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Emotional distress as a key construct in the personal model of diabetes management : associations of fatigue, diabetes-specific distress, and depressive symptomatology with quality of life in type 2 diabetes mellitus.

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EMOTIONAL DISTRESS AS A KEY CONSTRUCT IN THE PERSONAL  
MODEL OF DIABETES MANAGEMENT: ASSOCIATIONS OF FATIGUE,  
DIABETES-SPECIFIC DISTRESS, AND DEPRESSIVE SYMPTOMATOLOGY  
WITH QUALITY OF LIFE IN TYPE 2 DIABETES MELLITUS

By

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B.A., University of Louisville, 1999  
M.A., University of Louisville, 2002

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Submitted to the Faculty of the  
Graduate School of the University of Louisville  
In Partial Fulfillment of the Requirements  
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Department of Psychological and Brain Sciences  
University of Louisville  
Louisville, KY

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## **DEDICATION**

I would like to dedicate this dissertation to my Grandparents, Irving and Helene Rothschild. To my grandfather, for teaching me to laugh at myself, and understand the importance of family. To my grandmother, for teaching me about the importance of health, and teaching me discipline. These qualities are what I needed to accomplish all I have strived to accomplish with this dissertation. With their help anything is possible.

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## ABSTRACT

### EMOTIONAL DISTRESS AS A KEY CONSTRUCT IN THE PERSONAL MODEL OF DIABETES MANAGEMENT: ASSOCIATIONS OF FATIGUE, DIABETES-SPECIFIC DISTRESS, AND DEPRESSIVE SYMPTOMATOLOGY WITH QUALITY OF LIFE IN TYPE 2 DIABETES MELLITUS

Chelsea L. Rothschild

May 14, 2010

The importance of maximizing self-management and quality of life is well-documented in the diabetes literature. Although maintaining self-care is known to be important for individuals with type 2 diabetes, this is often difficult to maintain over time. Emotional distress has also been shown to impact self-care behaviors in adults with type 2 diabetes. Glasgow et al (1997) introduced a model of key variables influencing diabetes self-management. This study examined specific *emotional* Personal Model constructs of diabetes management. Independent and converging lines of research have implicated several potentially overlapping constructs that may reflect emotional distress in persons living with diabetes including: fatigue, distress, and global depression that is specific to the demands of diabetes. These emotional distress constructs have all been linked to self-management behavior and quality of life in chronic disease. This study sought to explain the associations between these emotional constructs and their impact on self-management and quality of life. Questionnaire and medical chart review data were collected from adults (N=151) with type 2 diabetes at an outpatient diabetes clinic. Depressive symptomatology, diabetes-specific distress, and fatigue were found to be



moderately associated with one another. Fatigue and diabetes specific distress were found to be associated with diet, mental, and physical quality of life. Findings suggest the Problem Areas In Diabetes scale (PAID) had the strongest association with diet adherence. Depressive symptomatology, diabetes-specific distress, and fatigue have a significant negative impact physical and mental quality of life. Future research should include the impact of fatigue on quality of life in adults with type 2 diabetes.

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## INTRODUCTION

### Overview of Diabetes

#### *Prevalence of Diabetes*

Diabetes mellitus (diabetes) is a chronic disease affecting approximately 20.8 million children and adults in the United States, 5 million of whom are undiagnosed [American Diabetes Association (ADA), 2007]. There are three major types of diabetes: (1) type 1 diabetes, which was previously known as insulin-dependent, or childhood onset diabetes, (2) type 2 diabetes, which was previously known as non-insulin dependent, or adult onset diabetes and comprises 95% of diabetes cases, and (3) gestational diabetes, which is characterized by hyperglycemia occurring during pregnancy and a return to a normal glucose levels after delivery (Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997). Symptoms of diabetes include excessive thirst and urination, fatigue, blurred vision, nausea, vomiting, increased appetite, and slow healing infections (National Institute of Health, 2005). Diabetes is the main cause of kidney failure and adult onset blindness, and individuals with diabetes are at serious risk for cardiovascular disease, stroke, hypertension, central and peripheral neuropathy, retinopathy, foot ulcers, and amputation (ADA, 2006).

Internationally, increasing rates of type 2 diabetes have reached epidemic proportions. The World Health Organization anticipates prevalence rates of diabetes to double by the year 2030 (WHO, 2006). This trend is also occurring in the United States

(Engelau et al, 2004). Rising rates of diabetes parallel rising obesity rates, increases in sedentary lifestyle, and a rapidly growing population of older adults (Visscher & Seidell, 2001). Additionally, the prevalence rate of diabetes is higher among ethnic minorities (ADA, 2003). Prevalence rates indicate diabetes-related mortality will increase by more than 50% in the next 10 years. According to the International Classification of Diseases (10<sup>th</sup> Version), diabetes is the sixth leading cause of death in the United States.

### *Economic Impact of Diabetes*

From an economic perspective, the cost of diabetes is increasing alongside prevalence rates. According to the ADA, in 2002 direct and indirect medical costs were estimated at \$132 billion annually. This is a dramatic increase from the 1997 report, which indicated the national cost of diabetes was estimated to be \$98 billion (ADA, 1998). Per capita medical expenses totaled \$13,243 for an individual with diabetes compared to \$2,560 per individual without diabetes (ADA, 2006). Diabetes is often a result of a loss in productivity, resulting in an economic loss of \$40 billion annually. These statistics only approximate the toll of diabetes as they exclude expenditures resulting from pain and suffering and impact on individuals and their families.

### *Rationale for Studying Diabetes*

Due to the impact of diabetes on individuals, the healthcare system, and the economy, it is essential to identify strategies to optimize diabetes management. Diabetes is a unique chronic illness due to the fact approximately 95% of its treatment is based on self-management (Anderson, 1985). Diabetes is believed to be one of the most psychologically and behaviorally taxing of the chronic medical illnesses (Cox, Gonder-Frederick, 1992). The key to successful diabetes management is to control blood glucose

levels and prevent additional complications. This is accomplished primarily by the patient adhering to an involved self-management regimen designed to stabilize blood glucose levels and prevent or delay further diabetic complications.

### Diabetes self-management

Diabetes self-management is defined in the literature as “the various tasks in which patients must engage on a regular basis to manage their diabetes” (Glasgow & Eakin, 1998, p. 436). The Diabetes Control and Complications Trial (DCCT) concluded that extensive blood glucose management could prevent the onset of additional co-morbidity and diabetes-related complications (DCCT and Research Group, 2003). Managing one’s blood glucose is a complex daily regimen of self-management behaviors that include monitoring and decision making related to diet, exercise, recognizing hyperglycemia (high blood sugar) and hypoglycemia (low blood sugar), administering endogenous insulin/oral medications (i.e. oral agents), managing sick days, and testing and recording blood glucose levels (Elliott, Shewchuk, Miller & Richards, 2001). Self-management regimen for diabetes was believed to be one of the main factors that distinguish diabetes from other chronic illnesses, which may require maintaining only a select few of these behaviors (ADA, 2006). However it has been demonstrated in the literature that this complex regimen is difficult to maintain over time (Hiss, Anderson, Hess, Stepien, & Davis 1994; Cramer, 2004; Harris & Eastman, 2001).

### *Maintenance of the Diabetes Self-management Regimen*

Maintenance of the complex self-management regimen is believed to be inversely related to the extent of behavioral modification required to adopt a new behavior (Meichenbaum & Turk, 1987). The more complicated or involved the regimen becomes,

the more difficult it is to maintain over time. People may be less inclined to change their behavior when the health behaviors are difficult to maintain, or when immediate results are not provided (Jacobsen, de Groot, & Samson, 1995). Individuals with type 2 diabetes often are required to make several changes to their routine, they are encouraged to incorporate exercise into their daily lives, monitor blood glucose, adhere to a medication regimen, and make changes to their diet. These changes are often implemented with a distal goal of delaying disease progression, and preventing the onset of comorbid health conditions. However, persons with diabetes mellitus frequently report difficulty adhering to their self-management regimen. This provides a unique opportunity for health psychologists, who have the skills to evaluate the etiology of such difficulties, such as environmental barriers or the psychosocial factors contributing to regimen non-adherence. The section below will begin the discussion of barriers to engaging in a self-management routine.

*Barriers to Self-Management: The Impact of Diabetes Burden*

There is a small literature available that suggests that the complex regimen individuals with diabetes must maintain can itself be perceived as a barrier to optimal diabetes self-management. The demands of the self-management regimen can directly contribute to decreased quality of life, suggesting quality of life is affected by the illness itself and the lifestyle changes that accompany diabetes (Glasgow, Ruggiero, Eakin, Dryfoos, & Chobanian, 1997). The burden of maintaining the self-management regimen often leads to diabetes-specific distress, and has been discussed in the literature as a risk factor for both poor glycemic control and poor adherence to the self-management regimen. This introduces the possibility of an affective component impacting this already

complex relationship, due to the distress associated with making these lifestyle changes (particularly adhering to the prescribed self-management regimen). This will be discussed in greater detail in the section below. Understanding the associations of affect, distress and self-management is important, it implies that this is a pathway by which affect contributes to the impact on both physical and psychological health in diabetes.

*Providing a Conceptual Framework for Self-Management: Personal Models of Diabetes*

Glasgow, Hampson, Strycker, and Ruggiero (1997) proposed a model of diabetes self-management that has been validated in the literature. This model suggests both personal models of diabetes and barriers to self-management are stronger predictors than a combination of demographic and other patient characteristics. Personal models of diabetes, according to Glasgow, Hampson, Strycker, and Ruggiero (1997) are “patient’s representations of their illness, including disease-related beliefs, emotions, knowledge, and experiences” (p.556). This study included 2,056 adults with diabetes throughout the United States. Glasgow’s model of Diabetes Self-Management (Figure 1) suggests these personal models influence the patient’s ability to engage in self-management behaviors. The personal models were tested in this cross-sectional study using Glasgow’s conceptualization, however only three components of the model were examined: (1) barriers, or challenges the individuals face with managing their diabetes, (2) treatment effectiveness, and (3) seriousness. Thus, while the authors’ description of the Personal Model of diabetes self-management highlights the importance of emotion, their influential study did not integrate this key construct (emotion) into their actual research and figure depicting the model (i.e. Figure 1). Recent research highlights the importance of integrating emotion into conceptualization of disease and quality of life (Polonsky,

2000). This suggests that the omission of emotion in the studies examining living with diabetes self-management is meaningful, highlighting the importance of emotion as a core component of the Glasgow et al (1997) model. As will be discussed in subsequent sections of this paper, it is postulated that emotional distress may play an important role in diabetes by influencing not only disease management, but also quality of life.

Emotion is conceptualized in the definition of “personal model”, but studies focused on models of diabetes have repeatedly excluded analysis of emotion or symptoms associated with negative feelings. Due to the high comorbidity of depression and diabetes (discussed in subsequent sections of this paper), it is important that studies addressing self-management and Quality of Life examine the role of affect, as this could provide information to guide future interventions targeting specific symptoms of experiencing negative affect. This dissertation sought to address the emotion construct of the personal model of diabetes by examining specific components of depressive symptomatology that had previously been identified in the diabetes literature. Fatigue, diabetes-specific distress, and global depressive symptomatology were examined in the context of a personal model of diabetes framework, which is a modification of Glasgow et al’s (1997) model of self-management (see Figure 2). The affective components have been individually studied in the diabetes literature, but not in tandem within Glasgow’s Personal Model self-management framework.

#### Diabetes-specific Emotional Distress

Due to both physical (e.g. changes to diet, exercise, blood glucose monitoring, administering medication) and psychological (e.g., problem solving ability, mental health status) demands of living with diabetes, researchers have documented the occurrence of

high levels of emotional distress and negative feelings in people with diabetes. Common emotions reported include: anger, reduced motivation, burnout, guilt, and discouragement (Welch, Jacobsen, & Polonsky, 1997). These emotions have been documented in the literature as *diabetes-related distress* and have been identified as an important risk factor for both poor adherence to diabetes regimen and poor glycemic control (Polonsky et al., 1995; Gary, Crum, Cooper-Patrick, Ford, and Brachati, 2000; Sultan and Heurtier-Hartemann, 2001).

*Measuring Diabetes-related Distress: The Problem Areas in Diabetes Scale*

Due to the importance of diabetes-related distress in people living with diabetes, the Problem Areas In Diabetes Scale (PAID) (Polonsky, Anderson, Lohrer, Welch, Jacobson, Aponte, & Schwartz, 1995) was created as a tool to assess the construct of diabetes-related distress both as a clinical tool and an outcome measure (Welch, Weinger, Anderson, & Polonsky, 2003). The PAID is a 20-item single-factor measure of diabetes related distress developed at the Joslin Diabetes Center and Harvard Medical School. This instrument has a 5-point item scaling, ranging from “Not a Problem” = 0 to “Serious Problem” = 4. Original scoring was a summed total; higher scores were indicative of higher levels of diabetes-specific distress. Original scoring has been simplified to a transformed scaled score ranging from 0-100, with higher scores demonstrating greater diabetes-specific distress. The main focus of the items surrounds feelings and moods associated with specific aspects of diabetes. The PAID has been found to be unrelated to age, duration of diabetes, education, ethnicity, and gender (Welch, Weinger, Anderson, & Polonsky, 2003).

The PAID is the most widely used instrument to assess diabetes-specific distress. A review of seven studies evaluating the utility of the PAID indicated internal reliability remained high ( $\alpha = .90$ ), and test-retest reliability was found to be adequate ( $r = .83$ ). This study also found the PAID was correlated with a variety of theoretically relevant constructs such as general emotional distress, depression, diabetes self-management, diabetes coping, and health beliefs (Welch, Weinger, Anderson, and Polonsky, 2003).

The next section will focus on studies that further elaborate upon the diabetes-related distress construct by discussing the potential sources and consequences of diabetes distress. This section will also focus on the potential relationships between diabetes-specific emotional distress and possible overlapping constructs to further explore the relationships.

#### *Potential sources of Diabetes-related Distress*

One source of diabetes-specific emotional distress is thought to be the lifelong burdensome regimen patients with diabetes are required to maintain (Polonsky, Anderson, Lohrer, Welch, Jacobson, Aponte, & Schwartz, 1995). Recent studies have provided additional support for the role of the treatment regimen (injection of exogenous insulin vs. taking oral medication vs. diet-exercise regimen only) on diabetes-related distress in individuals with type 2 diabetes. Researchers reported individuals on an insulin regimen experienced greater diabetes-related distress than those on oral medications or diet and exercise only treatment regimens (Delahanty et al., 2007). However, there is additional evidence that suggests patients with diabetes on high doses of oral agents may also report levels of distress similar to those on insulin regimens. This is believed to be due to a patient's heightened awareness that insulin injection therapy



will be prescribed next, if blood glucose levels do not decrease (Welch, Jacobsen, and Polonsky, 1997), or due to the complexity of the regimen itself.

Another potential source of diabetes-related distress may be awareness of the necessity to adhere to self-management recommendations despite the knowledge that the onset of complications is often unavoidable (Welch, Jacobson, and Polonsky, 1997; Thomas, Jones, Scarinci, and Brantley, 2003). Changes in health status or adjusting to managing diabetes-related symptoms may activate thoughts and fears related to the progression of illness and the development of complications. Individuals with diabetes report worrying about the future and the development of additional complications as a primary source of diabetes specific distress regardless of type of diabetes and treatment regimen (Welch, Jacobsen, & Polonsky, 1997; Delahanty et al., 2007).

According to the literature presented above, the complexity of the treatment regimen and the worry associated with both fearing and experiencing increases in diabetic complications are potential sources of diabetes-related distress. Researchers have discussed the necessity for studies that evaluate the relationships between diabetic-specific emotional distress and known overlapping constructs (e.g. depression and diabetes self-management behavior) (Welch, Jacobsen, and Polonsky, 1997). Diabetes-related distress has emerged as a valuable construct related to the psychosocial impact of diabetes on both behavior and mental health. Depressive symptomatology may further influence an individual's experience of distress by enhancing diabetes-specific distress scores on the PAID, due to the overlapping emotional impact.

In a recent meta-analysis by Stone, Peters, Davies, and Khunti (2006) psychological distress was described "as a natural and inevitable response" for

individuals with diabetes. The presence of depressive symptoms can be detrimental to diabetic outcomes. Diabetes-specific distress has been recently discussed in the literature as a construct that also may reflect more global depression, highlighting the overlap between these constructs. In a study comparing four measures of depressive symptomatology in persons with diabetes, the PAID was found to reflect both major and minor depression (Hermann, Kuzler, Krichbaum, Kubiak, & Haak, 2006). This study also provided support for the link between diabetes-related distress and depression. However, this is a relatively new area of research, and additional studies are needed to verify the validity of using the PAID in clinical samples of individuals with diabetes when screening for depression.

The relationship between diabetes and depression as a comorbid condition is well established in the research literature. By examining this literature, additional information related to the psychological impact of depression on diabetes outcomes can be further evaluated to continue to explore existing relationships of the Personal Model emotional constructs. Ciechanowski, Katon, and Russo (2000) found that depression itself has detrimental influences on diabetes symptom burden. Depressed individuals with diabetes were more likely to experience a higher burden of disease-specific symptoms than non-depressed individuals (Ciechanowski, Katon, and Russo, 2000). Given these depression-diabetes burden associations, it seems highly plausible that depression would elevate diabetes-specific distress due to a shared affective component. The diabetes-depression literature will be examined in subsequent sections in order to address the potential overlap between diabetes-specific distress and global depression and their impact on diabetes self-management behaviors.

## Depression and Diabetes

### *Overview of Depression*

Depression (Major Depressive Disorder) is relatively common in the United States; the lifetime prevalence rate of major depression is approximately 16.2% (Kessler, Berglund, Demler, Jin, Koretz, Merikangas, Rush, Walters, & Wang, 2003). Depression manifests itself as a collection of both somatic (physical) and psychological (mental) symptoms. According to the Diagnostic and Statistical Manual of Mental Disorders-4<sup>th</sup> Edition-Text Revision (DSM-IV-TR), the diagnosis of Major Depressive Disorder is warranted if 5 or more of the following conditions are met over a 2-week period: the presence of a depressed mood or a loss of interest in once pleasurable activities, significant changes in appetite, hypersomnia or insomnia, psychomotor agitation or retardation, *fatigue* or loss of energy, feelings of worthlessness or inappropriate guilt, impaired concentration or indecisiveness, and recurrent thoughts of death (including suicidal ideation and/or intent) (APA, 2000). Depression can affect all areas of an individual's life; severity is often conceptualized in terms of functional distress and impairment.

### *Depression in Diabetes*

The rates of depression are elevated in individuals with chronic medical disease (Katon & Sullivan, 1990) including diabetes (Lustman, Clouse, & Freedland, 1998). Recent research has indicated that adults with diabetes are twice as likely to have depression compared to individuals that do not have diabetes (e.g., Edege, Zheng, Simpson, 2002). Incidence rates of adults with diabetes in the United States are estimated to be 9.3% compared to 6.1% for individuals without diabetes (Edege &

Zheng, 2003). Global depression has been extensively studied in the diabetes literature due to the implications of depression on physical and mental well-being. Depression has been found to be associated with poor glycemic control, increased functional impairment, poor diet and medication adherence, higher health care costs in diabetic patients (Ciechanowski, Katon, & Russo, 2000; Lin et al., 2004) and has been found to have profound effects on quality of life (Goldney, Phillips, Fisher, & Wilson, 2004).

Research in specific areas relevant to the complex relationship between diabetes self-management and depression will be reviewed below. This relationship is a central tenet of the framework of the model that will be introduced in this dissertation, modified from the Glasgow et. al. (1997) diabetes-specific model of self-management described above.

In a study conducted by the ADA (2006), specific gaps in diabetes self-management education were identified as related to depression; specifically medication adherence, exercise, and diet. The literature on depression and diabetes and associations with health and well-being will be reviewed below. Potential areas of research that would inform these areas will be addressed.

#### *Prevalence of Diabetes and Depression and Associations with Health and Well-Being*

There is overwhelming evidence that comorbid depression in diabetes is associated with increased health problems, including increases in severity of diabetes symptoms, and an increase in risk of developing additional comorbid microvascular complications (e.g. retinopathy, nephropathy, peripheral neuropathy, cardiovascular disease) (Egede, 2006). Clinically relevant depression has been defined as “depression severe enough to warrant clinical intervention” (Anderson, Freedland, Clouse, and

Lustman, 2001). In a recent meta-analysis (Ali, Stone, Peters, Davies, and Khunti, 2006), prevalence rates of co-morbid depression in adults with type 2 diabetes were found to be significantly higher than in individuals without diabetes (17.6% vs. 9.8%). Another recent meta-analysis examined prevalence rates of depression among individuals with type 1 diabetes (Barnard, Skinner, and Peveler, 2006). In uncontrolled studies (the studies that did not have a comparison group) rates of depression were estimated to be 13.4%. Of the studies that had a control group, 12.0% of the diabetic population was depressed, compared to 3.2% of the healthy comparison groups. In a third recent meta-analysis (Anderson, Freedland, Clouse, & Lustman, 2001), a diagnosis of diabetes almost triples the odds of comorbid depression (OR=2.9, 95% CI 2.3-3.7), with no differences by type of diabetes, sex, subject source, or assessment method.

The evidence from these meta-analyses suggests depression is significantly higher in individuals with diabetes compared to those without diabetes. The three studies mentioned above relied on cross-sectional data to reach their conclusions, which prevents causality or directionality from being determined. However, it is useful to examine this literature to determine specific health related targets that are affected by having both depression and diabetes. Due to the known benefit of maintaining optimal glucose levels among individuals with diabetes, the effects of depression on glycemic control will be reviewed below.

#### *The Impact of Depression on Glycemic Control*

A recent meta-analysis of studies conducted with individuals with type 1 and type 2 diabetes found significant associations between depression and glycemic control (Lustman et al., 2000). When comparing effect sizes between individuals with type 1 and

type 2 diabetes, there were no significant differences found in depression scores between groups, indicating that the effect of glycemic control on depression is similar in both populations. However, using diagnostic criteria for depression yielded a larger effect size (ES = 0.28) than when self-report measures were utilized (ES = 0.15) to assess for the presence of depression in both groups. The associations in both of these meta-analyses suggest there is an existing relationship between depression and glycemic control independent of type of diabetes, but that reported severity of depression may be a function of the method of assessment.

Given the associations between depression and glycemic control and the impact of self-management behaviors on glycemic control, literature addressing the effects of depression on self-management behaviors will be reviewed below.

#### *The Impact of Depression on Diabetes Self management*

It has been well established that adoption of self-management behavior is crucial to optimal diabetes care. Evidence from large clinical trials has demonstrated that the effects of exercise, following dietary recommendations, and self-monitoring of blood glucose (SMBG) are essential to achieving optimal glycemic control, blood pressure, and lipid control (ADA, 2006). However, engaging and maintaining these recommendations frequently present challenges for persons with diabetes (Edge & Zheng, 2002; Nelson, Reiber, & Boyko, 2002; Harris, 2001). Co-morbid depression is believed to further complicate maintenance of adherence to diabetes self-management recommendations. A recent longitudinal study examined the relationship between depression and symptoms of diabetes and concluded depression influenced self-management behavior by affecting adherence to the self-management regimen (McKellar, Humphreys, & Plette, 2004).

Findings suggest that patient-initiated behaviors (e.g. exercise, dietary adherence, SMBG) are impacted by depression more than they are by physician-initiated services (e.g. HbA1c tests, physician visits) (Lin et al., 2004). The above findings provide additional support for the impact of depression on the self-management component of successful diabetes management. Associations between depression and diabetes and other emotion-related outcomes will be further examined, as seen in the section below.

#### *The Relationship Between Depression, Diabetes, and Symptom Burden*

Ciechanowski, Katon, and Russo (2000) found that depression has a detrimental impact on diabetes symptom burden. In a sample of individuals with diabetes, those who were depressed were more likely to experience a higher burden of disease-specific symptoms than those who were not depressed.

One possible explanation of the findings of the above studies could be the associations of the perceived burden of living with diabetic symptoms and complications, or the complexity of the regimen itself. Surwit, van Tilburg, Parekh, Lane and Feinglos (2005) demonstrated that the diabetes treatment regimen itself determined the relationship between depression and glycemic control. In individuals injecting insulin 3 or more times a day (i.e. complex treatment regimen) depression was associated with glycemic control. The burden of diabetes has been found to be significantly associated with reporting more diabetic symptoms (Ludman et al., 2004). This supports the influence of depression and diabetes-specific distress on both the perceived burden of living with diabetes symptoms *and* the demands of the treatment regimen itself. It appears that the complexity of the regimen that an individual is required to adhere to is associated with depression. However, there were no studies found that addressed the

impact of diabetes-specific depressive symptoms in relation to diabetes self-management. Such studies would be quite informative, due to the potential for shared heritability of the somatic component(s) of diabetes and depression. If symptoms overlap with both conditions, i.e. symptoms common to both diabetes *and* depression, it is important to identify the etiology of those symptoms to maintain accuracy of both diagnostic and self-report measurement of these symptoms. The subsequent section will review the existing literature that link shared symptomatology of depression and diabetes, to explore potential overlap in greater detail.

#### *Possible Mechanisms Underlying Depression and Diabetes*

Recent literature lends support to two potential hypotheses linking depression and diabetes. One hypothesis suggests that depression precedes the onset of type 2 diabetes. There are several studies that support this hypothesis (e.g. Eaton, Armenian, Gallo, Pratt, and Ford, 1996; Golden et al., 2004). However, this finding has not been universal, findings that depression precedes the onset type 2 diabetes has been inconsistent (e.g. Saydah, Brancati, Golden, Fradkin and Harris, 2003; Carnethon, Kinder, Fair, Stafford and Fortmann, 2003). When examining the mechanisms that could support this hypothesis, a recent literature review suggested that the increased risk of developing diabetes following the onset of depression stems from increased counterregulatory hormone release and action, mutations in glucose transporters, and increased immunoinflammatory activity. These physiological changes are believed to add to cellular insulin resistance, causing the onset of type 2 diabetes (Musselman, Betan, Larsen, & Phillips, 2003). The mechanisms of this process remain poorly understood, additional research in this area is needed to clarify these relationships (Edege, 2006).



A second hypothesis in the literature suggests depression in diabetes is caused by the psychosocial stressors related to having a medical condition. In one prospective study, youths who had Type 1 diabetes were followed over a 10-year period to assess for the onset of psychiatric conditions. Results indicated that after 10 years, 27.5% of participants developed major depression (Kovacs, Obrosky, Goldston, & Drash, 1997). In another large study of older adults with diabetes, results indicated there was a 3.7 fold increased odds of the onset of depression in type 2 diabetes (Palinkas, Barrett-Connor, & Wingard, 1991). This research suggests that regardless of age and type of diabetes, psychosocial factors play a role in the development of depression.

A third possibility that must be considered and has not been explored thus far is that there may be symptoms that overlap both depression and the physical aspects of diabetes. The somatic component of depression is one area that provides considerable opportunity for symptom overlap between depression and diabetes. The next section will review the current literature examining the shared somatic symptoms between depression and diabetes.

#### *Shared Somatic Symptoms of Both Depression and Diabetes.*

The above section summarized the recent literature examining the relationship between depression and diabetes. However, the potential overlap of somatic symptoms of depression and symptoms of diabetes is virtually absent in the literature. In a recent review by Edege (2006), it was suggested the overlap between symptoms of suboptimal control of diabetes and depression are often overlooked in the medical community and in the literature. Somatic symptoms such as fatigue, changes in appetite, changes in weight, and sleep disturbance could share etiology from either illness (Edege, 2006).

