

    1a. Do you receive treatment for it?..... YES NO

2. High blood pressure? ..... YES NO

    2a. Do you receive treatment such as beta-blockers, ACE inhibitors or diuretics?..... YES NO

3. High Cholesterol?..... YES NO

    3a. Do you receive treatment for it such as statins, nicotinic acid, fibrates or bile acid sequestrants?..... YES NO

4. Lung disease or problems (such as asthma, emphysema, or chronic bronchitis)?..... YES NO

    4a. Do you receive treatment for it?..... YES NO

5. Stroke?..... YES NO

    5a. Do you receive treatment for it?..... YES NO

6. Diabetes?..... YES NO

    6a. Do you receive treatment for it?..... YES NO

7. Ulcer or stomach disease?..... YES NO

    7a. Do you receive treatment for it?..... YES NO

8. Kidney disease? ..... ……YES NO

8a. Do you receive treatment for it?..... ……YES NO

9. Liver disease? ..... ……YES NO

9a. Do you receive treatment for it?..... ……YES NO

10. Cancer in the past 3 years? ..... ……YES NO

10a. Do you receive treatment for it? ..... ……YES NO

11. Depression? .....……YES NO

11a. Do you receive treatment for it? ..... ……YES NO

12. Anxiety? .....……YES NO

12a. Do you receive treatment for it? ..... ……YES NO

13. Arthritis of any kind (rheumatoid, osteoarthritis, degenerative arthritis, etc.)? ..... ……YES NO

13a. Do you receive treatment for it? ..... ……YES NO

14. Other medical conditions? ..... ……YES NO

Please list:_____

_____

_____

15. Other medications? ..... ……YES NO

Please list:_____

_____

_____

Health Information Questionnaire

1. When were you diagnosed with diabetes?

   Month (approximate) = _____ year = _____

2. What type of diabetes have you been diagnosed with?

   a. Type 1 Diabetes

   b. Type 2 Diabetes

   c. Gestational Diabetes

3. What was your most recent Hemoglobin A1c?

Date:_____ Result:_____

4. How many days of work or school have you been absent from because of diabetes-related illness or complications in the **past two months**?

   # of days absent = _____

5. How many days have you been hospitalized in the **past two months** due to diabetes-related illness or complications?

   # of days hospitalized = _____

6. How many health center visits have you had in the **past two months** due to diabetes?

   # of health center visits = _____

7. Please circle YES or NO to indicate any complications that you have experienced **as a result of diabetes**.

a. Skin Problems (e.g. infections, dryness or itchiness)

YES NO

b. Heart disease YES NO

c. Stroke YES NO

d. High Blood Pressure YES NO

e. Kidney Disease YES NO

f. Kidney Failure YES NO

g. Neuropathy (nerve disease) YES NO

h. Retinopathy (eye disease) YES NO

i. Blindness YES NO

j. Dental Disease (periodontal disease)

YES NO

k. Amputation YES NO

l. Diabetic Ketoacidosis (DKA) YES NO

m. Hyperosmolar Hyperglycemic NonKetotic Coma (HHNC)

YES NO

n. Other (please describe) _____

8. Please circle YES or NO to indicate which medications you are **currently taking for diabetes**.

   a. Insulin YES NO

   (e.g. rapid-acting insulin, short-acting insulin, longer-acting insulin, mixed rapid/short and longer-acting)

   b. Antihyperglycemics YES NO

   (e.g. glimepiride [Amaryl], glipizide [Glucotrol, Glucotrol XL], glyburide [DiaBeta, Glynase, Micronase], metformin [Glucophage, Glucophage XR]

   c. Other (please describe) _____

9. Are you currently using an insulin pump? YES NO

10. Please indicate the extent to which you feel you have experienced HYPOGLYCEMIA (or low blood sugar) in the past two weeks by circling the response that is most true for you.

    a. Not all, no signs of hypoglycemia in the past two weeks

    b. Rarely noticed signs of hypoglycemia in the past two weeks

    c. Occasionally experienced signs of hypoglycemia in the past two weeks

    d. Often experienced signs of hypoglycemia in the past two weeks

11. Please indicate the extent to which you feel you have experienced HYPERGLYCEMIA (or high blood sugar) in the past two weeks by circling the response that is most true for you.

    a. Not all, no signs of hyperglycemia in the past two weeks

    b. Rarely noticed signs of hyperglycemia in the past two weeks

    c. Occasionally experienced signs of hyperglycemia in the past two weeks

    d. Often experienced signs of hyperglycemia in the past two weeks

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