A recent large study examining the relationship between diabetes and symptom burden highlights the relevance of examining the coexisting symptomatology between depression and diabetes (Ludman et al., 2004). In this study of 487 patients with both diabetes and co-morbid depression, the association between depression-diabetes symptoms was stronger than the association between number of diabetes symptoms and glycemic control and diabetic complications. This study provides support for the strength of the association between depression and diabetes symptomatology. However, individual symptoms characterizing depression (e.g. fatigue, depressed mood, change in appetite, etc.) were not specifically examined. Additionally, because the study was cross-sectional, causality cannot be determined. However, the significant results observed in this study remained significant after controlling for age, gender, marital status ethnicity, HbA<sub>1c</sub>, number of complications, additional medical comorbidity, duration of diabetes, type of diabetes, and treatment intensity.

This study also used well-validated measures to assess the somatic symptoms. Ludman et al (2004) used a self-report version of the PRIME-MD adapted from the Patient Health Questionnaire Study (Spitzer, Kroenke & Williams, 1999) to assess both prevalence and intensity of depression over time. Diabetes symptoms were measured using the Self-Completion Patient Outcome instrument (Whitty, Steen, Eccles, 1997). This instrument measures symptoms of diabetes including: cold hands and feet, numb hands and feet, polyuria, excessive hunger and/or thirst, shakiness, blurred vision, feeling faint and feeling sleepy. Items are scored on a Likert type scale that ranges from “never” to “every day”. Symptoms are considered positive if they are experienced at least “several days” in the past month. Severity was identified via chart review. These

measures also demonstrated adequate internal consistency that strengthens the results of this study reviewed above. Ludman et al (2004) demonstrated that as the number of symptoms of depression an individual experiences increases, the number of symptoms of diabetes increase, even after controlling for complications and other potential confounding variables.

Examining the somatic overlap between symptomatology shared by both depression and diabetes could provide a framework for examining diabetes emotions and symptom burden by providing additional information that could guide optimal medical care (e.g. mental health screening vs. additional medical diagnostic testing).

#### *Somatic Symptom Burden in Diabetes: The Potential Role of Fatigue*

Surridge et al. (1984) found that fatigue was the most commonly reported diabetes physical demand including coping with fatigue by individuals with type 1 diabetes. Out of the 50 individuals enrolled in this study, 31 of them reported experiencing an increase in fatigue, with 20 of them reporting considerable impairment as a result of this fatigue (Surridge et al., 1984). This unique descriptive analysis provides preliminary evidence for the utility of examining fatigue in the diabetic population. Although this evidence for the role of fatigue in diabetes health and well-being is encouraging, the relatively small sample size in this study prohibits definitive conclusions from being drawn. It is also worth noting that it was the only study found that demonstrated the significance of this construct specifically in a diabetes sample. However, a large literature on fatigue and well-being is present in the larger behavioral medicine literature.

Additional support for the significance of fatigue impacting quality of life in individuals with chronic disease is demonstrated in a recent large longitudinal study that examined the validity of the DSM-IV criteria for depression among individuals with and without chronic co-morbid medical conditions (Simon & von Korff, 2006). There is an existing debate surrounding the inclusion of somatic symptoms when assessing for depression in a chronic disease population (Cavanaugh, Clark, & Gibbons, 1983). A recent study by Simon and von Korff (2006) demonstrated that of all of the somatic symptoms, the probability of reporting fatigue was greater in individuals with chronic disease when compared to a general medical clinic population (54% vs. 45% respectively). This suggests that health-related fatigue may be an independent construct in chronic disease and that assessment of fatigue could provide information above and beyond that of depression or other disease-specific distress measures alone. The results of Simon and von Korff (2006) provide support for the utility of independently examining fatigue and depression/disease specific distress, due to the increased prevalence of fatigue in chronic disease populations, particularly diabetes.

The next section will focus on defining the construct of fatigue, in addition to highlighting the importance of fatigue as a symptom of both somatic function and distress in other chronic diseases. In addition, the utility of this construct in type 2 diabetes will be discussed. Initially, the larger chronic disease literature will be discussed, due to the limited representation of fatigue in the diabetes literature. Then, the smaller literature that is specific to fatigue in diabetes will be presented and the methodologies critiqued.

### *Fatigue in the Larger Chronic Disease Literature*

As previously presented, fatigue is an important construct in the chronic disease literature. Fatigue is considered to be one of the most commonly reported symptoms of chronic disease. Due to the commonality of this symptom, it has emerged as a useful construct relating to both functional status and quality of life. Fatigue has been identified in a variety of conditions, resulting from the illness itself, treatment, or psychological factors such as depression. Due to the complexity of this issue, the behavioral medicine literature has examined both the impact and causes of fatigue in several populations. Edege (2006) suggests an integrated approach to evaluating fatigue, which includes but is not limited to the fields of psychology, behavioral science, nursing, and medicine.

One of the aims of this dissertation study was to examine self-reported fatigue as a potential emotional symptom of diabetes. Thus far, it has been identified as a potentially useful construct that has overlap with both physical (i.e. diabetes) and psychological (i.e. disease-specific distress, depression) illness. However, within the diabetes literature, there is limited evidence identifying definitions of fatigue and/or possible associations with other physical or psychological constructs. Therefore the section below will present the larger chronic disease literature to identify conceptual frameworks and existing theoretical models that provides support for examining this construct as a viable construct within the diabetes literature.

#### *Definitions of the Fatigue Construct*

Fatigue is a common complaint among patients suffering from a myriad of chronic diseases, including various forms of cancer and associated treatment, multiple sclerosis, and chronic fatigue syndrome. One of the greatest methodological challenges

in the fatigue literature centers on a consistent definition of the construct. In the existing literature, the definition of a symptom is often considered to be broadly defined as a manifestation of any illness. More specifically, symptoms are often discussed in terms of the individual's experience, and may not be directly observable (i.e. pain, nausea, fatigue, Rhodes, Watson, & Hanson, 1988). Fatigue is consistently operationalized as a subjective experience in the literature, which is consistent with the above description of symptom experience. Although fatigue is typically conceptualized as a subjective experience, the definitions of fatigue are inconsistent in the published literature. In a recent study, Richardson (1998) concluded that in the existing literature there are a variety of definitions that are ambiguous, numerous, and inconsistent across research studies. The absence of a comprehensive, consistent definition across studies prevents progress in the development of theoretical models that could potentially facilitate clinical practices related to chronic disease management.

#### *Defining Fatigue in Chronic Illness*

Definitions of fatigue have often been conceptualized as a decrease in physical performance or a loss of energy (Wu & McSweeney, 2001), but the debate over this construct continues in the literature. Piper (1986) was one of the pioneering researchers in operationalizing fatigue as an important symptom in cancer. Fatigue was described as “a subjective feeling of tiredness that is influenced by circadian rhythm; it can vary in unpleasantness, intensity, and duration” (Piper, 1986, p. 220). According to this definition, fatigue is conceptualized as serving as a protective function when it is experienced by the individual acutely. When fatigue becomes more chronic however, the protective function is no longer served.

In contrast, Rhodes, Watson, and Hanson (1988) suggested that fatigue in patients with cancer leads to distress when it is inconsistent and experienced less often. They report that when fatigue is experienced more frequently, cancer patients often do not experience high levels of distress. This finding was contingent upon patients developing appropriate self-management strategies to minimize their fatigue levels. Authors of this article suggested that individuals who experience fatigue intermittently may not have adequate self-management strategies in place to manage these symptoms, which may in turn lead to increased distress. Additionally, there was an observed association between engaging in appropriate self-management strategies and fatigue in patients with cancer. “Tiredness” was the symptom that interfered with self-management most frequently.

Rhoten (1982) suggested intensity of symptoms differentiates fatigue from tiredness, per se. He defined fatigue as a state of general negative feeling that is associated with pain, discomfort, and pain medication. The sample studied was a postoperative patient population. Tiredness was defined as resulting from physical activity and was considered a normal physical phenomenon that could be relieved by adequate amounts of rest. Fatigue was defined as being experienced in longer duration and a more extreme state with both physical and mental aspects. This definitional approach suggests the possibility of a multidimensional aspect of this construct due to its impact on multiple areas of an individual’s quality of life (i.e. physical, mental). This definition is in sharp contrast to the definition provided by Rhodes, Watson, and Hanson (1988), which defines the experience of fatigue as being associated with the frequency of symptom experience. Rhoten (1982) conceptualizes an increase in frequency and severity of the symptoms as differentiating fatigue from tiredness. These varied

definitions of fatigue highlight the differences and contradictions present in the literature that impede consistent results across studies. Without additional empirical support, progress toward gaining better understanding of fatigue is limited.

As fatigue has gained increased attention from clinicians and researchers in behavioral medicine, many professionals have operationalized fatigue as a multidimensional construct. Individuals do not all share the same fatigue experience, it is subjective, multidimensional, and difficult to measure (Glaus, Crow, and Hammond, 1996). One multidimensional definition proposes the development and establishment of cancer related fatigue (CRF). Cancer related fatigue defines a host of criteria that would standardize definition of fatigue for cancer patients (Cella, Peterman, Passik, Jacobsen, and Breitbart, 1998). For the full list of criteria for CRF, the reader is referred to Table 1. These proposed criteria were developed for inclusion in the International Classification of Diseases-10<sup>th</sup> Edition (ICD-10). The ICD-10 is widely used for diagnosis in the medical community (World Health Organization, 1992), and the inclusion of CRF into this classification system would solve the problems associated with inconsistency.

The majority of the information presented on fatigue thus far has been related to cancer. Fatigue is also a prevalent symptom in the Multiple Sclerosis literature, but literature is inconsistent when defining the construct. In a study examining the impact of fatigue and depression on quality of life in multiple sclerosis, fatigue was defined as “an abnormal sense of tiredness or lack of energy out of proportion to the degree of daily effort or degree of disability” (Janardhan & Bakshi, 2001, p.54). An earlier study conceptualized fatigue in terms of four distinct categories which supports a multidimensional approach (Schwartz, Coulthard-Morris, & Zeng, 1996). In a recent



study by Pittion-Vouyovitch et al. (2006) fatigue was defined as “a lack of physical or mental energy or a feeling of tiredness. [It is believed] to affect social relations, daily activities, cognitive and physical domains” (p.39). By comparing definitions used in these studies, similar inconsistencies that exist in defining the experience of fatigue in cancer are also found in the multiple sclerosis literature. There is a methodological debate that encompasses the enmeshment of measurement and definition inconsistencies in the existing literature for both cancer and Multiple Sclerosis.

*Summary of Conceptual and Methodological Issues in the Chronic Illness Fatigue Literature.*

Inconsistencies in definitions presented above are intended to highlight the diverse definitions available in the chronic disease literature. This impedes progress in further research by prohibiting generalizable conclusions from being drawn. Recent research in this area presented in chronic disease suggests a multidimensional approach would best capture the experience of fatigue; however this is not always apparent when examining how fatigue is defined. Consistent factors of the definitions presented above suggest fatigue is a subjective symptom that can vary in intensity, frequency, and duration. Additionally, fatigue is a symptom that surpasses “tiredness” in the sense it is chronic and not alleviated by adequate amounts of rest. Multidimensional definitions that capture the complexity of this issue are lacking consistency in the literatures reflecting the chronic disease populations presented above. It appears the cancer quality of life literature has examined this construct in greatest detail, and has developed criteria for defining and assessing cancer-related fatigue. The cancer literature provides a framework that may be applied to evaluating the diabetes literature. The complexities surrounding

measurement of fatigue largely seen in the cancer literature are demonstrated by a review of questionnaires that have been developed in this area, seen below.

### Fatigue Measurement

Review of fatigue measurement instruments reflects inconsistencies in measurement approaches. There is a current debate centering on the dimensionality of fatigue that further complicates measurement approaches. The next section will explore this debate, discussing evidence for both unidimensional and multidimensional methods for assessment of fatigue in chronic disease. By exploring assessment measures of fatigue, this may further explain the complicated relationships observed between fatigue, physical symptom reports and distress/depression in persons living with chronic disease.

#### *Measuring Fatigue in the Cancer Literature*

Due to the definitional issues in the fatigue literature, it is not surprising that there is a debate in the literature pertaining to optimal methods of assessing this construct. The majority of current fatigue measures have been developed from a multidimensional model that includes general, cognitive, affective, somatic, and vigor dimensions of fatigue. Although theoretical foundations conceptualize fatigue as a multidimensional construct, measures of fatigue often display substantial subscale intercorrelations and lack sufficient discriminability from one another. An additional line of research suggests the most efficient method of evaluating fatigue is the parsimonious assessment of a single general fatigue construct or scale. This unidimensional approach is appealing when assessing medical populations in clinical settings, due to the timeliness and simplicity of this approach. Such approaches include fatigue by asking about it directly (i.e. using the word fatigue), or through visual analogue scales. For example, in a recent study by

Reyes-Gibby, Aday, Anderson, Mendoza, and Cleeland (2006) “Fatigue was defined by the response to the question “Have you had any of the following persistent or troublesome problems...severe fatigue or exhaustion” (p.120). Some clinicians also report assessing fatigue by simply asking if the patient is tired, or if they feel impacted by fatigue, which eliminates the intensity dimension of fatigue has been examined and that is validated in both unidimensional and multidimensional approaches.

The multidimensional vs. unidimensional debate regarding assessment of fatigue is unresolved in the current fatigue literature. It is widely accepted in the literature however, that due to the subjectivity of fatigue as a symptom, use of self-report questionnaires is a valid measurement technique (Jacobsen, 2004). The next section of this proposal will divide the discussion of fatigue assessment into two parts: 1) Unidimensional measures of fatigue and 2) Multidimensional measures of fatigue. For a complete list of measures including dimensional characteristics and psychometric information, the reader is referred to Table 2. The following discussion will focus on the conceptual frameworks that underlie these measurement approaches. Commonalities and differences across measures will be discussed in detail. The measures have been organized in terms of dimensionality, to illustrate both perspectives of this debate.

#### *Unidimensional Measures of Fatigue*

The majority of measures that unidimensionally assess fatigue focus on the severity or intensity of the symptom. One consistent limitation is cited in the methodological design of the studies using these measures. Frequently, researchers have used measures without providing validity information specific to the illness of the subject sample, or intention for the measurement tool selected. This can pose potential difficulty

in the consistency of measurement in the literature, as some measures are defined in terms of the medical population they are studying [e.g. Functional Assessment of Cancer Therapy (FACT) Yellen, et al, (1997)]. This prohibits generalizability of the possible associations that could be uncovered by using a measure that is not specific to the disease itself. In contrast, the Fatigue Severity Scale (FSS) [Krupp et al, (1989)] is a commonly used measure of fatigue that can be used across medical populations. Its name is somewhat of a misnomer however, because the FSS actually measures the impact and functional outcomes of fatigue rather than symptom severity.

The majority of other unidimensional instruments measure the severity of fatigue on a single dimension. Close examination of these measures suggests that overall, the majority of instruments measure severity of fatigue itself, but lack operational definitions of the fatigue construct. The unidimensional measures do not provide consistency nor clarity in terms of definitions, instead these measures mostly focused on severity while ignoring individual factors that address some of the definitional confounds previously described. Consistent with unidimensional definitions of fatigue (e.g. Rhoten, 1982) these measures typically focus on the severity of the symptoms of fatigue. However little information is actually provided in terms of symptom operationalization, rather assume that the construct “fatigue” exists, and that it is often severe in chronic illness populations.

Due to the limitations of the unidimensional approach, many researchers have advocated for a multidimensional approach. Multidimensional assessment may provide an opportunity to assess different aspects of the fatigue experience, while assessing for

severity of fatigue in each of the factors that contribute to the overall experience of fatigue (e.g. mental and physical fatigue).

### *Multidimensional Measures of Fatigue*

Recent research reviewed in the cancer, multiple sclerosis, and chronic fatigue syndrome literatures suggests that chronic disease fatigue assessment would benefit from using a multidimensional approach to maximize understanding of experiencing fatigue, given its subjective nature (Jacobsen, 2004; Smets, Garssen, Bonke, & De Haes, 1995). When fatigue is measured in a multidimensional way, emotional, behavioral, and cognitive components are commonly assessed (Lewis & Wessely, 1992). Two reviews have discussed the multidimensional fatigue scales, and report them to be more comprehensive (Alberts, Vercoulen, and Bleijenberg, 1999; Friedberg and Jason, 1998), and due to the known differences between patients' experiences, essential to clarifying the ambiguity of fatigue as a construct. Severity of a poorly understood construct that remains ambiguous may not provide answers to more specific research questions. Research that incorporates multidimensional measures provides an opportunity to assess the actual experience of the individual in terms of which aspects of fatigue individuals are experiencing (i.e. physical symptoms and affective symptoms), and possibly distinguish differences in fatigue "profiles" across different chronic disease and working populations.

The Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF) is an excellent example of a multidimensional fatigue measure. It was designed by researchers based on the existing literature suggesting fatigue is a multidimensional symptom that can be best captured by evaluating five dimensions: general (i.e. severity), affective, physical, mental, and vigor (Stein, Martin, Han, & Jacobsen, 1998). Additionally, it has

been argued that, due to the absence of disease-specific information, it is a flexible measure that can be used in a variety of populations (Dittner, Wessely, & Brown, 2004). The MFSI-SF is believed to have good psychometric properties, including excellent internal consistency, good diagnostic validity, good test-retest reliability, and sufficient ability to discriminate between fatigued and non-fatigued individuals (Wu & McSweeney, 2001).

The Checklist of Individual Strength (CIS) is another measure developed out of the multidimensional assessment trend (Vercoulen, Swanink, Fennis, Glalma, van der Meer, & Blegijenberg, 1994). The CIS was developed using CFS patients as a validation sample (Vercoulen, Swanink, Fennis, Glalma, van der Meer, & Blegijenberg, 1996), and has been validated in working populations (Beurskens, Bultmann, Kant, Vercoulen, Bleijenberg, & Swaen, 2000), and MS patients (van der Werf, Jongen, Nijeholt, Barkhof, Hommes, & Bleijenberg, 1998).

#### *Issues in Assessment Tools Measuring Fatigue*

One limitation in the multidimensional fatigue literature is the development of questionnaires on an ad hoc basis, which hinders the possibility to advance the construct and decreases the overall reliability of the results. Definitional confounds have also been observed in measurement studies. Jacobsen (2004) discussed an absence of a commonly agreed upon definition leading to a lack of a consensus regarding fatigue measurement. Different research groups utilize different instruments that are theoretically dissimilar, preventing a consensus regarding definition and measurement. In a review conducted by Dittner, Wessely, and Brown (2004), this issue was presented as a “Catch 22...before a concept can be measured, it must be defined, and before a definition can be agreed, there

must exist an instrument for assessing phenomenology” (p. 166). They suggest when considering dimensionality, research should address the purpose of the information they are attempting to collect. It is unlikely that one assessment measure will develop as the “gold standard” due to the complexity of fatigue measurement and the ambiguous issues surrounding definition (Dittner, Wessely, & Brown, 2004).

Several unanswered questions in the multidimensional fatigue literature include influences of the course of fatigue which remains unknown due to the prevalence of cross sectional studies, and the lack of longitudinal information. Measurement approaches contribute to this by the lack of consistency in measuring the fatigue construct and in the study designs utilized. In addition, the measurement instruments themselves contribute to the issues, some tapping fatigue in the past two weeks, some discussing at present time, some relying on a 24-hour recall. Research could address these limitations by cross-validating instruments over time, to provide information that can explain temporal relationships of fatigue.

One final issue that must be addressed concerns the potential for measurement overlap in assessing fatigue and chronic illness comorbidity. As previously discussed, treatment issues and diseases themselves may contribute to the experience of fatigue, and the overlap between the symptom of fatigue in depression and chronic disease also need to be adequately addressed. Due to the absence of a biological marker for fatigue, a heavy reliance is placed on self-report measures due to the subjectivity of the fatigue experience. Fatigue can be experienced as a physical symptom due to the physical (or somatic) dimension described by individuals that experience it. Additionally, chronicity and severity contribute to the physical manifestations of fatigue, including weakness and

tiredness that remain after rest. Studies that examine convergent and discriminant validity across fatigue instruments and between fatigue, disease-specific distress and global depression measures are currently non-existent in the chronic disease literature.

*Fatigue and Chronic Illness: Summary and Future Directions*

Thus far, this review has demonstrated the impact of depression and diabetes-specific distress on diabetic outcomes. More specifically, the literature discussed has illustrated the impact of depression and diabetes-specific distress on diabetic symptoms, glycemic control, and self-management behaviors. Fatigue was introduced as a symptom that potentially shared an etiology with both depression and diabetes, and was found to be a commonly reported symptom in this population. However, the fatigue literature is very small within this population. Therefore, the existing current fatigue literature was reviewed in other chronic diseases, to illustrate the importance of this construct in other chronic disease populations.

Fatigue has been discussed thus far in this review in the context of cancer, MS, and depression. However, measuring fatigue as a symptom of diabetes has not been well-addressed in the literature; and the few studies that exist have been primarily conducted in working samples. The following section will review the studies on diabetes and fatigue, to inform the reader of the current status of the research in this area. A methodological critique will be presented. Results of the individual studies will be integrated to suggest a potential model that will guide future research examining the impact of fatigue on diabetes mellitus and the associations with measures of distress.

Within diabetes, fatigue may have several possible etiologies (e.g. physical vs. psychological). This construct was selected for inclusion in this proposal due to the



prevalence of fatigue among individuals with diabetes (e.g. Surridge et al., 1984), the overlap of fatigue and psychological distress, and the relative lack of data that addresses these specific symptoms in the diabetes-distress literature.

### Fatigue in Diabetes Mellitus

Integrating fatigue into the diabetes-distress research can expand the current health psychology literature in behavioral diabetes. This integrative approach may guide future research in this area by exploring the overlap of depression and physical symptoms associated with diabetes and performance of self management behaviors. Thus far, this review has highlighted the existing evidence and methodological problems in both the definition of fatigue, and consistent measurement in this area of research.

#### *A Critique of the Studies on Fatigue in Diabetes*

There were only five studies found in the literature that assessed fatigue as a symptom in the diabetes population in any context. Four of these studies were cross-sectional, preventing determination of causality. These four studies included type 1 diabetes, type 2 diabetes, diabetes with additional co-morbid chronic disease, and gestational diabetes populations, which prevents generalizability across studies. However, three of these studies used the Checklist of Individual Strength to measure fatigue (Weijman, Ros, Rutten, Schaufeli, Schabracq, & Winnbust, 2003; Weijman, Kant, Swaen, Ros, Rutten, & Schaufeli, et al, 2004; Weijman, Ros, Rutten, Schaufeli, Schabracq, & Winnbust, 2005) which has been validated in healthy working populations (Beurskens, Bultmann, Kant, Vercoulen, Bleijenberg, & Swaen, 2000). This multidimensional measure assesses severity and behavioral consequences of fatigue using a 7-point Likert scale. All three studies reported a cut-score of 76 indicating prolonged

fatigue, which is consistent with previous empirical research in a working population (Bultmann, de Vries, Beurskens, Bleijenberg, Vercoulen, & Kant, 2000). Additionally, this facilitates generalizability in terms of a valid point of reference across studies, which has been lacking in previous research.

Two of these studies included both type 1 and type 2 diabetes (Weijman, Ros, Rutten, Schaufeli, Schabracq, & Winnbust, 2003; Weijman, Ros, Rutten, Schaufeli, Schabracq, & Winnbust, 2005), the third included “diabetics” and compared them to four additional comparison groups that included both “healthy” individuals, individuals with diabetes with additional co-morbidity, and individuals with other chronic illnesses (Weijman, Kant, Swaen, Ros, Rutten, & Schaufeli, et al, 2004).

Diabetes-illness related variables accounted for 43.5% of the variance in fatigue in the Weijman et al (2003) study. An additional 16.3% of the variance in fatigue was explained by work characteristics. In a similar study, 30% of the population of insulin treated diabetics (type 1 and type 2 diabetes) reported CIS scores above 76, indicating they experienced prolonged fatigue (Weijman et al., 2004). This finding is supported by two of the three studies described above (Weijman et al., 2003; Weijman et al., 2005), suggesting fatigue is consistently reported *more* frequently in diabetic working populations when compared to healthy controls without diabetes. It should be noted that the third study did not support these findings, and reported contrasting findings with results, indicating that individuals with diabetes and no other co-morbid conditions reported *similar* fatigue levels to a “healthy” population. However, once additional co-morbidity was included in analyses, fatigue severity was significantly higher for diabetic

groups that also had additional physical illness (Weijman, Kant, Swaen, Ros, Rutten, & Schaufeli, et al, 2004).

An important consideration in the study of fatigue in diabetes is that associations with self management have been examined. With respect to fatigue and self-management behaviors, individuals who perceived insulin injections or dietary guidelines as a burden, reported higher levels of fatigue, and more depressive symptoms. Those who perceived diabetes self-management behaviors as less burdensome (i.e. less-diabetes-specific distress) were more likely to engage in that behavior, and reported lower levels of fatigue than if the behavior was perceived as more burdensome (Weijman, Kant, Swaen, Ros, Rutten, & Schaufeli, et al, 2004). This provides preliminary evidence of a relationship between diabetes-specific distress, co-morbidity, and fatigue that warrants additional attention. The results of this study should be interpreted with caution, due to the inequality of sample size in the differing disease groupings (e.g. N = 8,946 in the healthy group vs. N = 76 in the DM only condition and N = 65 in the DM group with comorbidity). This is believed to be a significant finding in terms of building a conceptual framework, as research has indicated higher disease comorbidity to be associated with poorer diabetes outcomes.

The fourth cross sectional study included in this critique attempted to understand exercise beliefs and behaviors in women with gestational diabetes (Downs & Ulbrecht, 2006). Researchers conducted this study without a priori hypotheses, to prevent “biased” results. Furthermore, although fatigue was included as an outcome variable, it was not defined and specific information as to how fatigue was assessed was not included in the paper. Nonetheless, fatigue was reported as the strongest barrier preventing engaging in

exercise during pregnancy. This result was no longer significant in a post-partum assessment. These results are to be interpreted with caution due to associated methodological limitations in the manner in which fatigue was assessed. As this was a small descriptive study, there was a small sample size (N=28) and no comparison group. Due to these issues, it is unclear if fatigue as a barrier to exercise is specific and unique to a diabetic pregnant population or if this barrier is also relevant in healthy pregnant or non-pregnant diabetes populations as well. Due to the known benefits of exercise on diabetic outcomes, replication is warranted in both type 1 and type 2 diabetes populations, as fatigue could be identified as a potential target for intervention. Exercise has a known paradoxical impact on both fatigue and glycemic control. Continuing this line of research is recommended to further explore this relationship.

One recent longitudinal study included in this review (conducted in 2005) examined a diabetes-screening program for type 2 diabetes. The Hoorn Screening study focused on the level of diabetes-specific symptom distress and its relationship to negative mood in individuals enrolled in a screening program for type 2 diabetes (Adriaanse et al., 2005). This Dutch study included 319 participants recruited from a pre-existing study of a screening program for type 2 diabetes (N=11,679). Questionnaires included the Type 2 Diabetes Symptom Checklist (Grootenhuis, Snoek, Heine, & Bouter, 1994) and the Negative well-being subscale of the Well-being Questionnaire (Pouwer, van der Ploeg, Ader, Heine, Snoek, 1999). The sample was divided based on their screening results; 156 of the participants received a diagnosis of type 2 diabetes, and the remaining 163 were identified as non-diabetic. The final sample included 116 participants who received a diagnosis and 130 who were non-diabetic.

Results of this study demonstrated that subjects with type 2 diabetes were significantly more burdened by fatigue symptoms in the first year post-diagnosis than were the individuals in the non-diabetic group. This group difference was also found to be stable over time. This provides longitudinal evidence that fatigue is a distressing symptom for individuals with type 2 diabetes for the first year post-diagnosis. It is also possible that the finding of greater psychological fatigue in the first year was due to diabetes-specific distress associated with diabetic symptoms and the new attempts to follow recommended self-management behaviors. This study provides evidence that within the first year after diagnosis, fatigue is not only perceived to be significantly different for individuals with type 2 diabetes compared to non-diabetic individuals, but that it is stable over time. Since this study only followed participants for one year it is unclear if this temporal relationship remains significantly longer than 12 months.

#### *Summary and Limitations of Literature on Fatigue in Diabetes*

The results of the five studies presented above suggest that fatigue is common in the diabetic population and warrants further attention. Diabetes-specific distress has been discussed above as a contributor to prolonged fatigue. Research has also linked diabetes-specific distress to depression. Finally, fatigue has been identified as an exercise barrier for women with gestational diabetes. However, there were no studies identified in the literature examining fatigue among diabetes in medical settings (i.e. primary care, diabetes clinics) to gain additional insight into the impact of fatigue. Because these studies included working populations and pregnant women, it is possible that assessment within a medical setting would produce different results.

The above sections have illustrated the importance of measuring fatigue and depressive symptomatology in a diabetes population. Previous sections highlight the essential role of self-management for successful diabetes management. However, the impact of diabetes-specific distress, depressive symptomatology, and fatigue on quality of life, specifically health related quality of life has not yet been addressed in this proposal. Quality of life serves as an important outcome in the diabetes literature, as it has been shown to be an essential construct when discussing self-management. The following section will highlight the current literature focusing on what is known about the relationship between diabetes and health-related quality of life.

### Measuring Fatigue-related Outcomes in Diabetes

#### *Defining Quality of Life*

Quality of Life can be defined as the ways in which health, illness, and medical treatment effect an individual's perception of their daily functioning and well-being (Guyatt, Feeny, & Patrick, 1993). Recent literature suggests quality of life has increasingly been utilized as an outcome measure with individuals with chronic disease, including diabetes mellitus (Jacobson, de Groot, & Samson, 1997). Individuals with chronic illnesses often report decreased Quality of Life when compared to individuals without chronic illnesses (Stewart, Greenfield, Hays et al, 1989). However, the reasons for these differences are often multi-factorial, and poorly understood.

#### *Quality of Life and Diabetes*

There is a large body of literature evaluating Quality of Life in diabetes mellitus. What is currently known about diabetes mellitus and Quality of Life is that Quality of Life is influenced by the number of secondary illnesses co-occurring (Rubin & Peyrot,

2002), and the frequency of serious metabolic complications that arise (Weinger & Jacobson, 2001). As previously mentioned, depressive symptomatology has been shown as an independent risk factor for decreased Quality of Life independent of physical complications or chronic illnesses individuals may also have (Barge-Schaapveld, Nicolson, Berkhow, and deVries, 1999). This has also been documented in the diabetes specific literature; individuals who experience depressive symptomatology often experience decreased Quality of Life, independent of number of secondary complications (Hanninen, Takala, and Keinanen-Kiukaanniemi, 1999). As previously reviewed in this paper, self-management is a key component of diabetes care and this plays an important role in health-related outcomes and well-being. The next section will review the existing Quality of Life literature to further explain what is known about this construct in relationship to diabetes self-management.

#### *Impact of Diabetes Self-Management on Quality of Life*

Recent literature has suggested successful management of diabetes improves quality of life. The inverse is also true; it has been suggested that suboptimal self-management has been linked to decreased quality of life. Additionally, quality of life decreases as a function of increased number of diabetic complications (Jacobsen, de Groot, & Samson, 1995; Glasgow, Ruggiero, Eakin, Dryfoos, & Chobanian, 1997). There is also evidence to suggest individuals with type 2 diabetes who are required to adhere to a daily insulin regimen frequently report a decreased quality of life (Jacobsen, de Groot, & Samson, 1995). It appears the insulin regimen itself can be another potential source of distress for individuals with type 2 diabetes. However, there is limited literature in this area; additional research is needed to better understand this relationship.

*Self-Management of Diabetes as an Outcome Variable.*

Self-management has been studied extensively in the diabetes literature. Research indicates diabetes is a unique disease due to the level of involvement of behavior in self-management and required regimen adherence. According to the American Association of Diabetes Educators (AADE), there are seven behaviors that together are seen as necessary for successful diabetes management. These behaviors include: being physically active, diet, medication taking, self-monitoring of blood glucose, problem solving (managing high and low levels, sick days, etc.), reducing risks of complications, and psychosocial adaptation to living with diabetes (AADE, 2003). Literature indicates these ongoing, multiple behavioral demands are the key factors that distinguish the demands of living with diabetes from those of other chronic illnesses, which may require maintaining only a select few of these behaviors (ADA, 2006).

It is well-established that the seven self management behaviors components do not correlate highly with one another, suggesting individuals can be adherent to one behavior while ignoring another (Glasgow & Eakin, 1998; Rubin & Peyrot, 1992; Orme & Binik, 1989). This suggests there is a multidimensional component to self-management. Due to the relative independence of the behaviors research suggests each component needs to be assessed separately when evaluating diabetes self-management outcomes (Johnson, 1992). This assessment of individual behavioral domains discussed in the behavioral diabetes literature as the preferred methodological approach to measuring self-management outcomes rather than creating a composite score summing all of the behaviors. For this dissertation project, blood glucose testing and diet are the individual self-management behaviors targeted for inclusion due to the impact of these



behaviors on maintaining optimal diabetes control. These two self-management behaviors will be discussed below.

### *Blood Glucose Testing*

Blood Glucose testing is recommended for individuals with diabetes to assess glycemic control. The ADA (2007) recommends blood glucose testing for individuals with type 2 diabetes. Individuals prescribed an insulin regimen are recommended to test their blood glucose 3 or more times daily to achieve their glycemic goals. Individuals not on an insulin regimen are recommended to test their blood glucose levels less frequently than those on an insulin regimen. The frequency of self-monitoring of blood glucose should be determined based on maximizing blood glucose control. Research suggests individuals who maintain optimal glycemic control frequently report blood glucose testing as a key element in their self-management regimen thus highlighting its importance (ADA, 2007). Additionally, the negative impact of depression has also been identified in the self-monitoring of blood glucose literature. It is useful to examine the emotional impact of global depressive symptomatology, diabetes-specific distress, and fatigue on frequency of self-management of blood glucose to gain a better understanding of the impact of these constructs on blood glucose testing.

### *Diet*

Diet was selected due to the importance of maintaining nutritional standards in addition to minimizing or delaying the onset of additional complications. Obesity is an independent risk factor for type 2 diabetes, and is often the result of poor nutritional habits. Due to the rising rates of type 2 diabetes and obesity, diet was selected as a behavior to assess, due to the health benefits of maintaining a healthy diet. Maintenance

of a healthy diet is important for many individuals with type 2 diabetes because it can lower blood sugar, triglycerides, blood pressure, cholesterol, and controlling weight (ADA, 2007). Research suggests maintaining a healthy diet is difficult for individuals to maintain (Toobert & Glasgow, 1994). This study sought to examine the frequency of dietary adherence. Additionally, due to the potential impact of depression on diet, this study examined the impact of global depressive symptomatology, diabetes-specific distress, and fatigue on the self-management of diet in individuals with type 2 diabetes.

### Purpose of Study

This study sought to explore the frequency and intensity of diabetes-specific distress and depressive symptomatology, including fatigue in adults with type 2 diabetes mellitus. Glasgow's Personal Models of Diabetes Self-management was used as a conceptual framework for examining the associations between depressive symptomatology, diabetes-specific distress, fatigue (and its potential for overlap with depression), self-management behaviors, and health related quality of life. The results of this study informed the literature on personal models of diabetes management by including the emotion component and within this framework distinguishing global depressive symptomatology, diabetes specific distress, and fatigue. Additionally, this dissertation was designed to explore the associations between these constructs and self-management behavior and quality of life.

### *Specific Aims*

#### *Aim I*

The primary aim of this study was to examine personal model constructs of diabetes management. Specifically, this study examined the individual levels of and

relationships between potential emotional aspects of diabetes (depressive symptomatology, diabetes-specific distress, and fatigue) using validated measures

*H1 (Hypothesis #1):* Hypothesized individual correlations between independent variables are listed in Table 3. It was believed the independent variables depressive symptomatology, diabetes specific-distress, and fatigue would be moderately associated with one another.

#### *Aim II*

A second aim of this study was to examine the unique associations of emotional distress with diabetes self-management behavior, physical, and mental quality of life, controlling for demographic variables and diabetes regimen demand. Hypothesized individual correlations between independent and dependent variables are listed in Table 4. Specifically, the following hypotheses were proposed:

#### *H2 (Hypothesis #2)*

Independent variable global depressive symptomatology (CESD-10) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and significantly associated with frequency of blood glucose testing on the SDSCA. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

#### *H3 (Hypothesis #3)*

Independent variable global depressive symptomatology (CESD-10) controlling for demographic (age, gender, and BMI), diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and

significantly associated with frequency of diet adherence on the SDSCA. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H4 (Hypothesis #4)*

Independent variable diabetes-specific distress (PAID) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and significantly associated with frequency of blood glucose testing on the SDSCA. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H5 (Hypothesis #5)*

Independent variable diabetes specific distress (PAID) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and significantly associated with frequency of diet adherence on the SDSCA. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H6 (Hypothesis #6)*

Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and significantly associated with frequency of blood glucose testing on the SDSCA. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H7 (Hypothesis #7)*

Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and significantly associated with frequency of diet adherence on the SDSCA. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H8 (Hypothesis #8)*

Independent variable global depressive symptomatology (CESD-10) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and significantly associated with the physical function scores on the SF-12. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H9 (Hypothesis #9)*

Independent variable global depressive symptomatology (CESD-10) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be positively and significantly associated with mental well-being on the SF-12. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H10 (Hypothesis #10)*

Independent variable diabetes-specific distress (PAID) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral

medication use), and anti-depressant use would be negatively and significantly associated with physical function scores on the SF-12. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H11 (Hypothesis #11)*

Independent variable diabetes-specific distress controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be positively and significantly associated with mental well-being on the SF-12. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H12 (Hypothesis #12)*

Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be negatively and significantly associated with physical function scores on the SF-12. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

*H13 (Hypothesis #13)*

Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use would be positively and significantly associated with mental well-being on the SF-12. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.

## METHODS

### *Description of Participants*

Participants were adults with diabetes receiving diabetes care at the Joslin Diabetes Center at Floyd Memorial Hospital in New Albany, Indiana. Joslin Diabetes Center offers both inpatient and outpatient clinic that offers a variety of treatment, education, and exercise programs for adults with both type 1 and type 2 diabetes. Participants included in this study were men and women who met the following eligibility criteria: (1) must have received a diagnosis of type 2 diabetes mellitus, (2) be over the age of 21, (3) are taking medication for their diabetes (e.g. oral agents, insulin, or both), (4) could successfully complete the Mini-Cog, and (5) read, write, and understand English. This protocol was approved by the Institutional Review Board(s) of both the University of Louisville, and Floyd Memorial Hospital.

### Procedure

#### *Participant Recruitment*

Individuals presenting to the Joslin Diabetes Center to receive routine care were invited to participate in this study by research personnel. All research/project personnel completed both HIPAA and CITI training requirements. Participants were invited while waiting for routine clinic appointments. Research personnel determined eligibility of patients by receiving a list of eligible participants from the medical administrative staff. Individuals were invited to participate in one of two ways: (1) Research personnel called the patient into an exam room for screening, or (2) research personnel approached the

patient while already in an exam room. Both methods accommodated HIPAA requirements. Participants then received consent and HIPAA forms and completed them with the study personnel.

### *Screening*

Screening approach consisted of the study personnel asking direct questions related to the eligibility criteria. Questions assessed for diabetes status, medication use, whether the participant was over the age of 21, and could read, write, and understand English. In addition, the research personnel administered the MINI-COG to screen for cognitive impairment. Participants were read three words then were asked to draw a clock with hands pointing to a specific time. Upon completion of the clock drawing task, participants were asked to recall the original three words they were read. If a participant incorrectly drew the clock and/or could not remember the words they were read, they were determined to be ineligible and were thanked for their time and participation. Eligible individuals were invited to participate in the study, and received the questionnaire packet. They were reminded their participation is voluntary, and that they would be asked to read and fill out a survey that would take approximately 30 minutes to complete.

### *Data Collection*

Participants were given two options for questionnaire completion and return: (1) completing the questionnaire while waiting for their clinic appointment and returning it in the provided manila envelope directly to research staff, or (2) completing the questionnaire and returning it directly to the research personnel at the University of Louisville via mail, using a pre-stamped manila envelope. In addition to the self-report



questionnaire packet, a subsequent chart review was conducted to collect information regarding the participant's HbA<sub>1c</sub> value, height, weight, fasting glucose, duration of diabetes, and use of medication (exogenous insulin, oral diabetes agents, and antidepressants) corresponding to measurements made on the day on which they were enrolled in the study. Additionally, chart recorded information listing complications associated with diabetes and additional medical comorbidity information was recorded. Diabetes related co-morbidities were compiled into a database using only a subject identification number.

### Measures

Table 5 and Table 6 summarize measures used for the independent and dependent variables respectively.

*Sociodemographic Questionnaire.* Data concerning background and socioeconomic characteristics was collected from each study participant. This questionnaire contains 12-items, which include age, gender, educational achievement, marital status, current living arrangement, employment status, race/ethnic background, height, and weight.

*The Mini-Cog.* The Mini-Cog is a composite measure used as a screener for cognitive impairment (Borson, Scanlan, Brush, Vitaliano, & Dokmak, 2000). This test was designed to discriminate between individuals with and without cognitive impairment. This brief instrument includes a 3-item recall and a clock drawing task. Recent literature addressed the utility of the Mini-Cog in primary care clinics; results indicated the Mini-Cog to be superior to the MMSE. This measure is believed to be easier to administer, and displays believed less bias with literacy and low-education issues (Ismail, Rajji,

Shulman, 2009). Screening criteria was consistent with the original scoring by Borson et al (2000). Individuals who were able to correctly identify all three items on the 3-item recall task were included in the study. If an individual correctly identified 1-2 items of the 3-item recall task, the clock drawing was analyzed for accuracy. If the clock was accurate (i.e. numbers accurately drawn, correct time, appropriate drawing and placement) the participant was included in this study. If an individual could not recall any of the 3-item recall items and/or could not produce an accurate clock, s/he was excluded from the study.

*Center for Epidemiological Studies of Depression Scale -10 (CESD-10).* The CESD-10 (Andersen, Malmgren, Carter, & Patrick, 1994) is a shortened version of the original 20-item measure designed to assess depressive symptomatology in a general population. Individuals are asked about the frequency or duration of which they experience cognitive, affective, and behavioral symptoms of depression within the preceding week. This measure uses a four point rating scale that ranges from “rarely to none of the time (less than one day)” (0) to “most or all of the time (5-7 days)” (3). The range of possible scores is from 0-60, with higher scores indicating a higher frequency of depressive symptoms. The CESD-10 has been used extensively in populations with chronic diseases, and is believed to be a valid measure of global depressive symptomatology. The CESD-10 has good psychometric properties, including a reliability coefficient of 0.85.

*Problem Areas In Diabetes Scale (PAID).* Due to the importance of diabetes-related distress, the Problem Areas In Diabetes Scale (PAID) (Polonsky, Anderson, Lohrer, Welch, Jacobson, Aponte, & Schwartz, 1995) was created as a tool to assess the

construct of diabetes related distress both as a clinical tool and an outcome measure (Welch, Weinger, Anderson, & Polonsky, 2003). The PAID is a 20-item single-factor measure of diabetes related distress developed by the Joslin Diabetes Center and Harvard Medical School. This instrument has a 5-point item scaling, ranging from “Not a problem” = 0 to “Serious Problem” = 4. Original scoring was a summed total; higher scores were indicative of higher levels of diabetes-specific distress. Original scoring has been simplified to a transformed scaled score ranging from 0-100, with higher scores demonstrating greater diabetes-specific distress. The main focus of the items surrounds feelings and moods associated with specific aspects of diabetes. The PAID has been found to be unrelated to age, duration of diabetes, education, ethnicity, and gender (Welch, Weinger, Anderson, & Polonsky, 2003).

*Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF)*. The Multidimensional Fatigue Symptom Inventory-Short Form is an excellent example of a multidimensional fatigue measure. It was designed by researchers based on the existing literature suggesting that fatigue is a multidimensional symptom that can be best captured by evaluating five dimensions: general (i.e. severity), affective, physical, mental, and vigor (Stein, Martin, Hann, & Jacobsen, 1998). Additionally, it has been argued due to the absence of disease-specific information, it is a flexible measure that can be used in a variety of populations (Dittner, Wessely, & Brown, 2004). The MFSI-SF is believed to have good psychometric properties, including excellent internal consistency, good diagnostic validity, good test-retest reliability, and sufficient ability to discriminate between fatigued and non-fatigued individuals (Wu & McSweeney, 2001).

*Personal Illness Models Questionnaire.* This questionnaire has been previously used in Glasgow et al's (1997) study examining personal models of diabetes. This measure assesses beliefs about treatment effectiveness by asking two specific questions about individual areas of self-management (physical activity, glucose testing, recording glucose test results, taking medication, checking feet, and eating low fat foods). Each regimen area contains two personal model items: "How important do you believe \_\_\_\_\_ is for controlling your diabetes?" and "How likely do you think it is that \_\_\_\_\_ will prevent future complications?" Responses are provided on a five-point rating scale ranging from (1) not at all important/likely to (5) very important/likely. These scores are averaged to produce a regimen-specific effectiveness score. This measure yielded sufficient internal consistency reliability ( $\alpha = .89$ ) as a measure of treatment effectiveness.

*Medical Outcomes Study Short Form 12 (SF-12).* The SF-12 is an abbreviated version of the original SF-36, which was designed to measure global level of functioning (Ware, Kosinski, & Keller, 1996). This measure contains 12-items that measure physical function (physical) and well-being (mental), with higher scores indicating better functioning. Estimates of reliability for the physical and mental component scales are 0.89 and 0.86 respectively. Normative data is also available for a diabetic population suggesting this instrument is both reliable and valid.

*The Summary of Diabetes Self-Care Activities Measure (SDSCA).* The SDSCA is a brief self-report measure that measures levels of self-management across multiple diabetes self-management behaviors over the previous seven days using a 0-7 Likert scale (Toobert & Glasgow, 1994). The revised SDSCA contains 11-items that assess the

frequency of performance of the following five self-management domains: (1) diet, (2) exercise, (3) blood glucose testing, (4) foot care, and (5) smoking (Toobert, Hampson, & Glasgow, 2000). Only the diet and blood glucose testing items will be administered in this study. A recent review article reported the SDSCA is the most widely used self-report instrument for measuring diabetes self-management in adults. This measure demonstrates good inter-item reliability, test-retest reliability, and validity (Toobert, Hampson, & Glasgow, 2000). The majority of published studies using the SDSCA have focused on type 2 diabetes.

*Covariates:* Several covariates were selected for inclusion in this dissertation. This study sought to explore the emotional component of Glasgow et al's (1997) model of self-management. This influential study included age, gender, oral medication, and insulin use as covariates. This was replicated in this study due to the impact of these variables on both self-management and quality of life. Duration of diabetes and BMI were also selected for inclusion as covariates due to their potential impact on both physical and mental health. Finally, use of anti-depressant medication was selected for inclusion as a covariate due to the potential impact on self-reported emotional distress, self-management, and quality of life.

## Data Analysis

### *Sample Size Calculation*

Cohen (1992) suggests a power analysis should be conducted to inform the number of participants needed to achieve a specified effect size between or within groups. This was conducted using the G\* Power3 program adapted from Faul, Erdfelder, Lang & Buchner (2007). Cohen (1992) recommends .80 as sufficient power to detect a

moderate effect size (.30). Based on Cohen's recommendation, a minimum of 121 subjects is needed to detect a moderate effect size at a significance level of .05 using multiple regression with 8 independent variables (including 3 demographic variables, 3 diabetes-specific variables, and anti-depressant use to be examined as covariates). The number of participants providing valid data exceeded 121 for all hypotheses. This sample size provided adequate power to this study to detect a moderate effect size with 95% confidence for the Primary and Secondary Aims at both the  $p < .05$  and  $p < .01$  levels.

### *Descriptive Statistics*

Descriptive statistics are provided for data from both self-report and chart review. This study focused on a clinical population of adults with type 2 diabetes who received their diabetes care at Joslin Center for Diabetes. Due to the heterogeneity of this population, demographic characteristics such as age, gender, level of education, occupation, ethnicity and body mass index were assessed to describe the characteristics of this sample with hopes to increase generalizability of this study to other populations of individuals with diabetes. Additionally, diabetes-related history such as use of insulin, duration of diabetes, and oral medication is described. Rates of current use of anti-depressant medication are also presented. All questions reflecting independent and dependent variable constructs were scored and descriptive data is presented. Data was analyzed and reported in terms of frequencies, means standard deviations and ranges in table form. T-Tests were used to compare means across groups to test for group differences.

### *Statistical Plan for Hypothesis Analysis*

Hypothesis 1 was tested using Pearson correlations to explore the associations between the total scores of the CESD-10, PAID, and MFSI-SF. A correlation matrix was formed to examine associations between these independent variables.

The hypotheses for Aim 2 (Hypothesis 2-Hypothesis 13) were analyzed using hierarchical linear regression to test if independent variables predict dependent variables. Based upon Glasgow's conceptual framework of Personal Illness Models and the associations with both the independent and dependent variables included in this study, demographic characteristics, diabetes regimen characteristics, and antidepressant use were included as separate blocks in the regression analyses. Demographic variables age, BMI, and gender were entered into the first block, diabetes regimen characteristics (exogenous insulin use, duration of diabetes, and oral agent use) were entered into the second block, antidepressant use was entered into the third block and the predictor term (independent variable) was entered into the fourth block. The effects of the predictor variables (independent variables) were interpreted individually and the change in variance associated was used to evaluate the statistical significance of the predictor variable (independent variable).

## RESULTS

### *Response Rates*

Figure 3 presents a summary of the study recruitment rates. A total of 246 adults with Type 2 Diabetes were invited to participate in this study. Of those invited, 18 (7%) declined participation, 21 (6%) were not eligible to participate due to screening (Mini-Cog), and 207 (87%) were consented and given questionnaire packets. Of the 207 consented participants 151 (73%) completed and returned the questionnaire packet. Fifty-six participants (27% of those consented) did not complete the questionnaire.

### *Completion Rates for Measures*

Participants responded to measures at rates ranging from 94.7% to 98.7% per self-report questionnaire. The SDSCA diet and blood glucose subscales were calculated individually; the percentages of subscale completion rates were noted to be equal (95.4%). The physical and mental component subscales of the Quality of Life measure (SF-12) were also calculated separately; both subscales yielded a response rate of 98.7%.

### *Study Completion Rate Group Differences*

In order to examine potential differences between individuals who provided consent but did and did not complete the study questionnaire packet, participants were grouped by completion status (i.e. those that completed vs. those who did not). Groups were compared on number of complications, Body Mass Index, and HbA<sub>1c</sub> using independent sample t-tests. Significant differences were observed for both duration of Diabetes and HbA<sub>1c</sub>. Those who completed the survey were more likely to have diabetes



longer than those who did not complete the survey  $t(190) = -2.35, p = .02$  (two-tailed). When examining group differences based on HbA<sub>1c</sub>, those who completed the survey had lower HbA<sub>1c</sub> than those who did not complete the survey  $t(191) = 3.81, p = .000$  (two-tailed). There were no statistically significant differences observed in terms of number of complications and completion status. Means and Standard Deviations by completion status are reported in Table 7.

Chi-square statistics were calculated to examine significant differences between completion status and several categorical variables including hypertension, hyperlipidemia, peripheral neuropathy, smoking status, antidepressant use, oral diabetes agent use, and exogenous insulin use. There were no significant group differences observed between completion status and oral agent use, insulin use, antidepressant use, smoking status, hyperlipidemia, and peripheral neuropathy. Comparisons of groups on presence of hypertension and completion status approached significance, with study completers having a trend of being more likely to be hypertensive than those that did not complete ( $p = .057$ ).

### *Demographics*

The demographic characteristics of participants (i.e. the study completers) are summarized in Table 8. Of the total sample of 151 adults, the mean age of participants was 60.7 years (SD=11.2). Participants were comprised of 51.7% females, 93.2% Caucasian, 72.5% married, and 58.9% were retired/disabled. Thirty three percent of participants reported their education as completing high school. Over half of the sample of participants had additional partial college/specialized training (54.1%) with 16.9% completing graduate or other professional training. Table 9 summarizes gender and

ethnicity characteristics of this sample as compared to both Louisville, KY and New Albany, IN (US Census Bureau, 2002).

#### *Descriptive Information on Study Measures and Subscales*

The means, standard deviations, and ranges of the total scores of the measures for the independent and dependent variables are presented in Table 10.

With respect to the CESD-10, the majority of this sample (93%) did not reach the empirically derived cutoff score of 10 (i.e. 7% had scores greater than or equal to 10) recommended by Andresen et al (Andresen, Malmgren, Carter, & Patrick, 1994) suggesting a positive clinical presentation of depressive symptomatology in the present sample.

#### *Gender Comparisons*

##### *Emotion Constructs*

Differences between genders on subscale scores for measures assessing emotion (depressive symptomatology, diabetes-specific distress, and fatigue), self-management (diet and blood glucose testing), and quality of life (physical and mental) were assessed. Means, standard deviations and p-values for corresponding independent sample t-tests are presented in Table 11. Women reported higher depressive symptomatology scores on the CESD-10,  $t(141) = 2.23, p = .03$  (two-tailed). Women also reported lower scores on the SF-12 mental component subscale relative to men  $t(146) = -1.99, p = .048$  (two-tailed).

##### *Medication Use*

Gender differences were also examined with respect to oral diabetes agent use, exogenous insulin use, and antidepressant use using Chi-square statistics. There were no significant differences observed between gender and oral agent use ( $p = .090$ ) or

exogenous insulin use ( $p = .482$ ). There were significant differences observed between gender and antidepressant use  $\chi^2 (1, N = 143) = 4.19, p = .032$ , women were twice as likely to taking antidepressants when compared to men.

### *Self-Management*

Gender differences were also examined with respect to diet and blood glucose testing. Women followed their diet recommendations more frequently according to the Diet subscale of the SDSCA,  $t (142) = 2.21, p = .02$  (two-tailed). There were no gender differences observed with respect to blood glucose testing.

### *Health Status*

Health Characteristics of participants was collected via-chart review at the time of consent. Of the 207 participants consented, chart data was available for 191 (92.3%) of the participants enrolled in this study. However, there were a number of participants who provided consent but did not return the survey. These cases were excluded from analyses including chart review, and the data is presented for 148 of the participants enrolled in this study. The mean duration of diabetes was 143.64 months (11.97 years,  $SD = 102.54$ ; range = 2-554). In response to the SF-12 question "How would rate your present health condition?", 1 (0.7%) participant responded "Excellent", 25 (17.0%) participants responded "Very Good", 68 (46.3%) "Good", 38 (25.9%) "Fair", and 15 (10.2%) "Poor", respectively.

Most of the participants in this sample were non-smokers (88.8%), on diabetes oral agent medication (92.3%), and Obese (80%). Additional analyses were conducted to examine obesity rates by standard obesity classification. Four participants (2.7%) were classified as Normal weight, 24 participants (17.1%) Overweight, 41 participants (27.7%)

Obesity Class I, 36 participants (24.3%) Obesity Class II, and 35 participants (23.6%) Obesity Class III (National Heart, Lung, and Blood Institutes of Health, 2000). Additionally, the mean number of co-morbid health conditions was 4.2 (SD=1.74) which included all medical diagnoses included in the chart; general medical and diabetes-specific comorbidities were included in this calculation. All co-morbid health conditions were diagnosed by clinic physicians and recorded in patients' charts. Patient's medical diagnoses were collected from medical charts by research personnel. Diabetes-specific comorbidities were selected from the comorbidity information and percentages were calculated separately and presented in table 12. The majority of the sample had diagnoses of hypertension (78.2%) and hyperlipidemia (88.7%). Forty-two percent of the sample also had a diagnosis of Peripheral Neuropathy.

The mean sample HbA<sub>1c</sub> was 7.32 (SD=1.45). Sixty-two participants had HbA<sub>1c</sub> below 7 (43.4%), 29.4% of the sample had HbA<sub>1c</sub> between 7 and 7.9, 14.7% of the sample had HbA<sub>1c</sub> between 8 and 8.9, 8.4% had HbA<sub>1c</sub> between 9.0 and 9.9 and 4.2% had HbA<sub>1c</sub> greater than 10. Thirty-five percent of the sample was taking Exogenous Insulin, and 23% of the sample was currently taking antidepressant medication. A summary of participants' health characteristics including sub-groupings of age, HbA<sub>1c</sub>, and Body Mass Index can be found in Table 12. Additionally, a chart depicting the participants' use of diabetes medications can be found in Figure 4.

### *Medication Use Comparisons*

#### *Insulin Use Status*

Participants were grouped and compared on blood glucose characteristics by insulin use status (Exogenous Insulin Use versus No Insulin Use) and compared on blood

glucose testing and health characteristics using independent sample t-tests. Means, standard deviations, and p-values for corresponding independent sample t-tests are reported in Table 13. Participants prescribed insulin were more likely to report that they tested their blood sugar than those who were not,  $t(130) = 2.25, p = .03$  (two-tailed). The mean frequency of those on insulin testing their blood glucose levels was 5.46 (SD=1.88) days per week. Those participants who were not prescribed insulin reported better physical quality of life on the SF-12,  $t(134) = -2.65, p = .009$  (two-tailed). Participants who were prescribed insulin were more likely to have higher HbA<sub>1c</sub> than those who were not,  $t(133) = 5.30, p = .000$  (two-tailed), indicating poorer metabolic control. There were no differences observed in subject age, BMI, or number of complications by insulin use status.

#### *Diabetes Oral Agent Use Status*

Participants were also grouped and compared by diabetes oral agent use status (i.e. those that took oral agents versus those that did not) using an independent sample t-test. Comparisons were examined for self-management, quality of life, depressive symptomatology, diabetes specific distress and fatigue. No significant differences were observed.

#### *Anti-Depressant Medication Use Status*

Participants were also grouped and compared by antidepressant medication use status (i.e. those that took oral agents versus those that did not) using an independent sample t-test. Means, standard deviations, and p-values for corresponding independent sample t-tests are reported in Table 14. Comparisons were examined for self-management, quality of life, depressive symptomatology, diabetes specific distress and

fatigue. Participants taking antidepressants reported higher depressive symptomatology scores  $t(135) = 2.87, p = .005$  (two-tailed), higher diabetes specific distress  $t(140) = 2.54, p = .015$  (two-tailed), and higher fatigue  $t(139) = 3.67, p < .001$  (two-tailed) than those that do not. Additionally, participants who were not taking antidepressants reported lower physical  $t(141) = -2.53, p = .013$  (two-tailed) and mental quality of life  $t(141) = -3.79, p = .000$  (two-tailed) scores relative to those not taking antidepressants. No significant differences were observed for diet or blood glucose monitoring SDSCA scores by anti-depressant medication use status.

### **Hypothesis testing and analyses**

Analysis of individual aims and hypotheses are listed below.

#### *Aim 1*

##### *Hypothesis 1 Analysis*

Hypothesis one examined the associations between depressive symptomatology, diabetes specific-distress, and fatigue. It was hypothesized these variables would be moderately associated with one another. The individual correlations between the measures reflecting emotional distress are summarized in Table 15. Overall, correlations supported this hypothesis: depressive symptomatology, diabetes specific-distress, and fatigue were all moderately associated with one another. Table 16 summarizes the correlations between emotional distress measures (independent variables) and self-management and quality of life (dependent variables). Table 17 summarizes the intercorrelations between the covariates, independent and dependent variables.

### *Depressive Symptomatology*

As seen in Table 17, depressive symptomatology was positively associated with fatigue and diabetes-specific distress as hypothesized. Depressive symptomatology was significantly negatively associated with gender, antidepressant use, physical quality of life, mental quality of life, and diet. Depressive symptomatology was not significantly associated with blood glucose testing, age, BMI, duration of diabetes, exogenous insulin use or diabetes oral agent use.

### *Diabetes-Specific Distress*

As seen in Table 17, diabetes-specific distress (PAID) scores were significantly and positively associated with fatigue, depressive symptomatology, and HbA<sub>1c</sub>, and significantly and negatively associated with antidepressant use, physical quality of life, mental quality of life, and diet. Diabetes-specific distress was not significantly associated with blood glucose testing, age, gender, BMI, duration of diabetes, exogenous insulin use or diabetes oral agent use.

### *Fatigue*

Fatigue (Total Score of the MFSI-SF) was positively associated with depressive symptomatology and diabetes-specific distress, and negatively associated with antidepressant use, physical quality of life, mental quality of life, and diet. Fatigue was not significantly associated with blood glucose testing, age, gender, BMI, duration of diabetes, exogenous insulin use or oral agent use.

### *Aim II*

## **Self-Management Outcomes**

### *Depressive Symptomatology Predicting Blood Glucose Testing*

Table 18 summarizes the findings of the hierarchical linear regression used to assess hypothesis 2, with blood glucose testing as the dependent variable and depressive symptomatology as the independent variable. The table includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The only step in the model that retained significance was the demographic step, which included BMI, gender, and age  $F(3, 119) = 6.17, p = .001 (R^2 = .135)$ . The change in variance associated with the addition of the predictor was not significant ( $p = .102$ ). No further analyses were conducted.

#### *Depressive Symptomatology Predicting Diet*

Table 19 summarizes the findings of the hierarchical linear regression used to assess hypothesis 3 with diet as the dependent variable and depressive symptomatology as the independent variable. The table includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The change in variance associated with the addition of the predictor was not significant ( $p = .107$ ). Demographics, diabetes regimen demand, and antidepressant use were also non-significant. No further analyses were conducted, this hypothesis was not supported.

#### *Diabetes-Specific Distress Predicting Blood Glucose Testing*

Table 20 summarizes the findings of the hierarchical linear regression used to assess hypothesis 4 with blood glucose testing as the dependent variable and diabetes-specific distress as the independent variable. The table includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 124) = 6.23, p =$



.001 ( $R^2 = .131$ ). The change in variance associated with the addition of the predictor was not significant ( $p=.269$ ). No additional analyses were completed.

#### *Diabetes-Specific Distress Predicts Diet*

Table 21 summarizes the findings of the hierarchical linear regression used to assess hypothesis 5 with diet as the dependent variable and diabetes-specific distress as the independent variable. The table includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. Diabetes-specific distress retained statistical significance in this model, which included PAID total score,  $F(1, 119) = 10.23, p = .002$  ( $R^2 = .131$ ). The PAID total was significantly (negatively) correlated with diet ( $r = -.234, p = .004$ ). Demographics, diabetes regimen demand, and antidepressant use were not significant in this model.

#### *Fatigue Predicts Blood Glucose Testing*

Table 22 summarizes the findings of the hierarchical linear regression used to assess hypothesis 6 with blood glucose testing as the dependent variable and fatigue as the independent variable. The table includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 122) = 6.38, p = .000$  ( $R^2 = .136$ ). The change in variance associated with the addition of fatigue was not significant ( $p = .115$ ). No additional analyses were completed.

### *Fatigue Predicts Diet*

Table 23 summarizes the findings of the hierarchical linear regression used to assess hypothesis 7 with diet as the dependent variable fatigue as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. Fatigue retained statistical significance in this model, which included the MFSI-SF total score,  $F(1,117) = 6.37, p = .01$  ( $R^2 = .116$ ). The MFSI-SF total was significantly negatively correlated with diet ( $r = -.221, p = .007$ ). Demographics, diabetes regimen demand, and antidepressant use variables were not significant in this model.

### **Quality of Life Outcomes**

#### *Depressive Symptomatology Predicts Physical Quality of Life*

Table 24 summarizes the findings of the hierarchical linear regression used to assess hypothesis 8 with physical quality of life as the dependent variable (Physical Component Score of the SF-12) and depressive symptomatology as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. With respect to Physical Component Score interpretation on the SF-12, a higher score is indicative of "better" quality of life. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 122) = 3.94, p = .01$  ( $R^2 = .088$ ). Depressive symptomatology also retained statistical significance in this model, which included the CESD-10 total score,  $F(1,117) = 13.28, p = .000, (R^2 = .246)$ . CESD-10 total was significantly negatively correlated with the Physical Component Score of the SF-12 ( $r = -.294, p = .000$ ). Diabetes regimen demand and antidepressant use variables were not significant in this model.

### *Depressive Symptomatology Predicts Mental Quality of Life*

Table 25 summarizes the findings of the hierarchical linear regression used to assess hypothesis 9 with mental quality of life (Mental Component Score of the SF-12) as the dependent variable and depressive symptomatology as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. With respect to Mental Component Score interpretation on the SF-12, a higher score is indicative of "better" quality of life. Demographics and diabetes regimen demand were not statistically significant in this model. Antidepressant use (block 3) retained significance in this model,  $F(1, 118) = 6.97, p = .009 (R^2 = .111)$ . Depressive symptomatology also retained statistical significance in this model, which included the CESD-10 total score,  $F(1, 117) = 68.58, p = .000 (R^2 = .246)$ . Antidepressant use was significantly (positively) correlated with the Mental Component Score of the SF-12 ( $r = .259, p = .002$ ). Depressive symptomatology was significantly (highly negatively) correlated with the Mental Component Score ( $r = -.622, p = .000$ ).

### *Diabetes-Specific Distress Predicts Physical Quality of Life*

Table 26 summarizes the findings of the hierarchical linear regression used to assess hypothesis 10 with physical quality of life as the dependent variable and diabetes-specific distress as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 127) = 4.66, p = .046 (R^2 = .099)$ . Antidepressant use (block 3) retained significance in this model,  $F(1, 123) = 4.08, p = .046 (R^2 = .163)$ . Diabetes-specific distress also retained statistical

significance in this model, which included the PAID total score,  $F(1,117) = 4.44, p = .037$  ( $R^2 = .192$ ). Antidepressant use was significantly (positively) correlated with the Physical Component Score of the SF-12 ( $r = .163, p = .032$ ). Diabetes-specific distress was significantly (negatively) correlated with the Physical Component Score (MCS) of the SF-12 ( $r = -.244, p = .002$ ). Diabetes regimen demand variables were not significant in this model.

### *Diabetes Specific Distress Predicts Mental Quality of Life*

Table 27 summarizes the findings of the hierarchical linear regression used to assess hypothesis 11 with mental quality of life as the dependent variable and diabetes-specific distress as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 127) = 2.79, p = .043$  ( $R^2 = .062$ ). Antidepressant use (block 3) retained significance in this model,  $F(1, 123) = 7.24, p = .008$  ( $R^2 = .130$ ). Diabetes-specific distress also retained statistical significance in this model, which included PAID total score,  $F(1,122) = 56.50, p = .000$  ( $R^2 = .406$ ). An independent sample t-test was calculated to assess for differences in Mental Component Score and antidepressant use. Those on antidepressants reported higher scores on the Mental Component Score than those not prescribed antidepressants  $t(141) = -3.80, p = .000$  (two-tailed) A higher Mental Component Score is indicative of "better" quality of life, indicating that those on antidepressants self-reported higher quality of life scores than those that are not on antidepressants. The higher an individual's score on the PAID, the more diabetes-specific distress they endorsed. Diabetes-specific distress was significantly negatively correlated with the SF-12 Mental Component Score

( $r = -.614, p = .000$ ). Diabetes regimen demand variables were not significant in this model.

#### *Fatigue Predicts Physical Quality of Life*

Table 28 summarizes the findings of the hierarchical linear regression used to assess hypothesis 12 with physical quality of life as the dependent variable and fatigue as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 126) = 4.23, p = .007 (R^2 = .092)$ .

Antidepressant use (block 3) retained significance in this model,  $F(1, 122) = 5.04, p = .027 (R^2 = .035)$ . Fatigue (MFSI-SF total score) also retained statistical significance in this model  $F(1, 121) = 17.68, p = .000 (R^2 = .107)$ . Those on antidepressants reported higher scores on the Physical Component Score than those not prescribed antidepressants  $t(141) = -2.53, p = .013$  (two-tailed). Fatigue was significantly and negatively correlated with the SF-12 Physical Component Score ( $r = -.374, p = .000$ ). Diabetes regimen demand variables were not significant in this model.

#### *Fatigue Predicts Mental Quality of Life*

Table 29 summarizes the findings of the hierarchical linear regression used to assess hypothesis 13 with mental quality of life as the dependent variable and fatigue as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. Demographics and diabetes regimen demand were not statistically significant in this model. Antidepressant use (block 3) retained significance in this model,  $F(1, 122) = 7.55, p = .007 (R^2 = .112)$ . Fatigue also retained statistical

significance in this model, which included MFSI-SF total score,  $F(1,121) = 86.81, p = .000$  ( $R^2 = .483$ ). Those on antidepressants reported higher scores on the SF-12 Mental Component Score than those that not prescribed antidepressants  $t(141) = -2.53, p = .013$  (two-tailed). Fatigue was significantly and highly negatively correlated with the SF-12 Mental Component Score ( $r = -.669, p = .000$ ) suggesting as fatigue scores increase, quality of life scores decrease.

### **Supplemental Analyses Representing Emotional Distress**

Associations observed between measures indicate overlap in assessment approaches. This raises additional issues for consideration in relation to study aims. One of the aims of this study sought to evaluate the potential role of fatigue as a viable construct within the diabetes literature. Three of the four original hypotheses pertaining to fatigue were retained in the proposed analyses, suggesting fatigue plays an important role in diet and physical and mental quality of life for individuals with diabetes. Fatigue was not significantly associated with blood glucose testing. However, the associations among the three dependent variable constructs ranged from .581 to .657, indicating moderate to high associations with one another. A key question then remains, is fatigue uniquely contributing to as an independent construct or is this measurement error? An exploratory item analysis was conducted to explore this issue.

#### *Item overlap across emotional distress measures*

First, *individual items* were reviewed from the CESD-10, PAID, and MFSI-SF to address similarities of these items across measures. Several items were determined to be similar in content and semantic structure and are presented in Table 30.

Item overlap was explained by examining the associations between the specific subscales of the MFSI-SF and the PAID, CESD-10 to identify the possibility of measurement error. This extends the original aims and hypotheses that were focused on the utilization of the total scores on the MFSI-SF and the PAID. Second, the subscales of the MFSI-SF were included in analysis examining the Physical and Mental Component Scores of the SF-12 to examine convergence/divergence. Table 31 includes observed associations between the specific MFSI-SF subscales and the PAID, CESD-10, and both SF-12 composite scores. These correlations ranged from  $-.091$  to  $.657$ . Both the CESD-10 and the PAID were positively associated with the general, emotional, physical, mental and total fatigue subscales, and negatively associated with the vigor subscale. All of these associations were in the moderate to high moderate range. The SF-12 physical component score was positively associated with the vigor subscale, and negatively associated with the general, physical, mental, and total fatigue subscales. Of note, the association between the emotional subscale of the MFSI-SF and the physical component score was not significant, suggesting minimal overlap between these items. The SF-12 mental component score was negatively associated with general, physical, emotional, mental and total fatigue score and positively associated with the vigor subscale.

**Unique contributions of fatigue measurement beyond depressive symptomatology and diabetes distress.**

One of the main goals of this project was to determine the utility of fatigue as a viable construct in the diabetes literature. The overlap between emotional constructs (i.e. depressive symptomatology, diabetes-specific distress and fatigue) that exists was anticipated prior to the start of the study. Due to this overlap, an additional set of four

regressions were also performed to examine the variance fatigue accounted for in this model over and above that of depressive symptomatology and diabetes-specific distress. This was accomplished by including depressive symptomatology and diabetes-specific distress as an additional block in the regression equation. These variables were entered as follows: Demographic variables (Block 1), diabetes regimen demand (Block 2), antidepressant use (Block 3), depressive symptomatology and diabetes-specific distress (Block 4), and Fatigue (Block 5). This approach minimizes error and is a more conservative approach than comparing  $R^2$  across regression equations. The results of these regressions are presented below.

#### *Fatigue and Blood Glucose Testing*

Table 32 summarizes the findings of the hierarchical linear regression used to assess blood glucose testing as the dependent variable and fatigue as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 119) = 6.17, p = .001 (R^2 = .135)$ . Diabetes regimen demand, antidepressant use, depressive symptomatology/diabetes-specific distress, and fatigue were non-significant in this model.

#### *Fatigue and Diet*

Table 33 summarizes the findings of the hierarchical linear regression used to assess diet as the dependent variable and fatigue as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. Demographic variables, diabetes regimen demand, and antidepressants did not reach statistical



significance in this model. The depressive symptomatology/diabetes-specific distress (block 4) did reach significance  $F(2, 114) = 5.30, p = .006 (R^2 = .143)$ . Fatigue did not significantly contribute to the model ( $p = .803$ ).

#### *Fatigue and Physical Quality of Life*

Table 34 summarizes the findings of the hierarchical linear regression used to assess physical quality of life as the dependent variable and fatigue as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 121) = 4.30, p = .006 (R^2 = .096)$ . Diabetes regimen demand did not reach statistical significance in this model ( $p = .111$ ). Antidepressant use was statistically significant in this model  $F(1, 117) = 3.87, p = .05 (R^2 = .169)$ . The depressive symptomatology/diabetes-specific distress (block 4) also did reach significance  $F(2, 115) = 5.98, p = .003 (R^2 = .247)$ . Of note, fatigue (block 5) was a significant predictor over and above the depressive symptomatology/diabetes specific-distress block  $F(1, 114) = 12.37, p = .001 (R^2 = .321)$ . This suggests fatigue may be contributing unique variance to the model when predicting physical quality of life.

#### *Fatigue and Mental Quality of Life*

Table 35 summarizes the findings of the hierarchical linear regression used to assess mental quality of life as the dependent variable and fatigue as the independent variable, and includes  $R^2$ ,  $\Delta R^2$ , and  $\Delta F$  for each step of the hierarchical regression analysis. The demographic step (block 1) retained significance in this model, which included BMI, gender, and age  $F(3, 121) = 2.90, p = .038 (R^2 = .067)$ . Diabetes regimen

demand did not reach statistical significance in this model ( $p = .759$ ). Antidepressant use was statistically significant in this model  $F(1, 117) = 6.19, p = .014 (R^2 = .123)$ . The depressive symptomatology/diabetes-specific distress (block 4) also did reach significance  $F(2, 115) = 52.46, p < .001 (R^2 = .541)$ . Of note, fatigue (block 5) was a significant predictor over and above the depressive symptomatology/diabetes specific-distress block  $F(1, 114) = 22.78, p < .001 (R^2 = .618)$ . This suggests fatigue may be contributing unique variance to the model when predicting mental quality of life.

## DISCUSSION

In this study, relationships between the emotional component of Glasgow's Personal Models of Diabetes Self-management, including blood glucose testing, diet, physical and mental quality of life were assessed. Global depressive symptomatology, diabetes-specific distress, and fatigue were used to examine the emotional construct within this model. An aim of this study was to collect descriptive data to better understand the extent of distress as assessed within each of these constructs and to examine their associations with one another. An additional aim was to examine the associations of each these constructs with key aspects of diabetes self-management and quality of life.

To address the aims described above, a series of 13 specific hypotheses were developed. The analytic plan included conduction of a correlation matrix and 12 individual hierarchical linear regressions. In addition, several supplemental analyses were conducted (individual item examination, an additional regression) to further explain the pattern of results observed. Given the relatively lengthy set of analyses, the discussion section below is organized to first provide a context for interpreting the study results, in order to guide the reader through the findings. This begins with a framework that addresses the study focus in the context of the existing published literature (study strengths, sample characteristics, scores on the key emotional constructs and outcome measures) then notes the gender differences that emerged in the analyses. Following this

contextual information, the discussion examines the findings for each individual aim and hypothesis. An overall summary and discussion of the pattern of results and their implications for the conceptual model and empirical literature follows the discussion of the individual hypotheses.

#### *Strengths of the Current Study*

This study makes a unique contribution to the existing diabetes literature across several domains. This study is the first study to explore the emotional component of Glasgow et al's (1997) model of self-management by integrating literature (e.g., Fisher et al, 2007) that addressed the impact of subclinical depressive symptomatology and diabetes-specific distress on diabetes related outcomes, specifically self-management and quality of life. Fatigue was introduced as a unique construct in the diabetes literature due to its importance as a potential overlapping symptom of both depression and diabetes. This study also contributes to the existing knowledge base by exploring the associations between the emotional constructs (depressive symptomatology, diabetes-specific distress, and fatigue) and self-management (blood glucose testing and diet) and quality of life (physical and mental quality of life). This study is the first to explore these associations in a clinic sample of adults; previously published research has examined the role of fatigue in a adults with diabetes specifically in a worksite setting.

Chart review was conducted to gather relevant medical information including BMI, duration of diabetes, medication use, insulin use, comorbidity status and HbA1c. The chart review data collected in this study revealed the majority of this sample was overweight/obese. These individuals also reported high levels of cardiovascular disease (CVD) comorbidity; which has been cited as being a long-term complication of diabetes

itself. This comorbidity information in the present sample highlights the “real world” health issues of a clinical sample of adults with type 2 diabetes.

The observed findings of this study present opportunities for future research to gain further understanding of the impact of fatigue on a population of adults with type 2 diabetes by addressing the impact of the subscales of fatigue with both physical and mental quality of life. Some of the study’s findings are consistent with current published studies and thus provides an opportunity to guide future research addressing the impact of fatigue on additional domains of self-management, specifically physical activity. Lastly, the hypotheses were addressed within a conceptual framework that has been empirically validated, which also greatly strengthens the opportunity for replication and future research.

#### *Representativeness of Sample*

Individuals who screened out the study due to their performance on the Mini-Cog were not included due to the cognitive capacity needed to complete questionnaire data. The Mini-Cog was included as a screening tool for cognitive impairment; those that completed this screener were included in the study and provided a questionnaire. Those that did not successfully complete this screening tool were excluded due to potential for cognitive impairment. Demographic and health-status information was not collected once an individual did not successfully complete the screening measure. Thus, the study sample was comprised of individuals whom were able to complete the cognitive screener (suggestive of absence of cognitive impairment) and meet eligibility criteria (i.e. a diagnosis of type 2 diabetes, currently prescribed medication, and can read, write, and understand English).

Those individuals who were eligible for participation and consented but did not complete the study measures had significantly higher chart-recorded HBA1-c levels relative to those who completed the study. This suggests that participants who completed the study had relatively good metabolic control relative to those who did not complete the study.

The present study was comprised of 93% Caucasian participants; with African American participant representation considerably lower than the population of Metro Louisville. Of note, New Albany Indiana (the location of the clinic recruitment site), while in close proximity to Louisville KY, has a more rural catchment area and is more populated by Caucasians relative to Louisville (Metro Louisville's population is comprised of 62.9% Caucasians, 33.0% Black/African Americans, 1.4% Asians and 1.9% Hispanics; New Albany Indiana's population is comprised of 90.0% Caucasians, 6.9% Black/African Americans, 0.4% Asians and 1.4% Hispanics, U.S. Census Bureau, 2009). This reflects the ethnic/racial representation in this study sample.

#### *Health Characteristics and CVD Risk*

The majority of this sample was well controlled in terms of their blood glucose levels. Despite adequate blood glucose control ( $HbA1_c < 8 = 29.4\%$ ;  $HbA1_c < 7 = 43.4\%$ ), the majority of this sample of participants were diagnosed with hypertension, hyperlipidemia, and obesity. These factors have all been identified in the literature as independent risk factors for cardiovascular disease (CVD), in addition to the diagnosis of diabetes itself. CVD has been shown in the literature to be the most prevalent complication of diabetes (Mooradian, 2003), and CVD accounts for approximately 65% of mortality rates among persons with diabetes (Grundy, Benjamin, Burke, Chait, Eckel,

et al, 1999). Results from a meta-analysis indicate the rate of CVD mortality for persons with diabetes was 2.2 times greater in men and 2.8 times greater in women compared to otherwise healthy controls (Kanaya, Grady, & Barrett-Connor, 2001).

Recent research is indicative of the severity of consequences CVD risk can have on a population of individuals with diabetes. The UK Prospective Diabetes Study (UKPDS) showed that intensive blood glucose control did not cause a significant reduction in CVD risk or CVD complications (The UKPDS Prospective Diabetes Study (UKPDS) Group, 1998). More recently, there were two large trials completed examining the impact of intensive blood glucose control on reduction in CVD risk- the Action in Diabetes and Vascular Disease-Preterax and Diamicron Modified Release Controlled Evaluation (ADVANCE) and the Veterans Affairs Diabetes Trial (VADT). Results of the ADVANCE trial indicate there are no observed differences in cardiovascular mortality based on intensive blood glucose control (The ADVANCE Collaborative Group, 2008). The VADT yielded similar results; individuals with poorly controlled blood glucose that began an intensive blood glucose regimen did not display reductions in CVD risk (Duckworth, Abraria, Mortiz, Reda, Emanuele, et al, 2009).

The majority of participants in this study maintained CVD risk factors similar to the studies mentioned above (i.e. hypertension, hyperlipidemia, and obesity). This information was collected via chart review. Of note, when participants were asked for their perceptions of their health status (an item on the SF-12), only 18.4% rated their health as Excellent or Very Good. It is believed CVD risk is an important factor to be considered to explain these subjective health ratings. Individual explanations are beyond

the scope of this study, however results suggest CVD risk may be contributing to participant's self-reported health status that warrants further exploration.

#### *Representativeness of Emotional Constructs*

##### *Depressive Symptomatology*

The majority of this sample did not reach the empirically derived cutoff score of 10 on the CES-D 10 recommended by Andresen et al (Andresen, Malmgren, Carter, & Patrick, 1994). This may suggest a positive clinical presentation of depressive symptomatology (93.0%), since 23.1% of the sample is currently prescribed antidepressant medication. The CESD-10 is not intended to diagnose depression, rather its function is to assess for the presence of depressive symptomatology. As discussed by Fisher et al (2007), persons with diabetes often do not meet criteria for a Major Depressive Disorder yet endorse *symptoms* of depression. Brown, Milburn, & Gary (1992) assessed depressive symptomatology using the CESD-20 with older African Americans and found that only 11% of their sample met the cutoff score, consistent with current findings. Large scale studies of depression in diabetes samples indicate that such levels of endorsement are not uncommon; persons with diabetes have been shown to be twice as likely to endorse symptoms of depression relative to those without diabetes (Lustman & Clouse, 2002).

##### *Diabetes-Specific Distress*

The mean PAID score in the current study was 39.7, which is notably higher than the mean PAID scores observed among depressed individuals in the Kokoszka et al (2009) study. Findings of the present study suggest that despite overlap between constructs, the PAID appears to be addressing a separate construct than the CESD-10 in



this study. This finding is consistent with recent literature, which also has indicated that depressive symptomatology and diabetes-specific distress are distinct constructs (Gonzalez, Delahanty, Safren, Meigs, & Grant, 2008).

### *Fatigue*

Correlations observed in this study between the CESD-10 and the MFSI-SF were comparable to associations observed in previous research (Stein, Martin, Hann, & Jacobsen, 1998; Stein, Jacobsen, Blanchard, & Thors, 2004). The mean of the total fatigue score observed in this study was comparable to fatigue levels observed in cancer patients (Prue, Rankin, Cramp, Allen, & Gracey, 2006). The MFSI-SF was developed for use in the cancer population; however, items are not illness-specific and this measure is increasingly being used in non-cancer populations (Stein, Jacobsen, Blanchard, & Thors, 2004). The present study findings support the use of the MFSI-SF in diabetes populations.

### *Antidepressant Use*

Despite individuals endorsing low levels of depressive symptomatology on the CESD-10, 23.1% of the study sample is currently prescribed anti-depressants. When comparing emotional distress across measures representing global and disease specific constructs, those taking antidepressant medications were found to have significantly higher distress scores --across depressive symptomatology, diabetes-specific distress, fatigue, and quality of life measures. This suggests despite the antidepressant therapy, a substantial percentage of participants continue to report higher scores on the CESD-10, PAID, and MFSI-SF indicating higher levels of emotional distress and lower scores on both the Physical Component Score (PCS) and Mental Component Score (MCS) of the

SF-12, indicating poorer perceptions of mental and physical quality of life than those not taking antidepressants. This could be indicative of the benefits of antidepressant use on depressive symptomatology, or a false negative on the self report measures. Women were also more likely to be prescribed antidepressants compared to men. This is consistent with women's relatively higher rates of depressive symptomatology on the CESD-10 as mentioned above.

#### *Representativeness of Self-Management*

Self-management was measured using the SDSCA, which is often used in the literature to assess the frequency of engaging in self-management regimen in the past 7 days. Blood glucose testing means available in the literature range from 4.31 to 5.80 (Forjuoh, Reis, Couchman, & Ory, 2008; Rose, Harris, Ho, & Jayasinghe, 2009). With respect to diet, the mean SDSCA scores (expressed as days adhered to diet) in the published literature range from 3.4 to 4.9 (Lin, Katon, Rutter, Simon, Ludman, et al, 2006; Katon, Russo, Heckbert, Lin, Ciechanowski, et al 2010). Blood glucose testing and diet scores on the SDSCA observed in the present study are consistent with the findings in the current research literature.

#### *Representativeness of Quality of Life*

Mean scores observed for both the Physical and Mental Component Scores of the SF-12 were consistent with means observed with Ware, Kosinski, and Keller (1996). This study also provided normative information for this sample; the observed mean scores were comparable to a sample of individuals with physical limitations and mental difficulty. A recent study examined the quality of life scores related to health status and reported means for obese individuals with diabetes, hypertension, and hyperlipidemia

(Sullivan, Ghushchyan, & Ben-Joseph, 2008) that are comparable to the means observed in the current study. The findings of the studies presented are consistent with the current study suggesting obese individuals with type 2 diabetes report significant deficits in physical and mental quality of life.

### *Gender Differences*

Depressive symptomatology was significantly negatively associated with gender. Females were more likely to have higher scores on the CESD-10 than males. This is consistent with the literature; Egede, Zheng, and Simpson (2003) also found that in a sample of adults with diabetes, women were more likely to maintain higher scores on measures of depression relative to men.

Diabetes-specific distress was unrelated to gender, consistent with findings from Welch, Weinger, Anderson, & Polonsky (2003). Blood glucose testing, age, insulin use, oral agent use, and BMI were all unrelated to PAID scores in this study. Women have been cited in the literature as reporting higher levels of emotional distress than men (Egede, Zheng, and Simpson, 2003). Despite women scoring higher on depression constructs, they did not score differently than males with respect to diabetes-specific distress. This gender difference could provide evidence these distress constructs are independent constructs.

With respect to quality of life, women were more likely to report lower Mental Component Summary scores compared to men. McCollum, Hansen, Ghushchyan, and Sullivan (2007) assessed quality of life using the SF-12 and found that women reported poorer Mental Component Scores than males, which provides support for the current study's findings. Women were also more likely to be prescribed antidepressants, which is

also consistent with reporting higher levels of depressive symptomatology and lower Mental Component Scores.

There were significant group differences observed for men and women with respect to diet. Women had higher SDSCA diet scores, consistent with greater adherence to their recommended diet (approximately one half day per week more) than men. Over half of the sample was married, women could be preparing foods for their husbands. Additionally, women may also be feeding children and grandchildren in the home, which also could explain this finding. This was not formally assessed, future research could assess this issue by adding a single item inquiring who prepares the meals in the home. This could assess this explanation more directly.

*Aim 1: Examining the associations between depressive symptomatology, diabetes-specific distress, and fatigue for adults with type 2 diabetes.*

#### *Hypothesis 1*

The primary aim of this study was to examine the individual levels of and relationships between potential emotional aspects of diabetes, namely depressive symptomatology, diabetes-specific distress, and fatigue. This hypothesis was supported in this study, moderate associations were observed between depressive symptomatology, diabetes-specific distress, and fatigue in this sample of adults with type 2 diabetes.

#### *Depressive Symptomatology*

Depressive symptomatology was assessed in this study using the total score of the CESD-10. Fisher et al (2007) discuss this measure and concluded the CESD-10 is more a measure of global depressive symptomatology and less a diagnostic measure of depressive disorder. Fatigue and diabetes-specific distress were significantly associated

with depressive symptomatology as hypothesized. Fisher et al (2007) discussed concern with potential overlap between depression and diabetes-specific distress and contended these are distinct constructs, but may be contributing to misdiagnosis of depression among individuals with diabetes due to the noted overlap between constructs and the likelihood for participants to endorse items on a depression measure that likely would be better explained by diabetes-specific distress. This may guide researchers and/or clinicians when selecting measures depending on the intended use of the information.

#### *Diabetes-Specific Distress*

Diabetes-specific distress was positively associated with fatigue and depressive symptomatology, as hypothesized. Diabetes-specific distress includes common emotions such as anger, reduced motivation, burnout, guilt, and discouragement related to specific aspects of diabetes. In a study comparing four measures of depressive symptomatology in persons with diabetes, the PAID was found to reflect both major and minor depression (Hermann, Kuzler, Krichbaum, Kubiak, & Haak, 2006). The Hermann et al (2006) study also provided support for overlap between diabetes-related distress and depression. The results of the current study replicate existing empirical support for the overlap between the independence of depressive symptomatology and diabetes-specific distress. In a recent study by Kokoszka, Pouwer, Jodko, Radzio, Mucko et al (2009), the PAID was used to evaluate diabetes-specific distress in a sample of patients with type 2 diabetes. This study concluded PAID scores are lower for individuals without depression than those with both depressive disorders and subclinical depression also supporting overlap between these emotional constructs.

Insulin regimens have been identified in the literature as burdensome for individuals (Makine, Karsidag, Kadioglu, Ilkova, Karsidag, et al, 2009). Participants on an insulin regimen did not differ from those not on an insulin regimen with respect to PAID scores in this sample. The perceived burden of the insulin regimen discussed in recent literature suggested insulin regimens are burdensome and would likely contribute to higher diabetes-specific distress scores. Diabetes-specific distress scores were not associated with insulin use in this study, which is inconsistent with the current literature.

Participants on an insulin regimen had higher HbA1c than those who were not prescribed insulin. Type 2 diabetes varies with respect to treatment options ranging from diet and exercise only, diabetic oral agent medication, an insulin regimen, or a combination of the above. Individuals are often prescribed an insulin regimen when their blood glucose is not optimally maintained with oral agent medication.

Although the insulin regimen was not associated with PAID scores, HbA1c was positively associated with total PAID scores. Additionally, results of the current study found that diabetes-specific distress (PAID) was also negatively associated with SDSCA diet scores, suggesting higher levels of diabetes-specific distress are related to less frequent adherence to diet recommendations. Diabetes-specific distress may be a significant contributor to poor glycemic control and diet adherence that warrants additional attention.

### *Fatigue*

Fatigue is one of the most commonly reported somatic symptoms associated with depression (Vaccarino, Sills, Evans, & Kalali, 2008) and is included in the diagnostic criteria for Major Depressive Disorder in the Diagnostic and Statistical Manual of Mental

Disorders, 4<sup>th</sup> Edition, Text Revision (American Psychiatric Association, 2000). Fatigue has also been identified as an overlapping symptom construct for both depression and diabetes. The present study was the first known to incorporate the construct of fatigue into emotion-based constructs with individuals with type 2 diabetes. Fatigue was found to be significantly and positively associated with both depressive symptomatology and diabetes-specific distress in this study. Fatigue was negatively associated with physical and mental quality of life, diet, and antidepressant use. This suggests that fatigue may impact an individual's perception of their functional status and their mental quality of life. Fatigue is believed to interfere with an individual's ability to adhere to diet recommendations. Fatigue was unrelated to blood glucose testing, age, gender, BMI, duration of diabetes, exogenous insulin use, and oral agent use.

Despite the overlap of fatigue, depressive symptomatology, and diabetes-specific distress, it appears fatigue is a useful construct to assess in adults with type 2 diabetes.

Published research has examined the overlap of fatigue and psychological distress in a working population of adults with diabetes (Jansen, Kant, & van den Brandt, 2002). The present study found results similar to this previous research -- fatigue converged with depressive symptomatology, but it also appears to be an independent construct. Results of this study highlight the utility of fatigue in a clinical population of adults with type 2 diabetes.

*Aim 2: Examine the unique associations of emotional distress with diabetes self-management behavior, physical, and mental quality of life, controlling for demographic variables and diabetes regimen demand.*

*Hypothesis 2 (H2): Global depressive symptomatology (CESD-10) will be negatively and significantly associated with frequency of blood glucose testing on the SDSCA, controlling for demographic variables (age, gender, and BMI), diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use.*

Hypothesis 2 tested the idea that depressive symptomatology decreases adherence to a blood glucose testing regimen in individuals with type 2 diabetes. Hypothesis 2 explored depressive symptomatology as an independent variable used to predict scores on the blood glucose testing subscale of the SDSCA. The results showed that scores on the CESD-10 did not significantly predict scores on the blood glucose testing subscale of the SDSCA. These results suggest that global depressive symptomatology was not a significant contributor to the frequency of blood glucose testing in this sample. This could be explained by participants' low scores on the depressive symptomatology measure. It was hypothesized the variance accounted for by the independent variable (depressive symptomatology) would be beyond that of demographics and medical history. This hypothesis was not supported.

The negative impact depressive symptomatology has on one's ability to test their blood glucose has been identified in the self-monitoring of blood glucose literature but results are mixed. Evidence from large clinical trials have demonstrated that the effects of exercise, following dietary recommendations, and self-monitoring of blood glucose (SMBG) are essential to achieving optimal glycemic control, and blood pressure and lipid control (ADA, 2010). However, engaging and maintaining these recommendations frequently present challenges for persons with diabetes (Edege & Zheng, 2002; Nelson, Reiber, & Boyko, 2002; Harris, 2001). A recent meta-analysis indicated co-morbid



depression is believed to further complicate adherence to blood glucose testing recommendations (Lustman & Clouse, 2002). In contrast, Paschalides et al (2004) concluded that depression influences physical and mental functioning - not blood glucose testing in individuals with type 2 diabetes (Paschalides et al, 2004). These studies are presented to highlight the mixed findings present in the current literature. The present study differs from others in the published literature with respect to the relatively lower levels of depressive symptomatology observed in the sample. The present study found that depressive symptomatology was not associated with blood glucose testing. The relatively low levels of depressive symptomatology likely influenced the ability to accurately detect the influence of symptomatology on blood glucose testing.

### *H3 (Hypothesis #3)*

*Global depressive symptomatology (CESD-10) will be negatively and significantly associated with frequency of diet adherence on the SDSCA, controlling for demographic variables (age, gender, and BMI), diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use.*

Hypothesis 3 examined the impact of depressive symptomatology on diet adherence. It was proposed that diet would be negatively impacted by depressive symptomatology above and beyond the effects of demographic and diabetes-related history. This hypothesis was not supported. There were no significant findings observed. It is difficult to address the impact of depressive symptomatology on diet given the minimal depressive symptomatology present in this sample. The CESD-10 is a screener for detecting the presence of depressive symptomatology, it is not intended to serve as a diagnostic tool.

*Summary of impact of depressive symptomatology on self-management.*

The impact of depressive symptomatology on self-management of diabetes has been well documented in the research literature. Depressive symptomatology has been linked to poor glycemic control (Lustman et al, 2000; Lustman & Clouse, 2005), a higher risk for diabetes complications (de Groot, Anderson, Freedland, Clouse, & Lustman, 2001), and increased mortality (Ismail, Winkley, Stahl, Chalder, & Edmonds, 2007).

Results of this study were unable to provide information related to the effects of depressive symptomatology on blood glucose testing and diet adherence largely due to the relatively low representation of depressive symptomatology reported by this sample. Recent literature has addressed the issue of subclinical depression and identified this as a risk factor for later development of major depressive disorder (Cuijpers & Smit, 2004). Fisher et al (2007) discussed most patients with diabetes are reporting high levels of depression are not clinically depressed, rather these individuals often are experiencing subthreshold depressive symptomatology.

*H4 (Hypothesis #4)*

*Independent variable diabetes-specific distress (PAID) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with frequency of blood glucose testing on the SDSCA. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 4 explored the associations between diabetes-specific distress and blood glucose testing when controlling for demographic, diabetes-related history

variables and antidepressant use. Results of these findings failed to reject the null hypothesis, demographic variables were the only significant findings observed in this regression analysis. Age was the only variable to retain significance upon further review of the regression model. This suggests that as individuals get older, they are checking their blood glucose more often. This could be explained as a result of the trend for individuals with type 2 diabetes beginning an insulin regimen often as the result of onset of complications or long-standing suboptimal blood glucose control.

Previous literature has established the PAID as a reliable and valid instrument for assessing disease-specific diabetes related distress (Welch, Weigner, Anderson, & Polonsky, 2003). One recent study examined depressive symptomatology and diabetes specific distress with respect to self-management outcomes using the SDSCA. Results were consistent with the observed findings in the current study; the PAID scores were not significantly associated with blood glucose testing (Gonzalez, Delahanty, Safren, Meigs, & Grant, 2008). The null findings for Hypothesis 4 support existing literature, diabetes-specific distress was not found to be statistically significant, consistent with the findings of Gonzalez and colleagues (2008).

#### *H5 (Hypothesis #5)*

*Independent variable diabetes specific distress (PAID) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with frequency of diet adherence on the SDSCA. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 5 explored the associations between diabetes-specific distress and diet when controlling for demographic/diabetes-related history variables and antidepressant use. It was hypothesized there would be a negative association observed between diabetes-specific distress and diet. Findings of this study provide support for this hypothesis. Diabetes-specific distress and diet were negatively correlated, suggesting that individuals who are currently experiencing more diabetes-specific distress are less likely to adhere to their diet recommendations. Due to the cross-sectional data collected in this study, causality cannot be determined. Results of this data would also suggest those with lower diabetes specific distress had higher frequency of diet adherence. Demographic variables, diabetes regimen demand, and antidepressant use were not statistically significant in this hypothesis consistent with previous literature. Diabetes specific-distress was also a significant predictor of diet adherence in the Gonzalez and colleagues (2008) study providing additional support for this hypothesis. The null hypothesis was rejected in this study, providing the evidence diabetes-specific distress has a negative impact on diet adherence in this sample of adults with type 2 diabetes mellitus.

*Summary of impact of diabetes-specific distress on self-management*

Fisher et al (2007) recently reported that diabetes-specific distress is a better indicator of self-management than depressive symptomatology. Gonzalez and colleagues (2008) concluded depressive symptomatology is a better indicator of self-management than diabetes specific distress. Further exploration revealed the studies presented above may not be producing conflicting results. These researchers both suggest that the variability in results can be explained by the measurements selected, and argue that depression measures do not assess etiology of symptoms, rather they provide information

related to presence or absence of symptoms. However etiology of depressive symptoms endorsed in the clinical interview have not been explored in diabetes samples. The authors suggested assessing content of depressive symptomatology collected via interview may have informed the nature of the symptoms, suggesting the overlap between these constructs would likely explain a subset of the sample of depressed individuals (Gonzalez, Delahanty, Saffron, Meigs, & Grant, 2008).

In the present study, diabetes specific distress was found to predict diet scores on the SDSCA but not SDSCA blood glucose testing scores. These results replicated findings observed by Gonzales and colleagues (2008). Our results suggest diabetes specific distress is a better predictor of self-management than depressive symptomatology, but these findings should be interpreted with caution due to the low scores observed on the CESD-10 in this study. Observed scores on the PAID were consistent with a population of depressed individuals with type 2 diabetes in the Kokoszka et al (2009) study. These authors concluded diabetes-specific emotional problems are equally likely with clinical depression and subclinical depression. This finding is consistent with the results of this study, diabetes-specific distress was a significant contributor to diet. Our study provided additional support for the existing literature, the PAID is a valid measure of diabetes-specific distress, and this disease-specific distress is capable of predicting self-management behaviors in a population of individuals with type 2 diabetes. Additional research is needed to further explore the validity of the PAID with respect to individual domains of self-management (i.e. diet, medications, blood glucose testing) since these behaviors are believed to be mutually exclusive (Johnson, 1992).

Literature indicates these ongoing, multiple behavioral demands are the key factors that distinguish the demands of living with diabetes from those of other chronic illnesses, which may require maintaining only a select few of these behaviors (ADA, 2006). It is well-established that the seven self management behavioral components of diabetes self-management do not correlate highly with one another, suggesting individuals can be adherent to one behavior while ignoring another (Glasgow & Eakin, 1998; Rubin & Peyrot, 1992; Orme & Binik, 1989). Due to the relative independence of the behaviors research suggests each component needs to be assessed separately when evaluating diabetes self-management outcomes (Johnson, 1992).

*H6 (Hypothesis #6)*

*Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with frequency of blood glucose testing on the SDSCA. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 6 sought to assess the impact of fatigue on blood glucose testing recommendations. This study was the first known study to incorporate the construct of fatigue into the literature differentiating emotion-based constructs with individuals with diabetes. This study proposed there would be a negative association between fatigue levels and blood glucose testing behavior. This hypothesis was not supported. However, age and BMI retained significance in this regression suggesting those that are overweight and/or obese and those that are older check their blood glucose more frequently than those that are not. Observed correlations indicate older individuals in this sample are

heavier, have had diabetes longer, and check their blood sugar more often. It is believed these associations significantly contributed to the inability to reject the null hypothesis. There were no observed associations between fatigue and blood glucose observed in this study therefore no conclusions can be made.

There was a significant difference observed in the frequency of blood glucose testing based on medication use. Individuals on insulin were more likely to test their blood glucose more frequently than those individuals on oral agents. This is likely explained by the health provider's recommendations for blood glucose testing. Blood glucose testing recommendations differ for individuals on oral agents and those on insulin. In the overall sample, individuals were testing their blood sugar on average 4.87 days per week. Further exploration revealed there were significant differences noted based on types of medication prescribed. Those on insulin checked their blood sugar 5.42 times per week vs. those on oral agents checked their blood glucose 4.57 times per week. Interestingly, those on Byetta tested their blood glucose more often; 5.95 times per week. ADA recommends those individuals on insulin should check their blood glucose up to 3 times daily. This study did not inquire about frequency of daily blood glucose testing, rather how many times in the previous week had participants adhered to their physician recommendations for blood glucose testing. It is believed those on insulin should be checking their blood glucose daily; results reveal this is not the case. Rather findings from this study indicated individuals on insulin are not checking as often as they should according to the ADA recommendations.

*H7 (Hypothesis #7)*

*Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with frequency of diet adherence on the SDSCA. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 7 sought to assess the impact of fatigue on diet self-management. This study was the first known study to incorporate the construct of fatigue into the literature differentiating emotion-based constructs with individuals with diabetes. This study proposed there would be a negative association between fatigue levels and adherence to diet. This hypothesis was supported, fatigue was found to negatively impact an individual's ability to adhere to diet recommendations. Fatigue was the only significant predictor of diet observed in this regression. There were no significant demographic or diabetes-specific variables observed in this regression.

There are several possible explanations for this finding. First, it is possible fatigue can be identified as a barrier for an individual to select, prepare, and consume foods that are consistent with a diabetes diet. This is the first known study that examined the relationship between fatigue and diet in diabetes independent of depression. The depression research has long suggested depression impacts an individual's self-management ability; however specific symptoms of depression have often not been assessed to further explain specific symptoms of depression (i.e. fatigue) and its potential impact on an individual's ability to adhere to diet recommendations.



*Summary of the impact of fatigue on self-management*

Fatigue has been identified in the literature as an overlapping symptom of both depression and diabetes, but the etiology of fatigue is less clear. This study sought to explore the impact of fatigue on self-management. Results provided preliminary evidence on the impact of fatigue on diet adherence. This relationship suggested individuals with higher fatigue were less likely to adhere to their diet recommendations than those with lower levels of fatigue. These findings may guide future research in this area by exploring the overlap of depression and physical symptoms associated with diabetes and performance of self management behaviors, due to fatigue being identified in both depression and diabetes.

*H8 (Hypothesis #8)*

*Independent variable global depressive symptomatology (CESD-10) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with physical function scores on the SF-12. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 8 was supported; but results should be interpreted with caution. Examination of this hypothesis was complicated by the low rates of depressive symptomatology endorsed in this sample. Findings suggest depressive symptomatology is predictive of the Physical Component Score of quality of life, in addition to the demographic variables included in this model (age, gender, and BMI). Results also revealed that age and BMI specifically predict higher scores on the Physical Component

Score of the SF-12, suggesting individuals who are older and have higher BMI report experiencing poor physical quality of life. An underlying assumption of this hypothesis is that participants' self-report of their physical well-being may be impacted by depressive symptomatology. This provides support for low levels of depressive symptomatology can also impact an individual's physical function.

The results of this hypothesis are supported by Fisher et al's (2007) contention that subclinical depression also affects an individual's perception of their physical quality of life. It has been established in the literature those with type 2 diabetes often report multisystem complications including poorer perceptions of their functional status. Studies have also implicated the progression of complications associated with diabetes is often associated with a sharp decline in self-report of functional status (Mayou, Bryant, & Turner, 1990). Although co-morbid diagnoses were not included in this study, obesity has been linked to increased co-morbidity among individuals with diabetes. Lopez-Garcia et al (2003) recently concluded that obesity was indicative of poorer perceptions of physical health regardless of age and gender compared to normal weight controls. These findings support this hypothesis -obesity was found to be associated with poor physical quality of life.

Age was also found to be significant despite controlling for the effects of age in the regression analyses; suggesting that older adults often report poor physical functioning. The diabetes literature discussed the likelihood of developing complications increases as individuals get older. Aside from diabetes-related complications, other physical illness may impact an individual's functional status (i.e. arthritic conditions may impair someone's ability to function). This provides a platform for inclusion of all

physical complications when assessing physical quality of life. Qualitative information related to why individual's feel their functional status is poor may also inform future longitudinal research. For this sample, older obese individuals who reported higher levels of depressive symptomatology reported poor functional status.

*H9 (Hypothesis #9)*

*Independent variable global depressive symptomatology (CESD-10) controlling for demographic (age, gender, and BMI), diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be positively and significantly associated with mental well-being on the SF-12. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 9 was largely supported; depressive symptomatology was negatively associated with the mental component score on the SF-12. This finding suggests consistency in terms of reporting; individuals are more likely to experience poor mental quality of life when they are also experiencing depression. Additionally, consistencies were also noted with respect to gender; women reported both higher depressive symptomatology and poorer mental quality of life relative to men. This hypothesis originally suggested a positive association, however the scoring criteria of the SF-12 suggests higher scores indicate better quality of life, as with the CESD-10 higher scores are indicative of higher levels of depressive symptomatology. Taking the scoring into consideration, there was a negative association observed in this study, the higher an individual's depressive symptomatology, the lower their mental quality of life scores.

Consistent with findings on global depressive symptomatology, participants who were prescribed antidepressants reported a lower Mental Component Summary score than did those who were not prescribed antidepressants. This is an interesting finding worthy of discussion. Antidepressant therapy has been shown to be very effective for the treatment of depression, however recent literature suggests despite the effectiveness of antidepressant therapy, individuals may experience residual symptoms of depression (American Psychiatric Association, 2000). This may be contributing to this study's findings. Additional research can specifically address the effects of antidepressants on mental quality of life.

An individual's perceptions of their quality of life may also be contributing to their scores on the quality of life measure in addition to the symptoms they may be experiencing. It is possible taking antidepressants may be linked to a perception of "doing worse" which could also be contributing to these findings.

*H10 (Hypothesis #10)*

*Independent variable diabetes-specific distress (PAID) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with physical function scores on the SF-12. It was hypothesized the variance accounted for by the independent variable would be beyond that of demographics and medical history.*

Hypothesis 10 examined the construct of diabetes-specific distress having a negative impact on physical quality of life. This hypothesis suggested as PAID scores increased (higher levels of diabetes-specific distress), functional status (SF-12 Physical

Component Score) would decrease (poorer functional status). In testing hypothesis 10 the association of diabetes-specific distress and physical quality of life was assessed using the PAID total score and the physical component score (PCS) of the SF-12 while controlling for demographics (age, gender, and BMI), diabetes related history (insulin, duration of diabetes, and oral medication use), and antidepressant use.

The demographic variables, antidepressant use, and the PAID total score all retained statistical significance in this model, rejecting the null hypothesis that no conclusions can be made. With respect to the demographic variables, age and BMI were both statistically significant, suggesting individuals who are older and have higher BMI report poorer physical quality of life. This is consistent with obesity literature, which has identified obesity as a risk factor for decreased functional status (Wee, Wu, Thumboo, Lee, & Tai, 2010). Obesity has been identified in the literature as an independent risk factor for a host of physical illnesses. Disease comorbidity also may contribute to the observed findings in this study.

Antidepressant use also retained statistical significance, accounting for 16.3% of the variance in this model. Results suggest participants who were prescribed antidepressants are more likely to report higher levels of functional impairment than those that are not. Interestingly, those who were currently taking antidepressants reported higher levels of diabetes-specific distress compared to those that were not taking antidepressants. This finding is believed to be related to the overlap between depressive symptomatology and diabetes-specific distress, however it is unknown if the emotional distress that initiated antidepressant therapy may have been related to the level of disease-specific distress that the individual reported to their physician, rather than Major

Depressive Disorder. Current findings were consistent with Fisher et al (2007) study suggesting diabetes-specific distress is a better predictor of quality of life than major depression.

Diabetes-specific distress has been identified in the literature as a reasonable construct to assess in clinical practice (Hermanns, Kulzer, Krichbaum, Kubiak, & Haak, 2006). Patients with diabetes often report diabetes-related stressors, and these disease-specific stressors have been cited in the literature as an independent risk factor for depression and reduced quality of life (Peyrot & Rubin, 1997; Hermanns, Kulzer, Krichbaum, Kubiak, & Haak, 2006; Snoek, Pouwer, Welch, & Polonsky, 2000).

Diabetes-specific distress scores were shown to be elevated in this sample for individuals with poor diet adherence and higher HbA<sub>1c</sub>. Additionally, obesity has also been identified in this sample as a significant risk factor for decreased functional status. Additional comorbidity is also a potential contributor to Physical Component Scores, however, this was not addressed in the present study.

The directionality of the relationship between diabetes-specific distress and physical quality of life remains poorly understood. It is likely this relationship is bidirectional. It is feasible an individual will experience higher levels of diabetes-specific distress due to "feeling bad". On the other hand, an individual's physical health may cause disease-specific worry (i.e. diabetes-specific distress). Additional longitudinal research is needed to further explore the directionality of this relationship.

*H11 (Hypothesis #11)*

*Independent variable diabetes-specific distress controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication*

*use), and anti-depressant use will be positively and significantly associated with mental quality of life on the SF-12. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 11 examined the construct of diabetes-specific distress having a negative impact on mental quality of life. This hypothesis suggested as PAID scores increased suggesting higher levels of diabetes-specific distress, mental quality of life (SF-12 MCS) would decrease suggesting increased severity of the impact of psychological distress on an individual's quality of life. In testing hypothesis 11 the association of diabetes-specific distress and mental quality of life was assessed using the PAID total score and the mental component score (MCS) of the SF-12 while controlling for demographics (age, gender, and BMI), diabetes related history (insulin, duration of diabetes, and oral medication use), and antidepressant use.

The demographic variables, antidepressant use, and the PAID total score all retained statistical significance in this model, rejecting the null hypothesis that no conclusions can be drawn. With respect to the demographic variables, age and BMI were both statistically significant, suggesting individuals who are older and have higher BMI report poorer mental quality of life. Recent literature suggests that obesity may be an independent risk factor for psychological distress, specifically depression (Sacco et al, 2007). The present findings are consistent with Sacco et al (2007), with BMI linked to higher levels of both diabetes-specific distress and decreased mental quality of life.

Additionally, the association between diabetes-specific distress and mental quality of life is a logical finding. It was expected diabetes-specific distress would have a negative impact on mental quality of life, due to the distress associated with diabetes

impacting an individual's psychological functioning. Directionality of this relationship cannot be addressed due to the cross-sectional design of this study, but it appears this relationship could be bidirectional. Health status may be driving higher scores on the PAID, which is indicative of higher levels of diabetes-specific distress. High levels of distress may lead to a decreased psychological quality of life, as reflected by a decrease in scores on the Mental Component score of the SF-12. . Alternatively, the inverse could also be true, having poor perceptions of mental quality of life may impair one's ability to view their illness rationally, which also would likely produce similar findings.

Additional research is needed to further explore this relationship.

#### *H12 (Hypothesis #12)*

*Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with physical function scores on the SF-12. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 12 sought to assess the impact of fatigue on physical function scores on the SF-12. This study was the first known study to incorporate the construct of fatigue into the literature differentiating emotion-based constructs with individuals with diabetes. This study proposed there would be a negative association between fatigue levels and physical quality of life. Findings provided support for this hypothesis. However, age and BMI also retained significance in this regression suggesting those that are overweight and/or obese and those that are older subjectively report lower physical quality of life scores. Observed correlations indicate older individuals in this sample are



heavier, have had diabetes longer, and check their blood sugar more frequently; all which can potentially contribute to decreased quality of life. Additionally, co-morbid health conditions are more prevalent in older adults, but were not included as a covariate in this analysis. It is likely disease co-morbidity is also contributing to the decrease in physical function observed in this sample. Results revealed mean co-morbidity of 4.2 co-morbid health conditions. The impact of disease co-morbidity on quality of life has been well-documented in the literature (Jacobson, de Groot, Samson, 1994). A recent study indicated obese individuals reported decreased physical quality of life compared to normal weight individuals even when controlling for the impact of diabetes and disease co-morbidity (Hlatky, Sheng-Chia, Escobedo, Hillegass, Melsop, et al, 2010).

Fatigue was also found to be contributing to an individual's Physical Component Score from the SF-12. As an individual's fatigue score increased their Physical Component Score score decreased, suggesting that fatigue is contributing to an individual's poor functional status. However, one cannot ignore the impact of obesity and age. Age and obesity likely contribute to an individual's fatigue level. Recent literature suggests fatigue and obesity are positively associated with one another and that these factors both contribute to an individual's decreased physical quality of life.

Proinflammatory cytokines have been implicated as a contributor to the fatigue levels observed in obese individuals (Vgontzas, Bixler, & Chousos, 2006), however this relationship is beyond the scope of this study. Results from this study suggested obesity and fatigue both contribute to increased fatigue levels, but how they are independently affecting quality of life is uncertain.

*H13 (Hypothesis #13)*

*Independent variable fatigue (MFSI-SF) controlling for demographic (age, gender, and BMI) and diabetes-related history (insulin, duration of diabetes, oral medication use), and anti-depressant use will be negatively and significantly associated with mental component summary scores on the SF-12. It was hypothesized the variance accounted for by the independent variable will be beyond that of demographics and medical history.*

Hypothesis 13 examined the construct of fatigue having a negative impact on mental quality of life. This hypothesis suggested as MFSI-SF scores increased suggesting higher levels of fatigue, mental quality of life (SF-12 MCS) would decrease suggesting fatigue has a negative impact on an individual's mental quality of life. The association of fatigue and mental quality of life was assessed using the MFSI-SF total score and the mental component score (MCS) of the SF-12 while controlling for demographics (age, gender, and BMI), diabetes related history (insulin, duration of diabetes, and oral medication use), and antidepressant use. This hypothesis was supported, suggesting higher fatigue levels significantly contribute to an individual's perception of their mental quality of life.

The purpose of antidepressant therapy is to effectively treat symptoms of depression. The majority of participants in this sample reported low levels of depressive symptomatology, yet it is likely residual symptoms of depression remain. Recent literature suggests despite the efficacy of antidepressant treatment it is not uncommon for patient's to experience residual symptoms, most commonly to include fatigue, sleep disturbance, and apathy (Fava, 2006). These residual symptoms are often linked to increased risk of poor psychosocial functioning. Results indicate fatigue has a significant negative impact on mental quality of life scores.

Obesity has been linked to higher levels of self-reported fatigue in the literature. In one recent study examining the role of obesity and fatigue, fatigue was identified as a common symptom for obese individuals (Vgontzas, Bixler, Chrousos, 2006). However, BMI was not significant in this model. This finding is inconsistent with Vgontzas et al (2006) study, but may have important implications. The findings of this study suggest fatigue is a significant contributor to an individual's mental quality of life. This is likely multidimensional in terms of etiology; additional research is needed to clarify this relationship.

#### *Summary of Fatigue and Quality of Life findings*

Fatigue has been shown in this study to contribute to an individual's poor physical and mental quality of life. The relationship requires additional research to tease out the multiple factors that have been identified as significant contributors to causality. Additional analyses were performed to better understand this relationship.

### **Additional Analyses**

#### *Multidimensional Aspects of Fatigue*

The total score of the Multidimensional Fatigue Symptom Inventory-Short Form total score was used in this study to assess fatigue as a unidimensional construct. This was done because this is the first known study to specifically address the impact of fatigue on a population of clinic-based adults with diabetes. The results of this study indicated fatigue is a useful construct that warrants additional attention. Convergent validity across measures was assessed to explore the associations between depressive symptomatology, diabetes specific distress, and both physical and mental quality of life with the individual subscales of the MFSI-SF (general, physical, mental, and vigor).

Results revealed moderate to high associations among constructs, suggesting a moderate to high degree of overlap across measures. This overlap was anticipated prior to the start of the study.

The subscales of the MFSI-SF were included in analysis examining the Physical and Mental Component Scores of the SF-12 to examine convergent/divergent validity. Both the CESD-10 and the PAID were positively associated with the general, emotional, physical, mental and total fatigue subscales, and negatively associated with the vigor subscale. This finding suggests moderate to high levels of convergent validity across measures.

#### *Fatigue and Blood Glucose Testing*

This analysis examined the relationship between fatigue and blood glucose testing while controlling for demographics, diabetes-related history, anti-depressant use, and emotion. Age and BMI retained significance in this model, which is consistent with the original hypothesis that explored the associations between fatigue and diet. This is consistent with the findings of this study presented thus far, the hypothesis that examined fatigue and blood glucose testing was not significant.

#### *Fatigue and Diet*

This hypothesis explored the associations of fatigue and diet while controlling for demographics, diabetes-related history, anti-depressant use, and emotion. Block 4 included depressive symptomatology (CESD-10). Diabetes-specific distress retained significance in this model. Depressive symptomatology was not significant in the original hypothesis examining the associations with diet. PAID total scores retained

significance in these analyses and the original analyses presented thus far, which is consistent with the current literature (Gonzalez et al, 2008).

Fatigue was found to be significant in the originally proposed, individual analyses, but did not remain significant when controlling for depressive symptomatology and diabetes-specific distress. Beta weights were examined to gain information related to which construct is believed to have the strongest associations with diet adherence; diabetes-specific distress accounted for a significant amount of the variance in this model. This suggests the total score of the PAID may be a stronger predictor of diet than is the total score of the MFSI-SF. In conclusion, diabetes-specific distress appears to be the strongest predictor of diet adherence across the measures included to assess emotion in this study.

#### *Fatigue and Physical Quality of Life*

This analysis explored the associations of fatigue and physical quality of life (functional status) while controlling for demographics, diabetes-related history, antidepressant use, and emotion. The demographic variables, antidepressant use, depressive symptomatology (CESD-10) and diabetes-specific distress (PAID) retained significance in this model. As previously discussed, age and BMI were significant contributors to decreased physical quality of life in this sample. Those who are older and heavier reported decreased functional status. Antidepressant use was significant in both of the original analyses that examined the associations of diabetes-specific distress and fatigue and their impact on functional status. Antidepressant use retained significance in this model; however once fatigue was entered into the model the effect of antidepressant use was no longer significant.

Block 4 of this five-step regression included depressive symptomatology (CESD-10) and diabetes-specific distress (PAID) to control for the impact of these constructs on the association between fatigue and physical quality of life. Diabetes-specific distress was a significant predictor of physical quality of life; depressive symptomatology was not significant. Diabetes-specific distress assessed an individual's level of distress related to their diabetes. Those who reported higher levels of diabetes specific distress also reported poorer physical quality of life. This is likely a bidirectional association, an individual may experience distress as a result of decreased functional status, or decreased functional status may cause an individual to experience diabetes-specific distress.

In addition to the findings discussed above, fatigue was significant, suggesting as one's fatigue level goes up, their physical quality of life goes down. This finding remained significant when controlling for demographics, diabetes-related history, anti-depressant use, and emotion. This analysis utilized the total score of the MFSI-SF which is a unidimensional summary score of an individual's fatigue level. This also provides support for the original question in this study, fatigue is a unique construct when assessing physical quality of life in a sample of adults with type 2 diabetes. Fatigue assumed 32% of the variance over and above depressive symptomatology and diabetes-specific distress.

#### *Fatigue and Mental Quality of Life*

This analysis explored the associations of fatigue and mental quality of life while controlling for demographics (age, gender, and BMI), diabetes-related history (insulin, duration of diabetes, oral medication use), anti-depressant use, and emotion (depressive symptomatology and diabetes-specific distress). Body Mass Index retained significance

in this model, suggesting that heavier individuals report decreased mental quality of life. This is consistent with original hypotheses examining the associations between fatigue and mental quality of life. Antidepressant use also retained significance, consistent with original hypotheses. Depressive symptomatology and diabetes-specific distress also retained significance in this analysis. These variables were entered into a block in the regression equation to explore if fatigue provided a unique contribution to an individual's mental quality of life over and above the variance accounted for by the emotion constructs included. Fatigue retained significance in this model, suggesting fatigue is contributing something different to the model.

The SF-12 mental component summary score reflects the frequency of endorsement of emotional difficulty as a barrier to accomplishing tasks, and doing things as carefully as usual. The mental component summary score also addressed the impact of feeling "downhearted and blue", "calm and peaceful", in addition to asking about an individual's energy level. These items are highly consistent with emotional items that are addressed in both the CESD-10 and the PAID. However, the unique contribution of the SF-12 highlights the impact of these emotional distress constructs on participant's ability to accomplish tasks and do work or activities. Literature suggests as an individual experiences emotional distress, this emotional distress acts as a barrier for an individual accomplishing things as often and as effectively as they would like (Ware, Kosinski, & Keller, 1996). When examining the specific contributions of the emotional constructs included in this analysis, depressive symptomatology was not significant. Rather diabetes-specific distress accounted for 41.6% of the variance accounted for with this model. This suggests an individual's disease-related distress has a significant impact on

their mental quality of life. Perceptions of diabetes likely impacted the mental of quality of life in this sample. Fatigue contributed an additional 7.6% of the variance accounted for. The differences across these emotional constructs suggest despite overlap between constructs, depressive symptomatology, diabetes-specific distress, and fatigue appear to be distinct but not mutually exclusive constructs.

## **Limitations**

### *Limitations of the Current Study*

Conclusions from this study are limited by the cross-sectional design. Another limitation of this study is the retrospective recall of several constructs included in these analyses (depressive symptomatology, diabetes-specific distress, fatigue, quality of life, and blood glucose testing and diet) in addition to the nature of self-report measures. There is a possibility of the moderate to high correlations of self-report measures of distress being due to shared measurement variance. That is, the similar self-report approach of the measures could introduce bias and pose limitations for validity of associations among the proposed constructs. Studies may benefit from prospective assessment of these distress constructs and other indices of distress (e.g. physiological) to further assess the associations observed in this study. With respect to blood glucose testing, improved technology now affords the opportunity for the provider to download information from the meter directly into a data file to include time, date, and blood glucose reading. Additionally, use of ecological momentary analysis also would be a useful approach to collection of longitudinal data to address the issue of causality.

The present study assessed fatigue using the total score of the MFSI-SF. This approach limits consideration of the multidimensionality of the fatigue construct.



However, this study did explore the overlap of the total score of fatigue with both depressive symptomatology and diabetes-specific distress. Examination of the individual subscales of fatigue with the overlapping emotional constructs was discussed, but additional research is needed to explore this relationship.

Finally, there were demographic limitations in this study. African-Americans and other ethnic minorities, were under-represented compared to general Louisville, KY and greater United States population. Assessing an individual's emotional state while waiting for a physician appointment may also be a limitation, specifically if those people are experiencing health related difficulty, these scores may be inflated compared to a non-clinic sample. Specifically, the effects of completing these questionnaires while waiting for their physician may increase their distress and that attending their doctor's appointments may have impacted their distress scores. Longitudinal assessment will also potentially remedy this issue by assessing these constructs over a period of time to strengthen the current findings.

#### *Recommendations for future research*

Research often struggles with the inherent limitations of self-report measurement methodologies. Clinical settings are pressured to assess for symptoms that are problematic for the patient and interfere with both the disease process and the individual's quality of life. This study addressed the utility of measures that assessed different domains of emotional distress to gain understanding into the utility of these measures and their associations with self-management and quality of life. Replication of this study with a longitudinal design would allow for examination of causality which

would further enhance the current level of understanding of the associations discussed in this study.

With respect to gender, women were more likely to be more depressed and report lower mental quality of life when compared to men. Future research would benefit from a better understanding these gender differences in order to design interventions to best meet the needs of both women and men living with diabetes.

This sample in this study was primarily Caucasian. Future research is needed to address the constructs examined in this study in minority populations. Additionally, further exploration of CVD risk factors would address the effects of comorbid conditions on an individual's emotional distress, fatigue, and quality of life. Obesity is another construct that should be included in future research, as the impact of obesity on physical quality of life and fatigue has been well documented in the literature. Specifically, the relationship between fatigue and obesity in adults with diabetes remains poorly understood.

#### *Recommendations for Use of Emotion Measures in Research and Clinical Practice*

The CESD-10 is a brief 10-item measure of global depressive symptomatology. Fisher et al (2007) discussed the impact of subthreshold depression impacting outcomes and often being misdiagnosed as depression. One could argue that diabetes-specific distress is a contributing factor to that misdiagnosis. If the emotional distress is related to a disease-specific etiology, the symptoms endorsed may be misattributed to depression. This study found a significant relationship between depressive symptomatology and quality of life – despite a relatively low level of depressive symptomatology overall. Future research approaches could include a comparative study with two groups of

individuals; one that is clinically depressed and one that is not to examine potential differences between groups to further understand this relationship. Additionally, longitudinal research could provide information related to the change of the subthreshold depressive symptomatology over time. Results of this study indicate the CESD-10 is a useful screening tool for global depressive symptomatology.

The PAID was used to assess diabetes-specific distress, which is a more disease-specific representation of emotional distress. PAID total scores observed in this study were comparable to scores observed in previous research. Clinically, the PAID provides useful information for the treating provider to address specific concerns the patient may have with respect to their diabetes. From a research perspective, the PAID is a valid, useful measure to assess diabetes-specific distress.

One of the major questions this study sought to address was the utility of fatigue-specific measurement in a sample of adults with type 2 diabetes. Results from this study suggest that fatigue is an important construct to assess in diabetes. Fatigue was found to be associated with physical and mental quality of life, obesity, and diet. With respect to both physical and mental and quality of life outcomes, fatigue remained significant over and above the impact of diabetes-specific distress, suggesting fatigue is an independent construct.

This study provides useful information related to the role of fatigue in a sample of individuals with diabetes. Additional support is needed for this finding, however these results provide a unique opportunity to explore a potentially useful construct. Analysis of the subscales may provide information about the ability of the MFSI-SF to accurately distinguish physical and mental dimensions of fatigue, which sets the stage for future

research. Of note, the vigor subscale of the MFSI was not associated with depressive symptomatology, diabetes-specific distress, or mental quality of life. This fatigue subscale may be a particularly useful in clinical evaluations, as it is brief and will provide information related to physical energy level, and possibly guide differentiating this from mental fatigue.

#### *Self Care Recommendations*

Self-management is often discussed in the diabetes research literature as a single construct despite the multitude of behaviors required to fully adhere to self-management recommendations. Johnson (1992) suggested these self-management behaviors are mutually exclusive and should be assessed separately. The present findings provide additional support for separating each self-management behavior, as diet was found to be impacted by diabetes-specific distress and fatigue. Assessment of self-management behaviors independently also provides useful information for a clinician to design a treatment plan targeting these behaviors independently. Future research should focus on specific self-management behaviors. They have been identified in the literature as constructs that should be addressed separately. This suggests outcome research should address this issue by utilizing specific self-management behaviors. Examining these behaviors independently will increase the understanding of what variables are actually impacting the adherence rates and the SDSCA is believed to be a valid instrument to assess this frequency. The SDSCA is a reliable measure of self-management that is brief and provides information to a clinician or researcher quickly to identify areas for intervention.

There were no significant differences observed between any of the emotional constructs and blood glucose testing in this study. The blood glucose testing and diet subscale scores observed in this study were consistent with scores observed in the literature, providing support for the representativeness of this sample with respect to self-management. The new ADA (2010) Standards of Medical Care are less clear with regard to specific standards of blood glucose monitoring for individuals who have not been prescribed an insulin regimen, or who take insulin less frequently. Hence, specific prescriptions for blood glucose monitoring largely become the decision of the clinician. The SDSCA is recommended to assess behaviors for clinicians and healthcare providers, as this is a brief, valid measurement of self-management. With respect to diet, women in the present study reported adhering to diet recommendations more often than did men. Future research can further explore this relationship, focusing on both benefits and barriers to adhering to diet recommendations. Additionally, diet was found to be associated with both diabetes-specific distress and fatigue, additional research examining the subscales of these measures would provide additional information related to possible targets for intervention.

#### *Recommendations for Quality of Life Assessment*

The results of the current study highlight the poor quality of life scores observed in this sample. The SF-12 is a reliable and valid instrument that provides a substantial amount of information in a brief amount of time, minimizing both participant burden and clinical time. The Physical and Mental Component Scores are heavily utilized in the literature, which provides additional utility in terms of replication. Although there are additional subscales available for the SF-12, the Physical and Mental Component Scores

are most frequently used in research settings. Clinically, it provides qualitative information that target specific difficulties for an individual, and may guide interventions to address these concerns.

## REFERENCES

- The ADVANCE Collaborative Group. (2008). Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. *New England Journal of Medicine*, 358, 2560-2572.
- Ali, S., Stone, M.A., Peters, J.L., Davies, M.J., and Khunti K. (2006). The prevalence of co-morbid depression in adults with Type 2 Diabetes: a systematic review and meta-analysis. *Diabetic Medicine*, 23, 1165-1173.
- Alberts, M., Vercoulen, J. and Bleijenberg, G. (1999). Assessment of fatigue. The application of the subjective feeling of fatigue in different research studies. In Vingerhoets, A. (Ed.) *Assessment in behavioral medicine*. Reading, UK :Harvard.
- American Association of Diabetes Educators (2003). Position Statement: Standards for Outcomes Management of Self-Management Education. *The Diabetes Educator*, 29, 804-816.
- American Diabetes Association. (1998). Economic Costs of Diabetes in the U.S. in 1997. *Diabetes Care*, 21, 296-309.
- American Diabetes Association. (2003). Economic Costs of Diabetes in the U.S. in 2002. *Diabetes Care*, 26, 3, 917-932.
- American Diabetes Association. (2010). Executive Summary: Standards of medical care in diabetes – 2010. *Diabetes Care*, 33 (Suppl. 1), S4-S10.
- American Diabetes Association. (2007). Standards of medical care in diabetes – 2007. *Diabetes Care*, 30 (Suppl. 1), S4-S42.
- American Diabetes Association. (2007) Total Prevalence of Diabetes & Pre-Diabetes. Available at [www.diabetes.org/utills](http://www.diabetes.org/utills). Accessed January 17, 2007.
- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4<sup>th</sup> ed., text rev.). Washington, DC: Author.
- Anderson, R.M. (1985). Is the problem of compliance all in our heads? *Diabetes Educator*, 11, 31-34.

- Anderson, R., Freedland, K., Clouse, R., Lustman, P. (2001). The prevalence of comorbid depression in adults with diabetes. *Diabetes Care*, *24*, 1069-1078.
- Anderson, R. M., Minino, A.M., Hoyert, D.L., and Rosenberg, H.M. (2001). Comparability of cause of death between ICD-9 and ICD-10: Preliminary estimates. *National Vitality Statistics Report*, *49*, 1-32.
- Andresen, B., Carter, W., Malmgren, J., & Patrick, D. (1994). Screening for depression in older adults: Evaluation of a short form of the CES-D. *American Journal of Preventive Medicine*, *10*, 77.
- Barge-Schaapveld, D., Nicolson, N., Berkhow, J., and deVries, M. (1999). Quality of Life in depression: daily life determinants and variability. *Psychiatry Research*, *88*, 173-189.
- Barnard, K., Skinner, T., and Peveler, R. (2006). The prevalence of co-morbid depression in adults with Type 1 diabetes: systematic literature review. *Diabetic Medicine*, *23*, 445-448.
- Beurskens, A., Bultmann, U., Kant, I., Vercoulen, J., Bleijenberg, G., & Swaen, G. (2000). Fatigue among working people: validity of a questionnaire measure. *Occupational and Environmental Medicine*, *57*, 353-357.
- Borson, S., Scanlan, J., Brush, M., Vitaliano, P., & Dokmak, A. (2000). The mini-cog: A cognitive 'vital-signs' measure for dementia screening in multi-lingual elderly. *International Journal of Geriatric Psychiatry*, *15*, 1021-1027.
- Brown, D., Milburn, N., Gary, L. (1992). Symptoms of depression among older African Americans: an analysis of gender differences. *Gerontologist*, *32*, 789-795.
- Bultmann, U., de Vries, M., Beurskens, A., Bleijenberg, G., Vercoulen, J., and Kant, I. (2000). Measurement of prolonged fatigue in the working population: determination of a cutoff point for the Checklist of Individual Strength. *Journal of Occupational Health Psychology*, *5*, 411-416.
- Carnethon, M., Kinder, L., Fair, J., Stafford, R., & Fortmann, S. (2003). Symptoms of depression as a risk factor for incident diabetes: findings from the National Health and Nutrition Examination Epidemiologic Follow-up Study, 1971-1992. *American Journal of Epidemiology*, *158*, 416-423.
- Cavanaugh, S., Clark, D., & Gibbons, R. (1983). Diagnosing depression in the hospitalized medically ill. *Psychosomatics*, *24*, 809-815.
- Cella, D., Peterman, A., Passik, S., Jacobsen, P., & Breitbart, W. (1998). Progress toward guidelines for the management of fatigue, *Oncology*, *12*, 369-377.



- Ciechanowski, P., Katon, W., & Russo, J. (2000). Depression and diabetes: Impact of depressive symptoms on adherence, function and costs. *Archives of Internal Medicine*, *160*, 3278-3285.
- Cox, D.J. & Gonder-Frederick, L. (1992). Major developments in behavioral diabetes research. *Journal of Consulting and Clinical Psychology*, *60*, 628-638.
- Cramer, J. A. (2004). A systematic review of adherence with medications for diabetes. *Diabetes Care*, *27*(5), 1218-1224.
- Cuijpers, P. & Smit, F. (2004). Subthreshold depression is a risk factor for major depressive disorder. A systematic review of prospective studies. *Acta Psychiatrica Scandinavica*, *109*, 335-331.
- de Groot, M., Anderson, R., Freedland, K., Clouse, R., & Lustman, P. (2001). Association of depression and diabetes complications: a meta-analysis. *Psychosomatic Medicine*, *63*, 619-630.
- Delahanty, L., Grant, R., Wittenberg, E., Bosch, J., Wexler, D., Cagliero, E. & Meigs, J. (2007). Association of diabetes-related emotional distress with diabetes treatment in primary care patients with Type 2 diabetes. *Diabetic Medicine*, *24*, 48-54.
- Diabetes Control and Complications Trial Research Group. (1993). The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *New England Journal of Medicine*, *329*, 977-986.
- Dittner, A., Wessely, S, and Brown, R. (2004). The assessment of fatigue: A practical guide for clinicians and researchers. *Journal of Psychosomatic Research*, *56*, 156-170.
- Duckworth, W., Abraria, C., Mortiz, T., Reda, D., Emanuele, N., Reaven, P., Zieve, F., Marks, J., Davis, S., Hayward, R., Warren, S., Goldman, S., McCarren, M., Vitek, M., Henderson, W., & Huang, G. (2009). Glucose control and vascular complications in veterans with type 2 diabetes. *New England Journal of Medicine*, *360*, 129-139.
- Eaton, W., Armenian, H., Gallo, J., Pratt, L., & Ford, D. (1996). Depression and risk for onset of type II diabetes: A prospective population based study. *Diabetes Care*, *19*, 1097-1102.
- Edege, L. (2006). Disease focused or integrated treatment: Diabetes and depression. *The Medical Clinics of North America*, *90*, 627-646.
- Edege, L. & Zheng, D. (2002). Modifiable cardiovascular risk factors in adults with

- diabetes: prevalence and missed opportunities for physician counseling. *Archives of Internal Medicine*, 162, 427-433.
- Edege, L. & Zheng, D. (2003). Independent factors associated with major depressive disorder in a national sample of individuals with diabetes. *Diabetes Care*, 26,104-111.
- Edege, L., Zheng, D., & Simpson, K. (2002). Comorbid depression is associated with increased health care use and expenditures in individuals with diabetes. *Diabetes Care*, 25, 464-470.
- Elliott, T.R., Shewchuk, R.M., Miller, D.M., & Richards, J.S. (2001). Profiles in Problem Solving: Psychological well-being and distress among persons with diabetes mellitus. *Journal of Clinical Psychology in Medical Settings*, 8, 283-291.
- Engelgau, M.M., Geiss, L.S., Saadine, J.B., Boyle, J.P., Benjamin, S.M., Gregg, E.W., Tierney, E.F., Riso-Burrows, N., Mokad, A.H., Ford, E.S., Imperatore, G., & Narayan, K.M. (2004). The evolving diabetes burden in the United States. *Annals of Internal Medicine*, 140, 945-950.
- Faul, F., Erdfelder, E., Lang, A.-G. & Buchner, A. (2007). G\*Power3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191.
- Fisher, L., Skaff, M., Mullan, J., Arean, P., Mohr, D., Masharani, U., Glasgow, R., & Laurencin, G. (2007) Clinical depression versus distress among patients with type 2 diabetes: Not just a question of semantics. *Diabetes Care*, 30, 542-548.
- Forjuoh, S., Reis, M., Couchman, G., & Ory, M. (2008). Improving diabetes self-care with a PDA in ambulatory care. *Telemedicine and e-Health*, 14, 273-279
- Freidberg, F. and Jason, L. (1998). *Understanding chronic fatigue syndrome. An empirical guide to assessment and treatment*. Washington, DC: American Psychological Association.
- Gary, T., Crum, R., Cooper-Patrick, L., Ford, D., & Brachati, F. (2000). Depressive symptoms and metabolic control in African-Americans with type 2 diabetes, *Diabetes Care*, 23, 23-29.
- Glasgow, R.E. and Eakin, E.G. (1998). Issues in Diabetes self-management. In Shumaker, S., Schron, E., Ockene, J., McBee, W. (Eds.). *The handbook of health behavior change (2nd ed.)*. pp. 435-461 New York, NY, US: Springer Publishing Co.

- Glasgow, RE, Hampson, SE, Strycker, LA, Ruggiero, L (1997). Personal-model beliefs and social environmental barriers related to diabetes self management. *Diabetes Care* 20: 556-61.
- Glasgow, R.E., Ruggiero, L., Eakin, E.G., Dryfoos, J. & Chobanian, L. (1997). Quality of life and associated characteristics in a large national sample of adults with diabetes. *Diabetes Care*, 20, 562-567.
- Glaus, A., Crow, R., & Hammond, S. (1996). Assessment of fatigue in cancer and non-cancer patients and in healthy individuals. *Supportive Care in Cancer*, 4, 82-96.
- Golden, S., Williams, J., Ford, D., Yeh, H., Paton Stanford, C., Nieto, F., Brancati, F. (2004). Depressive symptoms and the risk of type 2 diabetes: the Atherosclerosis Risk in Communities study. *Diabetes Care*, 27, 429-435.
- Goldney, R., Phillips, P, Fisher, L, & Wilson, D. (2004) Diabetes, depression, and quality of life: A population study. *Diabetes Care*, 27, 1066-1070.
- Gonzales, J., Delahanty, L., Safren, S., Meigs, J., & Grant, R. (2008). Differentiating symptoms of depression from diabetes-specific distress: relationships with self-care in type 2 diabetes. *Diabetologica*, 51, 1822-1825.
- Grundy, S., Benjamin, I., Burke, G., Chait, A., Eckel, R., Howard, B., Mitch, W., Smith, S., & Sowers, J. (1999). Diabetes and Cardiovascular Disease: A statement for healthcare professionals from the American Heart Association. *Circulation*, 100, 1134-46.
- Guyatt, G., Feeny, D., & Patrick, D. (1993). Measuring health-related quality of life. *Annals of Internal Medicine*, 118, 622-629.
- Hanninen, J., Takala, J., and Keinanen-Kiukaanniemi, S. (1999). Depression in subjects with type 2 diabetes: predictive factors in relationship to quality of life. *Diabetes Care*, 22, 997-998.
- Harris, M. (2001). Frequency of blood glucose monitoring in relation to glycemic control in patients with type 2 diabetes, *Diabetes Care*, 24, 979-982.
- Harris, M. I., & Eastman, R. C. (2001). Early detection of undiagnosed diabetes mellitus: A US perspective. *Diabetes/Metabolism Research and Reviews*, 16, 230-236.
- Hermann, N., Kuzler, B., Krichbaum, M., Kubiak, T., & Haak, T. (2006). How to screen for depression and emotional problems in patients with diabetes: comparison of screening characteristics of depression questionnaires, measurement of diabetes-specific emotional problems and standard clinical assessment. *Diabetologia*, 49, 469-477.

- Hiss, R.G., Anderson, R.M., Hess, G.E., Stepien, C.J & Davis, W.K. (1994). Community diabetes care: a 10 year perspective. *Diabetes Care*, *17*, 1124-1134.
- Hlatky, M., Chung, S., Escobedo, J., Hillegass, W., Melsop, K., Rogers, W., Brooks, M, for the BARI 2D Study Group (2010). The effect of obesity on quality of life in patients with diabetes and coronary artery disease. *American Heart Journal*, *159*, 292-300.
- Ismail, K., Winkley, K., Stahl, D., Chalder, T., & Edmonds, M. (2007). A cohort study of people with diabetes and their first foot ulcer: the role of depression on mortality. *Diabetes Care*, *30*, 1473-1479.
- Ismail, Z., Rajji, T., & Shulman, K. (2009). *International Journal of Geriatric Psychiatry, epub*. In press.
- Jacobsen, P. (2004). Assessment of fatigue in cancer patients. *Journal of the National Cancer Institute Monographs*, *32* 93-97.
- Jacobson, A.M., de Groot, M., & Samson, J. (1994). The evaluation of two measures of quality of life in patients with type 1 and type 2 diabetes. *Diabetes Care*, *17*, 267-274.
- Jacobson, A.M., de Groot, M., & Samson, J. (1995). Quality of life research in patients with diabetes mellitus. In *Quality of Life in Behavioral Medicine Research*. Dimsdale, J.E., Baum, A., Eds. Hillsdale, N.J. Lawrence Erlbaum Associates, p. 241-262.
- Jacobson, A.M., de Groot, M., & Samson, J. (1997). The effects of psychiatric disorders and symptoms on quality of life in patients with Type 1 and Type 2 diabetes mellitus. *Quality of Life Research*, *6*, 11-20.
- Janardhan, V. and Bakshi, R. (2001). Quality of life in patients with multiple sclerosis: The impact of fatigue and depression. *Journal of the Neurological Sciences*, *205*, 51-58.
- Jansen, N., Kant, I., & van den Brandt, P., (2002). Need for recovery in the Working Population: Description and associations with fatigue and psychological distress. *International Journal of Behavioral Medicine*, *9*, 332-340.
- Johnson, S. (1992). Methodological issues in diabetes research. *Diabetes Care*, *15*, 1658-1667.
- Kanaya, A., Grady, D., & Barrett-Connor, E. (2001). Gender differences in risk of cardiovascular outcomes in type 2 diabetes: a meta-analysis. *Diabetes*, *50* (Suppl 2), A211-A212.

- Katon, W., Russo, J., Heckbert, S., Lin, E., Ciechanowski, P., Ludman, E., Young, B., & von Koff, M. (2010). The relationship between changes in depression symptoms and changes in health risk behaviors in patients with diabetes. *International Journal of Geriatric Psychiatry*, 25, 466-475.
- Katon, W., von Korff, M., Ciechanowski, P., Russo, J., Lin, E., Simon, G., Ludman, E., Walker, E., Bush, T., & Young, B. (2004). Behavioral and clinical factors associated with depression among individuals with diabetes. *Diabetes care*, 27, 914-20.
- Kessler, R., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K., Rush, A., Walters E., Wang P. (2003). The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA*, 289(23), 3095-105.
- Kokoszka, A., Pouwer, F., Jodko, A., Radzio, R., Mucko, P., Bienkowska, J., Kuligowska, E., Smoczynska, O., & Sklodowska, Z. (2009). Serious diabetes-specific emotional problems in patients with type 2 diabetes who have different levels of comorbid depression: A polish study from the European Depression in Diabetes (EDID) Research Consortium. *European Psychiatry*, in press.
- Kovacs, M., Obrosky, D., Goldston, D., & Drash, A. (1997). Major depressive disorder in youths with IDDM. A controlled prospective study of course and outcome. *Diabetes Care*, 20, 45-51.
- Lewis, G. and Wessely, S. (1992). The epidemiology of fatigue: more questions than answers. *Journal of Epidemiology and Community Health*, 46, 92-97.
- Lin, E., Katon, W., Rutter, C., Simon, G., Ludman, E., von Koff, M., Young, B., Oliver, M., Ciechanowski, P., Kinder, L., & Walker, E. (2006). Effects of enhanced depression treatment on diabetes self-care. *Annals of Family Medicine*, 4, 46-53.
- Lin, E., Katon, W., Von Korff, M., Rutter, C., Simon, G., Oliver, M., Ciechanowski, P., Ludman, E., Bush, T., & Young, B. (2004). Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes Care*, 27, 2154-2160.
- Ludman, E., Katon, W., Russo, J., von Korff, M., Simon, G., Ciechanowski, P., Lin, E., Bush, T., Walker, E., & Young, B. (2004). Depression and diabetes symptom burden. *General Hospital Psychiatry*, 26, 430-436.
- Lustman, P., Anderson, R., Freedland, K., de Groot, M., Carney, R., and Clouse, K. (2000). Depression and poor glycemic control: a meta-analytic review of the literature. *Diabetes Care*, 23, 934-42.
- Lustman, P & Clouse, R. (2002). Treatment of depression in diabetes: impact on mood

- and medical outcome. *Journal of Psychosomatic Research*, 53, 917-924.
- Lustman, P & Clouse, R. (2005). Depression in diabetic patients. The relationship between mood and glycemic control. *Journal of Diabetes Complications*, 19, 113-122.
- Lustman, P., Clouse, R., & Freedland, K. (1998). Management of major depression in adults with diabetes: Implications of recent clinical trials. *Seminars in Clinical Neuropsychiatry*, 3, 102-114.
- Makine, C., Karsidag, C., Kadioglu, P., Ilkova, H., Karsidag, K., Skovlund, F., Snoek, F., & Pouwer, F. (2009). Symptoms of depression and diabetes-specific emotional distress are associated with a negative appraisal of insulin therapy in insulin-naïve patients with type 2 diabetes mellitus. A study from the European depression in diabetes (EDID) research consortium. *Diabetic Medicine*, 26, 28-33.
- McCollum, M., Hansen, L., Ghushchyan, V., & Sullivan, P. (2007) Inconsistent health perceptions for US women and men with diabetes. *Journal of Women's Health*, 16, 1421-1428.
- McKellar, J., Humphreys, K., & Plette, J. (2004). Depression increases diabetes symptoms by complicating patients' self-care adherence. *The Diabetes Educator*, 30, 485-492.
- Meichenbaum, D.H., & Turk, D.C. (1987). *Facilitating treatment adherence: A practitioner's guidebook*. New York, Plenum Press.
- Mooradian, A. (2003). Cardiovascular disease in type 2 diabetes: Current management guidelines. *Archives of Internal Medicine*, 163, 33-40.
- Musselman, D., Betan, E., Larsen, H., & Phillips, L. (2003). Relationship of depression to diabetes types 1 and 2: Epidemiology, biology, and treatment. *Biological Psychiatry*, 54, 317-329.
- National Heart, Lung, and Blood Institute, National Institutes of Health (2000). The Practical Guide: Identification, Evaluation, and treatment of Overweight and Obesity in Adults (NIH Publication No. 00-4084). Available Online: <http://www.nhlbi.nih.gov/guidelines/obesity/prctgd c.pdf>. Accessed October 13, 2009.
- National Institute of Health (2005). Diabetes fact sheet. Available at [www.nlm.nih.gov/medline/001214](http://www.nlm.nih.gov/medline/001214). Accessed January 17, 2007.
- Nelson, K., Reiber, G., & Boyko, E. (2002). Diet and exercise among adults with type 2 diabetes: findings from the third National Health and Nutrition Examination Survey (NHANES III). *Diabetes Care*, 25, 1722-1728.

- Orme, C. & Binik, Y., (1989). Consistency of adherence across regimen demands. *Health Psychology, 8*, 27-43.
- Palinkas, L., Barrett-Connor, E., & Wingard, D. (1991). Type 2 diabetes and depressive symptoms in older adults: a population-based study. *Diabetic Medicine, 8*, 532-539.
- Paschalides, C., Wearden, A., Dunkerley, R., Bundy, C., Davies, R., & Dickens, C. (2004). The association of anxiety, depression, and personal illness representations with glycaemic control and health related quality of life in patients with type 2 diabetes mellitus. *Journal of Psychosomatic Research, 57*, 557-564.
- Pittion-Vouyovitch, S., Debouviere, M., Guillemin, F., Vandenberghe, N., Anxionnat, R., & Vespignani, H. (2006). Fatigue in multiple sclerosis is related to disability, depression, and quality of life. *Journal of Neurological Sciences, 243*, 39-45.
- Piper, B., Dibble, S, Dodd, M., Weiss, M., Slaughter, R., & Paul, S. (1998). The revised Piper fatigue scale: Psychometric evaluation in women with breast cancer. *Oncology Nursing Forum, 25*, 677-684.
- Pittion-Vouyovitch, S., Debouviere, M., Guillemin, F., Vandenberghe, N., Anxionnat, R., & Vespignani, H. (2006). Fatigue in multiple sclerosis is related to disability, depression, and quality of life. *Journal of Neurological Sciences, 243*, 39-45.
- Polonsky, W., Anderson, B., Lohrer, P., Welch, G., Jacobson, A., Aponte, J., & Schwartz, C. (1995). Assessment of diabetes-related distress. *Diabetes Care, 18*, 754-760.
- Prue, G., Rankin, J., Cramp, F., Allen, J., & Gracey, J. (2006). Fatigue in gynaecological cancer patients: a pilot study. *Support Care Cancer, 14*, 78-83.
- Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. (1997). *Diabetes Care, 20*, 1183-97.
- Reyes-Gibby, C., Aday, L., Anderson, K., Mendoza, T. and Cleeland, C. (2006). Pain, depression, and fatigue in community-dwelling adults with and without a history of cancer. *Journal of Pain and Symptom Management, 32*, 118-128.
- Rhodes, V., Watson, P., Hanson, B. (1988). Patients' descriptions of the influence of tiredness and weakness on self-care abilities. *Cancer Nursing, 11*, 186-194.
- Rose, V., Harris, M., Ho, M., & Jayasinghe, U. (2009). A better model of diabetes self-management? Interactions between GP communication and patient self-efficacy in self-monitoring of blood glucose. *Patient Education and Counseling, 77*, 260-265.

- Rhoten, D. (1982). Fatigue and the postsurgical patient. In C. Norris (Ed.) *Concept clarification in nursing*, Rockville, MD: Aspen.
- Rubin, R. R. & Peyrot, M. (1992). Psychosocial problems and interventions in diabetes. *Diabetes Care*, *15*, 1640-1657.
- Rubin, R. R. & Peyrot, M. (1999). Quality of life and diabetes. *Diabetes and Metabolic Research Review*, *15*, 205-218.
- Saydah, S., Brancati, F., Golden, S., Fradkin, J., & Harris, M. (2003). Depressive symptoms and the risk of type 2 diabetes mellitus in a US sample. *Diabetes Metabolism Research and Reviews*, *19*, 202-208.
- Schwartz, C., Coulthard-Morris, L, and Zeng, Q. (1996). Psychosocial correlates of fatigue in Multiple Sclerosis. *Archives of Physical Medicine and Rehabilitation*, *77*, 165-169.
- Simon and Von Korff (2006). Medical co-morbidity and validity of DSM-IV depression criteria. *Psychological Medicine*, *36*, 27-36.
- Smets, E., Garssen, B., Bonke, B., & De Haes, J. (1995). The multidimensional fatigue inventory (MFI) psychometric qualities of an instrument to assess fatigue. *Journal of Psychosomatic Research*, *39*, 315-325.
- Spitzer, R, Kroenke, K., & Williams, J. (1999). Validation and utility of a self-report version of the PRIME-MD. The PHQ primary care study. Primary care evaluation of mental disorders: Patient Health Questionnaire. *Journal of the American Medical Association*, *282*, 1737-1744.
- Stein, K., Jacobsen, P., Blanchard, C., & Thors, C. (2004). Further Validation of the Multidimensional Fatigue Symptom Inventory-Short Form. *Journal of Pain and Symptom Management*, *27*, 14-23.
- Stein, K., Martin, S., Hann, D., & Jacobsen, P. (1998). A multidimensional measure of fatigue for use with cancer patients. *Cancer Practice*, *6*, 143-152.
- Stewart, A, Greenfield, S., Hays, R., et al (1989). Functional status and well-being of patients with chronic conditions. *Journal of the American Medical Association*, *262*, 907-913.
- Strober, L. & Arnett, P. (2005). An examination of four models predicting fatigue in multiple sclerosis. *Archives of Clinical Neuropsychology*, *20*, 631-646.
- Sullivan, P., Ghushchyan, V., Ben-Joseph, R. (2008). The impact of obesity on diabetes, hyperlipidemia, and hypertension in the United States. *Quality of Life Research*,



17, 1063-1071.

Sultan, S. & Heurtier-Hartemann (2001). Coping and distress as predictors of glycemic control in diabetes. *Journal of Health Psychology, 6*, 731-739.

SurrIDGE, D., Williams Erdahl, D., Lawson, J., Donald, M., Monga, T., Bird, C., & Letemenda, F. (1984). Psychiatric aspects of diabetes mellitus. *British Journal of Psychiatry, 145*, 269-276.

Surwit, R., van Tilburg, M., Parekh, P., Lane J., & Feinglos, M. (2005). Treatment regimen determines the relationship between depression and glycemic control. *Diabetes Research and Clinical Practice, 69*, 78-80.

Thomas, J., Jones, G., Scarinci, I., Brantley, P. (2003). A descriptive and comparative study of the prevalence of depressive and anxiety disorders in low-income adults with type 2 and other chronic illnesses. *Diabetes Care, 26*, 2311-2317.

Toobert, D. & Glasgow, R. (1994). Assessing diabetes self-management: The summary of diabetes self-care activities questionnaire. *Handbook of Psychology and Diabetes: A Guide to Psychological Measurement in Diabetes Research and Practice*. C. Bradley. Newark, NJ, Harwood Academic Publishers (part of the Gordon & Breech Publishing Group).

Toobert, D., Hampson, S., & Glasgow, R. (2000). The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes Care, 23*, 943-950.

The UKPDS Prospective Diabetes Study (UKPDS) Group. (1998). Effect of intensive blood-glucose control with metformin on complications in overweight patients with type 2 diabetes (UKPDS 34). *Lancet, 352*, 837-853.

U.S. Census Bureau (2009). State & County QuickFacts: Louisville, KY: Retrieved from the World Wide Web: <http://quickfacts.census.gov/qfd/states21000.html>.

U.S. Census Bureau (2009). State & County QuickFacts: New Albany, IN: Retrieved from the World Wide Web: <http://quickfacts.census.gov/qfd/states18019.html>.

Vaccarino, A., Sills, T., Evans, K., & Kalali, A. (2008). Prevalence and association of somatic symptoms in patients with major depressive disorder. *Journal of Affective Disorders, 110*, 270-276.

van der Werf, S., Jongen, P., Nijeholt, G., Barkhof, F., Hommes, O., & Bleijenberg, G. (1998). Fatigue in multiple sclerosis: interrelations between fatigue complaints, cerebral MRI abnormalities and neurological disability. *Journal of the Neurological Sciences, 160*, 164-170.

- Vgontzas, A., Bixler, E., & Chrousos, G. (2006). Obesity-related sleepiness and fatigue: The role of the stress system and cytokines. *Annals of the New York Academy of Sciences*, 1083, 329-344.
- Visscher, T.L., and Seidell, J.C. (2001). The public health impact of obesity. *Annual Review Public Health*, 22, 355-375.
- Ware, J. Jr., Kosinski, M. & Keller, S. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical Care*, 34, 220-33.
- Weinger, K. & Jacobson, A. (2001). Psychosocial and quality of life correlates of glycemic control during intensive treatment of type 1 diabetes. *Patient Education and Counseling*, 42, 123-131.
- Welch, G., Jacobsen, A., and Polonsky, W. (1997). The problem areas in diabetes scale: An evaluation of its clinical utility. *Diabetes Care*, 20, 760-766.
- Welch, G., Weinger, K., Anderson, G. and Polonsky, W. (2003). Responsiveness of the Problem Areas in Diabetes (PAID) questionnaire. *Diabetic Medicine*, 20, 69-72.
- Whitty, P., Steen, N., Eccles, M. (1997) A new completion outcome measure for diabetes: is it responsive to change? *Quality of Life Research*, 6, 407-413.
- World Health Organization. (2006). Diabetes: Fact Sheet No.312, September, 2006. Available at [www.who.int/mediacentre/factsheets/fs312](http://www.who.int/mediacentre/factsheets/fs312). Accessed January 17, 2007.
- World Health Organization. (1992). ICD-10: International Statistical Classification of Diseases and Health Related Problems, tenth revision. World Health Organization, Geneva, Switzerland.
- Wu, H. and McSweeney, M. (2001). Measurement of fatigue in people with cancer. *Oncology Nursing Forum*, 28, 1371-1386.

## APPENDICES

Table 1

Proposed ICD-10 Criterion of Cancer-Related Fatigue

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A. There are eleven symptoms within this criterion, one of these MUST be (1) significant fatigue. These are listed below:

1. Significant fatigue, diminished energy, or increased need to rest disproportionate to any recent change in activity level.
2. Complaints of generalized weakness or limb heaviness.
3. Diminished concentration or attention.
4. Decreased motivation or interest to engage in usual activities.
5. Insomnia or hypersomnia.
6. Experience of sleep as unrefreshing or nonrestorative.
7. Perceived need to struggle to overcome inactivity.
8. Marked emotional reactivity (e.g. sadness, frustration, or irritability) to feeling fatigued.
9. Difficulty completing daily tasks attributed to feeling fatigued.
10. Perceived problems with short- term memory.
11. Postexertional malaise lasting several hours.

B. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

C. There is evidence from the history, physical examination, or laboratory findings that the symptoms are a consequence of cancer or cancer therapy.

D. The symptoms are not primarily a consequence of comorbid psychiatric disorders such as major depression, somatization disorder, somatoform disorder, or delirium.

\*For a diagnosis of CRF to be warranted, six of the above criteria must be present for at least a 2-week period every day or nearly every day.

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Adapted from Cella, Peterman, Passik, Jacobsen, and Breitbart, 1998.

Table 2  
Summary of Fatigue Assessment Measures

Author/ Date	Instrument	Population	Definition	Reliability/ Validity	Di- mensionali ty
Hann et al., 1998	Fatigue Symptom Inventory (FSI) 3 items; 0-10 numeric scale	N=107 women currently undergoing treatment for breast cancer.  N=113 women that completed treatment for breast cancer.  N=50 women with no history of cancer	Fatigue was not discussed in terms of definition; it was assessed due to its impact on quality of life	Reliability: Alpha = 0.94, 0.95, 0.93 for the three groups  Test-retest reliability was 0.35-0.75 was found in the active treatment group and 0.10-0.74 in the normal group.  Construct Validity: Active Tx and post-Tx both had higher fatigue scores than the healthy group in terms of intensity, duration, and impact on QOL.	U
Hazdi-Pavlovic et al, 2000	Schedule of Fatigue and Anergia (SOFA) scale 10-items  5-point Likert scale	N=770 patients with CFS. N=1593 primary care and CFS primary care	Fatigue was discussed in terms of severity.	The only validity information regarding discrimination between patients with CFS/primary care patients.	U

Krupp et al., 1989	Fatigue Severity Scale (FSS)  9-items  7-point Likert	A large number of patients with MS and systemic lupus erythematosus (SLE)	This measure assesses the impact and functional outcomes affected by fatigue, rather than a direct	Internal consistency: Alpha=0.88.  Discriminative Validity: This measure sufficiently discriminated between MS and CFS groups	U
McNair et al., 1992	Profile of Mood States (POMS)  37 items  5-point Likert scales	Large psychiatric populations and college students	Not defined; Fatigue is addressed in terms of intensity.	Reliability: Well-examined in the literature, Fatigue subscale has not been validated separately.  Construct Validity: not discussed	U
Piper et al., 1998	Revised Piper Fatigue Scale (Revised PFS)  22 items  0-10 numerical rating scale, and 5 open ended questions	N=382 Breast cancer survivors	Fatigue was defined as a subjective feeling of tiredness that is affected by circadian rhythm. Four dimensions are assessed: behavioral/severity, affective meaning, sensory, and cognitive mood.	Reliability: Alpha=0.97 (entire scale) and ranged from 0.92-0.96 for the four subscales.  Construct validity: Demonstrated due to four factor solution.	M

Rhoten, 1982	Rhoten Fatigue Scale (RFS)  One item  11-point severity scale	N=5 adults admitted for abdominal surgery	Postoperative fatigue is defined as a general state of negative feeling associated with pain, discomfort, and pain medication	Reliability: not discussed  Validity: Patients' ratings on the RFS are correlated with the investigators ratings.	U
Schwartz, 1998	Schwartz Cancer Fatigue Scale (SCFS)  28-items  5-point Likert rating	N=166 patients with various forms of cancer.	CRF is a subjective state that is captured in four dimensions: physical, emotional, cognitive, and temporal.	Reliability: Alpha=0.96 for the total scale, 0.82-0.93 for the subscales.  Construct Validity: Differences were observed between those receiving treatment and those who had completed treatment.	M
Schwartz et al, 1993	Fatigue Assessment Instrument (FAI)  29 items  7-point Likert scale	N=235 individuals with Lyme disease, CFS, SLE, MS, dysthymia, and controls	Fatigue is measured in terms of four subscales: Fatigue severity, situation specificity, consequences of fatigue, and responsiveness to sleep.	Internal consistency: range from 0.70-0.91	M
Smets et al., 1995	Multidimensional Fatigue Inventory (MFI)  20-items  7-point Likert scale	N=111 patients with various forms of cancer  N=357 patients with CFS	Definition unclear, fatigue is a multidimensional symptom with 5 dimensions: general fatigue, physical fatigue, reduced activity, reduced motivation, and mental fatigue.	Reliability: Alpha=0.65-0.80 internal consistency.  Construct Validity: Significant differences observed for	M

				groups that reported symptoms as a result of circumstances vs. activity level	
Stein et al., 1998	<p>1. Multidimensional Fatigue Symptom Inventory (MFSI)</p> <p>85-items</p> <p>2. MFSI-Short Form (MFSI-SF)</p> <p>30-item</p> <p>Both measures use a 5-point Likert rating</p>	<p>1. N=15 patients with breast cancer; N=10 with no history of cancer, and N=8 oncology care providers</p> <p>2. N=146 women currently undergoing treatment for breast cancer, N=92 women that were post-treatment for cancer, and N=54 with no history of cancer.</p>	<p>Fatigue was conceptualized for both measures in terms of five dimensions: global experience, somatic, cognitive, affective, and behavioral. It is defined as a subjective feeling of tiredness and weariness both in association of activity and/or independent of physical effort, decreased performance motivation, and an altered mood state. MFSI-SF included a vigor dimension rather than a behavioral dimension.</p>	<p>1. Reliability: Alphas were as follows: global= 0.92, affective=0.88, somatic=0.90, cognitive=0.91, and behavioral=0.87</p> <p>2. Reliability: Alphas were as follows: general= 0.96, affective=0.93, physical =0.85, mental=0.90, and vigor=0.88</p>	Multidimensional
Vercoulen et al, 1994.	<p>Checklist of Individual Strength (CIS).</p> <p>20 items</p> <p>5-point Likert scale</p>	N=298 CFS patients	<p>Fatigue is assessed in terms of both severity and behavioral consequences using four subscales: subjective experience of fatigue, concentration, motivation, and physical activity.</p>	<p>Internal Consistency: Alpha=0.90</p> <p>Test-retest reliability has not been demonstrated, however this measure is sensitive to changes in fatigue over</p>	Multidimensional



				time.	
Yellen et al, 1997.	<p>Functional Assessment of Cancer Therapy (FACT) scale</p> <p>Fatigue subscale (FACT-F)</p> <p>13-items</p> <p>5-point Likert rating</p>	N=49 patients receiving cancer treatment	Fatigue was assessed in terms of severity and impact of the symptom itself.	<p>Internal Consistency: Alpha=0.93.</p> <p>Test-retest reliability: 0.90</p>	Unidimensional

Table 3

Hypothesized Individual Correlations between Independent Variables

Construct	(CESD-10)	(PAID)	(MFSI-SF)
Depressive Symptomatology (CESD-10)	--	Moderate/+	Moderate to High/+
Diabetes Specific Distress (PAID) (PAID)	Moderate/+	--	Moderate/+
Fatigue (MFSI-SF)	Moderate to High/+	Moderate/+	--

Note. None = 0 to .10; Low = .11 to .30; Moderate = .31 to .50; High .51 and larger.

Table 4

Hypothesized Relationships between Diabetes Emotional Distress Constructs and Self-management and Quality of Life

Construct	(CESD-10)	(PAID)	(MFSI-SF)
<b>Diabetes Self-Care Behavior (SDSCA)</b>			
Diet	Moderate/-	Moderate/-	Moderate/-
Blood Glucose Monitoring	Moderate/-	Moderate/-	Moderate/-
<b>Quality of Life (SF-12)</b>			
Physical Component	High/-	Moderate/-	High/-
Mental Component	High/-	High/+	High/-

Note. None = 0 to .10; Low = .11 to .30; Moderate = .31 to .50; High .51 and larger.

Table 5.

Measures Assessing Constructs Reflecting Diabetes Emotional Distress

Observed Construct	Measure
Depressive Symptomatology	Center for Epidemiological Studies of Depression Scale-10 (CESD-10)
Diabetes-Specific Distress	Problem Areas In Diabetes Scale (PAID)
Fatigue	Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF)

Note: Total scores of these measures used as independent variables

Table 6.

Measures Assessing Diabetes Self-Care Behavior and Quality of Life Constructs and Subscales.

Observed Construct	Measure	Relevant Subscales
Diabetes Self-Care Behavior	Summary of Diabetes Self-Care Activities (SDSCA)	Diet
		Blood Glucose Testing
Quality of Life	Medical Outcomes Study Short Form 12 (SF-12)	Physical Component Score
		Mental Component Score

Table 7

## Diabetes Characteristics by Completion Status

Observed Construct	Completion Status	<i>n</i>	<i>M</i>	<i>SD</i>
Number of Complications	Complete	143	4.23	1.74
	Non-Complete	49	4.12	1.88
Duration of Diabetes in months (years presented in parenthesis)	Complete	143	143.64* (11.97)	102.54 (8.54)
	Non-Complete	49	105.65 (8.80)	80.69 (6.72)
HbA1 <sub>c</sub>	Complete	143	7.33**	1.45
	Non-Complete	50	8.29	1.79
Body Mass Index	Complete	143	35.38	6.83
	Non-Complete	50	36.82	8.59

\*  $p=.02$ ; \*\*  $p=.000$

Table 8

## Demographic Characteristics of Participants

Characteristic	<i>n</i> (Total N=148)	%	M	SD
Age			60.68	11.24
Age Under 40	5	3.4		
In 40's	16	10.8		
In 50's	45	30.4		
In 60's	51	34.5		
In 70's	24	16.2		
In 80's	7	4.7		
Gender				
Male	71	48.0		
Female	77	52.0		
Ethnicity				
Caucasian	137	93.2		
African American	7	4.8		
Hispanic	2	1.4		
Asian	1	0.7		
Marital Status				
Never Married	11	7.4		
Currently Married	107	72.3		
Separated	1	0.7		
Divorced	14	9.5		

Characteristic	<i>n</i>	%	M	SD
Widowed	15	10.1		
<b>Living Arrangement</b>				
Live Alone	27	18.1		
Live with spouse/partner	84	56.8		
Live w/spouse and children	26	17.6		
Live with children	3	2.0		
Live with roommate	3	2.0		
Live with parents	2	1.4		
Other	3	2.0		
<b>Education</b>				
Less than 7 <sup>th</sup> Grade	1	0.7		
Junior High School	4	2.7		
Partial High School	13	8.8		
High School Graduate	49	33.3		
Partial college/specialized training	37	25.2		
College or University Graduate	18	12.2		
Graduate Professional Training	25	17.0		
<b>Employment</b>				
Full time	43	29.7		
Part time	8	5.5		
On Leave Without Pay	1	0.7		



Characteristic	<i>n</i>	%	M	SD
Disabled	21	14.5		
Retired	64	44.1		
Homemaker	8	5.5		
<b>Income</b>				
Less than \$10,000	3	2.2		
\$10,000-19,999	20	14.5		
\$20,000-39,999	28	20.3		
\$40,000-59,999	39	28.3		
\$60,000-100,000	32	23.2		
Greater than \$100,000	16	11.6		

Table 9.

Representativeness of study sample in comparison to U.S. Census demographic information.

Characteristic	Study Sample	New Albany, IN	Louisville, KY
Gender			
Male	48.3%	46.9%	48.4%
Female	51.7%	53.1%	51.6%
Ethnicity			
Caucasian	93.2%	90.0%	82.8%
African American	4.7%	6.9%	13.9%
Hispanic	1.4%	1.4%	1.6%
Asian	0.7%	0.4%	1.1%

Note: Comparisons based on 2000 Census data

Table 10

Means and Standard Deviations of Personal Illness Models Construct Measures (emotional distress, self-management, quality of life)

Observed Construct	Measure and Subscales	<i>n</i>	<i>M</i> (Range)	<i>SD</i>
Depressive Symptomatology	CESD-10	142	4.87 (0-13)	2.60
Diabetes Specific-Distress	PAID	147	39.69 (19-87)	14.36
Fatigue	MFSI-SF	147	13.90 [(-19)-78]	19.46
Self-Management	SDSCA			
	Blood Glucose Testing	143	4.87 (0-7)	2.24
	Diet	143	3.67 (0-7)	1.40
Quality of Life	SF-12			
	Physical	148	41.82 (12.9-63.4)	12.37
	Mental	148	43.89 (11.3-64.4)	12.73

Table 11.

Means and Standard Deviations between Insulin Use, Emotional Constructs, Diet, Blood Glucose, and Quality of Life Outcomes

Construct	Gender							
	Male			Female			<i>p</i>	
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>		
Depressive Symptomatology (CESD-10)	69	4.39	2.50	73	5.33	2.64	.032*	
Diabetes Specific Distress (PAID)	71	37.65	13.94	76	41.61	14.59		
Fatigue (MFSI-SF)	71	11.41	18.18	75	15.91	20.37		
Diabetes Self-Care Behavior (SDSCA)								
Diet	68	3.39	1.50	75	3.93	1.27	.020*	
Blood Glucose Monitoring	68	4.66	2.31	75	5.06	2.18		
Quality of Life (SF-12)								
Physical Component	71	41.68	11.82	77	41.94	12.93		
Mental Component	71	46.05	11.99	77	41.91	13.16	.048*	

Note: Exact *p*-values are reported for significant difference

Table 12

## Health Characteristics of Participants

Characteristic	<i>n</i>	%	M	SD
Duration of DM (months)			143.64	102.54
Body Mass Index			35.38	6.83
Body Mass Index by Group				
Normal	4	2.9		
Overweight	24	17.1		
Obesity I	41	29.3		
Obesity II	36	25.7		
Obesity III	35	25.0		
HbA1 <sub>c</sub>			7.33	1.45
HbA1 <sub>c</sub> by Group				
<7.0	62	43.4		
7.0-7.9	42	29.4		
8.0-8.9	21	14.7		
9.0-9.9	12	8.4		
>10	6	4.2		
Antidepressant Use	33	23.1		
DM Oral Agent Use	132	92.3		
Exogenous Insulin Use	47	34.8		
Byetta Use	10	7.4		
Medication Use				

Orals Only	78	54.5		
Insulin Only	11	7.7		
Both Insulin and Oral Agents	54	37.8		
<b>Smoking Status</b>				
Tobacco User	16	11.2		
Non-Smoker	127	88.8		
<b>How would you rate your present health condition?</b>				
Excellent	1	0.7		
Very Good	25	17.0		
Good	68	46.3		
Fair	38	25.9		
Poor	15	10.2		
No. of Complications			4.23	1.74
Hypertension	111	78.2		
Hyperlipidemia	126	88.7		
Peripheral Neuropathy	60	42.3		

---

Note: Data based on chart review

Table 13.

*Means and Standard Deviations for Personal Illness model Construct measures (Emotional Constructs, Self-Management, and Quality of Life Outcomes) by insulin use status*

Construct	Exogenous Insulin Use						<i>p</i>
	YES			NO			
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Depressive Symptomatology (CESD-10)	44	4.93	2.67	85	4.78	2.57	
Diabetes Specific Distress (PAID)	46	42.28	15.32	88	38.63	14.09	
Fatigue (MFSI-SF)	46	13.63	19.00	87	12.28	18.72	
Diabetes Self-Care Behavior (SDSCA)							
Diet	45	3.74	1.26	86	3.70	1.50	
Blood Glucose Monitoring	46	5.24	1.89	85	4.57	2.32	.035*
Quality of Life (SF-12)							
Physical Component	47	38.34	12.57	88	43.87	12.08	.014*
Mental Component	47	41.99	12.56	88	45.09	12.53	
HbA1c	47	8.12	1.65	88	6.84	1.13	.000*

Note: Exact *p*-values for independent sample *t*-tests are reported for significant differences by insulin use status

Table 14.

*Means and Standard Deviations for Personal Illness model Construct measures (Emotional Constructs, Self-Management, and Quality of Life Outcomes) by antidepressant use status*

Construct	Antidepressant Use						
	YES			NO			<i>p</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Depressive Symptomatology (CESD-10)	31	5.97	2.76	106	4.50	2.43	.005*
Diabetes Specific Distress (PAID)	33	46.82	19.65	109	37.67	11.69	.015*
Fatigue (MFSI-SF)	32	23.09	19.61	109	9.98	17.20	.000*
Diabetes Self-Care Behavior (SDSCA)							
Diet	32	3.67	1.32	106	3.69	1.45	
Blood Glucose Monitoring	33	4.76	2.19	105	4.92	2.23	
Quality of Life (SF-12)							
Physical Component	33	37.21	13.53	110	43.29	11.66*	.013*
Mental Component	33	37.20	12.84	110	46.27	11.79*	.000*

Note: Exact *p*-values for independent sample *t*-tests are reported for significant differences by antidepressant use



Table 15

*Associations between emotional distress measures*

Construct	Depressive Symptomatology (CESD-10)	Diabetes Specific Distress (PAID)	Fatigue (MFSI-SF)
Depressive Symptomatology (CESD-10)		.581 (.000)	.657 (.000)
Diabetes Specific Distress (PAID)			.619 (.000)
Fatigue (MFSI-SF)			

Note. p-values for Pearson Correlations are listed in parentheses.

Table 16.

Associations between Personal Illness Model measures (emotional distress, diabetes self-management, and quality of life)

Construct	Depressive Symptomatology (CESD-10)	Diabetes Specific Distress (PAID)	Fatigue (MFSI-SF)
Diabetes Self-Care Behavior (SDSCA)			
Diet	-.181 (.032)*	-.231(.005)*	-.173 (.040)*
Blood Glucose Monitoring	-.140 (.101)	-.015 (.863)	-.066 (.438)
Quality of Life (SF-12)			
Physical Component	-.290 (.000)*	-.262 (.000)*	-.392 (.000)*
Mental Component	-.612 (.000)*	-.574 (.000)*	-.685 (.000)*

Note: Pearson correlations p-values are listed in parentheses, \* denote significance

Table 17

Associations of primary study variables including independent variables, dependent variables and covariates.

Construct	1	2	3	4	5	6	7	8	9	10	11	12	13
1. DM-Specific Distress	1												
2. Fatigue	.617**	1											
3. Depressive Sx.	.579**	.644**	1										
4. <i>Gender</i>	-.136	-.105	-.184*	1									
5. Age	-.066	-.083	-.133	.024	1								
6. Body Mass Index	.146	.086	.057	-.193*	-.398**	1							
7. HbA1c	.227**	.040	.094	.008	-.082	.241**	1						
8. Duration of DM	-.008	-.026	-.121	-.058	.353**	-.106	-.044	1					
9. <i>Antidepressant Use</i>	-.268**	-.289**	-.242**	.174*	.144	-.071	-.099	-.037	1				
10. Physical QOL	-.262**	-.392**	-.290**	-.020	-.138	-.112	-.126	-.162	.201*	1			
11. Mental QOL	-.574**	-.685**	-.612**	.146	.046	-.096	-.130	-.035	.291**	.361**	1		
12. Diet	-.231**	-.173*	-.181*	-.183	.033	-.073	-.232**	.077	.010	-.081	.169*	1	
13. Blood Glucose Testing	-.015	-.066	-.140	-.081	.222**	.055	-.021	.161	.035	-.158	.029	.203*	1

Note: \* p < .05; \*\* p < .01 Variables in italics are point bi-serial correlations

Table 18.

Summary of Hierarchical Linear Regression Analysis with Blood Glucose Testing  
(SDSCA Blood Glucose Testing) as Criterion (N=123)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.135	.135	6.17*
2	Insulin, Duration of DM, Oral Agents	.174	.040	1.86
3	Antidepressant Use	.175	.001	.100
4	Depressive Sx (CESD-10)	.194	.019	2.73

\* p = .001

Table 19.

Summary of Hierarchical Linear Regression Analysis with Diet (SDSCA Diet) as  
 Criterion (N=124)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.037	.037	1.55
2	Insulin, Duration of DM, Oral Agents	.061	.023	0.975
3	Antidepressant Use	.063	.003	.320
4	Depressive Sx (CESD-10)	.105	.042	5.4

Table 20.

Summary of Hierarchical Linear Regression Analysis with Blood Glucose Testing  
(SDSCA Blood Glucose Testing) as Criterion (N=128)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.131	.131	6.23*
2	Insulin, Duration of DM, Oral Agents	.168	.037	1.81
3	Antidepressant Use	.169	.001	.164
4	DM Specific Distress (PAID)	.178	.009	1.23

\* p = .001

Table 21

Summary of Hierarchical Linear Regression Analysis with Diet (SDSCA Diet) as

Criterion (N=128)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.042	.042	1.79
2	Insulin, Duration of DM, Oral Agents	.066	.024	1.05
3	Antidepressant Use	.069	.003	.375
4	DM-Specific Distress (PAID)	.143	.074	10.23*

p <.05

Table 22

Summary of Hierarchical Linear Regression Analysis with Blood Glucose Testing  
(SDSCA Blood Glucose Testing) as Criterion (N=126)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.136	.136	6.38*
2	Insulin, Duration of DM, Oral Agents	.172	.037	1.76
3	Antidepressant Use	.173	.001	.157
4	Fatigue (MFSI-SF)	.191	.017	2.52

\* p < .001



Table 23

Summary of Hierarchical Linear Regression Analysis with Diet (SDSCA Diet) as  
 Criterion (N=126)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.040	.040	1.68
2	Insulin, Duration of DM, Oral Agents	.066	.026	1.11
3	Antidepressant Use	.068	.002	.293
4	Fatigue (MFSI-SF)	.116	.048	6.37*

p=.013

Table 24

Summary of Hierarchical Linear Regression Analysis with Physical Quality of Life (SF-12 Physical Component Score) as Criterion (N=126)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.088	.088	3.94*
2	Insulin, Duration of DM, Oral Agents	.129	.040	1.83
3	Antidepressant Use	.160	.031	4.42
4	Depressive Sx (CESD-10)	.246	.086	13.28**

\*p <.05; \*\*p<.001

Table 25

Summary of Hierarchical Linear Regression Analysis with Mental Quality of Life (SF-12 Mental Component Score) as Criterion (N=126)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.051	.051	2.18
2	Insulin, Duration of DM, Oral Agents	.058	.007	.312
3	Antidepressant Use	.111	.053	6.99*
4	Depressive Sx (CESD-10)	.440	.329	68.58**

\*p <.05; \*\*p<.001

Table 26

Summary of Hierarchical Linear Regression Analysis with Physical Quality of Life (SF-12 Physical Component Score) as Criterion (N=131)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.099	.099	4.66**
2	Insulin, Duration of DM, Oral Agents	.135	.036	1.70
3	Antidepressant Use	.163	.028	4.08*
4	DM-Specific Distress (PAID)	.192	.029	4.44*

\*p <.05; \*\*p<.005

Table 27.

Summary of Hierarchical Linear Regression Analysis with Mental Quality of Life (SF-12 Mental Component Score) as Criterion (N=131)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.062	.062	2.79*
2	Insulin, Duration of DM, Oral Agents	.079	.017	.771
3	Antidepressant Use	.130	.051	7.24*
4	DM-Specific Distress (PAID)	.406	.275	56.50**

\*p <.05; \*\*p<.001

Table 28.

Summary of Hierarchical Linear Regression Analysis with Physical Quality of Life (SF-12 Physical Component Score) as Criterion (N=130)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.092	.092	4.23*
2	Insulin, Duration of DM, Oral Agents	.126	.034	1.60
3	Antidepressant Use	.160	.035	5.04*
4	Fatigue (MFSI-SF)	.267	.107	17.68**

\*p <.05; \*\*p<.001

Table 29.

Summary of Hierarchical Linear Regression Analysis with Mental Quality of Life (SF-12 Mental Component Score) as Criterion (N=130)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.047	.047	2.06
2	Insulin, Duration of DM, Oral Agents	.057	.011	.468
3	Antidepressant Use	.112	.055	7.55*
4	Fatigue (MFSI-SF)	.483	.371	86.81**

\*p <.05; \*\*p<.001

Table 30.

Overlapping items across Measures representing emotional distress constructs

Emotional Distress Construct	Measure	Item Wording	Item Number
Depression	CESD-10	I felt depressed.	3
	MFSI-SF	I feel depressed.	21
	SF-12	Have you felt downhearted and depressed?	11
	PAID	Feeling depressed when you think about your diabetes?	11
Concentration	CESD-10	I had trouble keeping my mind on what I was doing.	2
	MFSI-SF	I am unable to concentrate.	20
	MFSI-SF	I have trouble paying attention.	15
Energy	MFSI-SF	I feel energetic.	24
	SF-12	Did you have a lot of energy?	10



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Emotional Distress Construct	Measure	Item Wording	Item Number
Calm	MFSI-SF	I feel calm.	29
	SF-12	Have you felt calm and peaceful?	9

---

Table 31.

MFSI-SF subscales and their associations with CESD-10, PAID, and SF-12 component scores.

MFSI-SF Subscale	CESD-10	PAID	SF-12 physical	SF-12 mental
General	.559 (.000)	.492 (.000)	-.385 (.000)	-.489 (.000)
Physical	.539 (.000)	.451 (.000)	-.502 (.000)	-.537 (.000)
Emotional	.624 (.000)	.573 (.000)	-.091 (.272)	-.604 (.000)
Vigor	-.427 (.000)	-.333 (.000)	.300 (.000)	.573 (.000)
Mental	.410 (.000)	.553 (.000)	-.218 (.008)	-.396 (.000)
Total	.657 (.000)	.619 (.000)	-.384 (.000)	-.680 (.000)

Correlation	Moderate to High	Moderate to High	Moderate	Moderate to high
-------------	---------------------	---------------------	----------	---------------------

Note: p-values are listed in parentheses.

Table 32

Summary of Hierarchical Linear Regression Analysis with Blood Glucose Testing  
(SDSCA Blood Glucose Testing) as Criterion (N=122)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.135	.135	6.17*
2	Insulin, Duration of DM, Oral Agents	.174	.040	1.86
3	Antidepressant Use	.175	.001	.100
4	CESD-10, PAID	.195	.020	1.41
5	Fatigue (MFSI-SF)	.197	.002	.250

\*p <.05

Table 33.

Summary of Hierarchical Linear Regression Analysis with Diet (SDSCA Diet) as

Criterion (N=123)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.037	.037	1.55
2	Insulin, Duration of DM, Oral Agents	.061	.023	.975
3	Antidepressant Use	.063	.003	.320
4	CESD-10, PAID	.143	.080	5.30*
5	Fatigue (MFSI-SF)	.144	.000	.062

\*p <.05

Note----Step 4 significance comes from the PAID (p=.027) compared to CESD (p=.521)

Table 34

Summary of Hierarchical Linear Regression Analysis with Physical Quality of Life (SF-

12 Physical Component Score) as Criterion (N=124)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.096	.096	4.30*
2	Insulin, Duration of DM, Oral Agents	.141	.045	2.05
3	Antidepressant Use	.169	.027	3.87*
4	CESD-10, PAID	.247	.078	5.98*
5	Fatigue (MFSI-SF)	.321	.074	12.37**

\*p ≤ .05; \*\*p < .001

Table 35

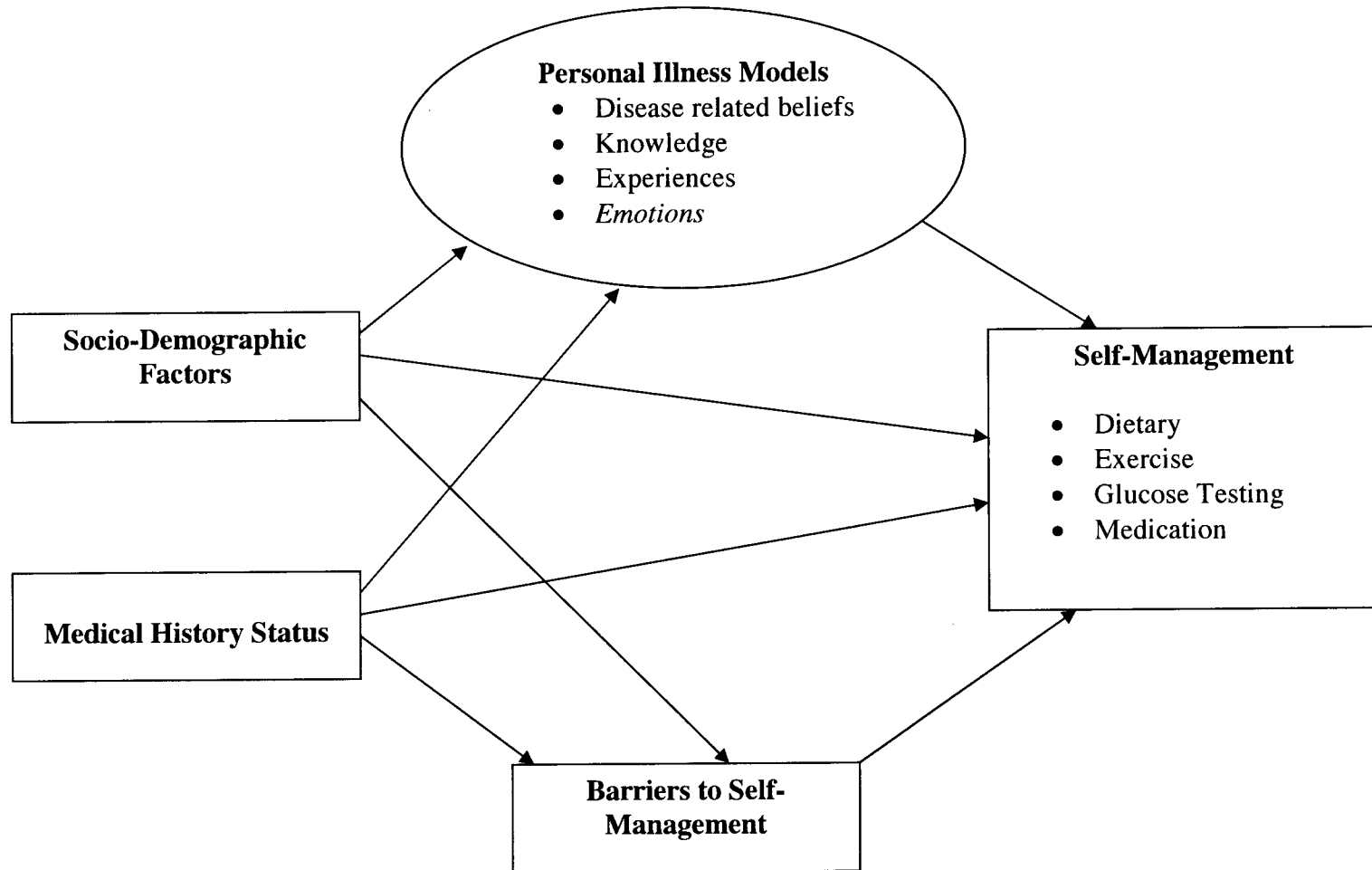
Summary of Hierarchical Linear Regression Analysis with Mental Quality of Life (SF-

12 Mental Component Score) as Criterion (N=124)

Step	Predictor Variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF
1	BMI, Gender, Age	.067	.067	2.90*
2	Insulin, Duration of DM, Oral Agents	.076	.009	.392
3	Antidepressant Use	.123	.046	6.19*
4	CESD-10, PAID	.541	.419	52.46**
5	Fatigue (MFSI-SF)	.618	.076	22.80**

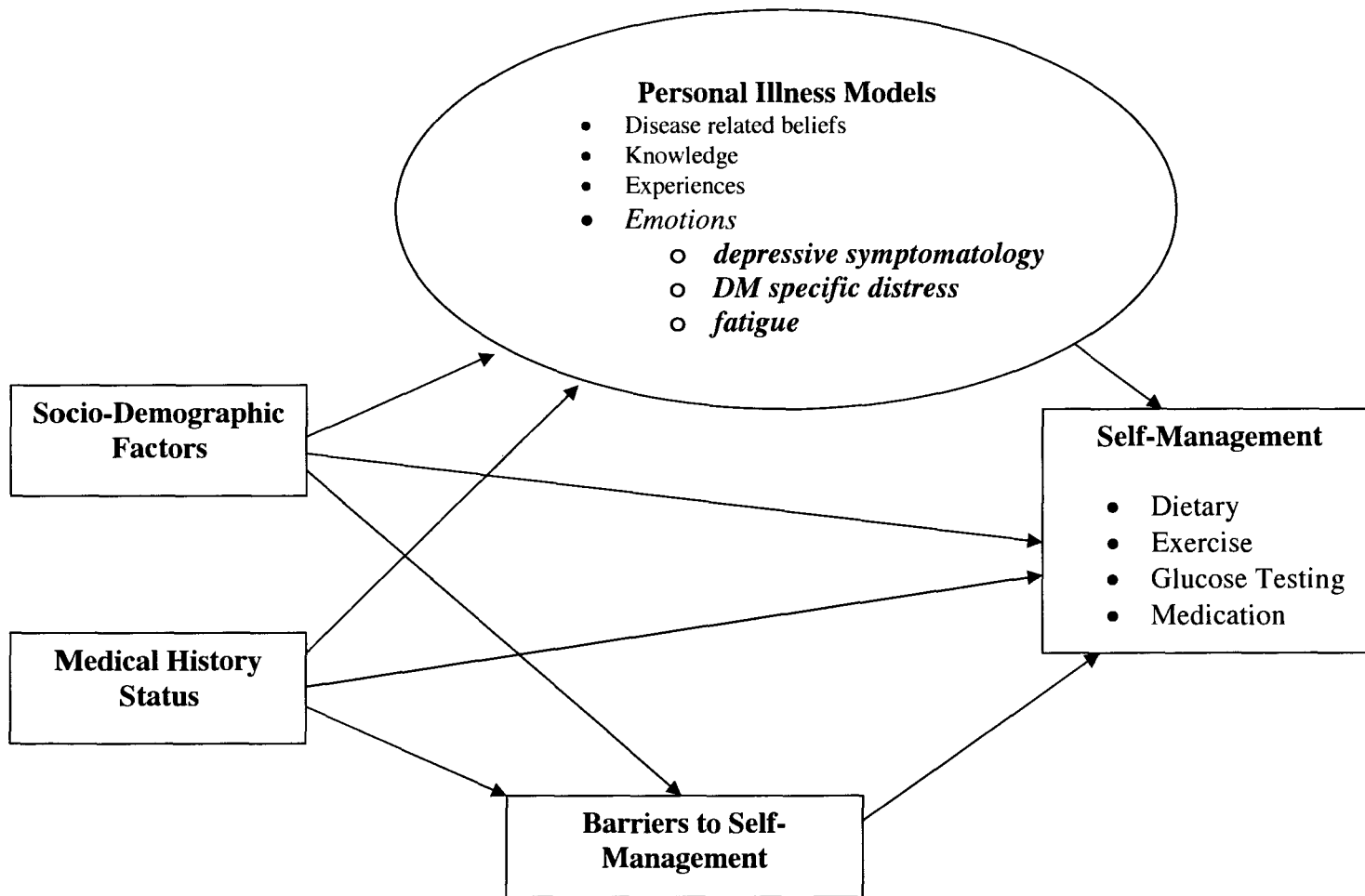
\*p <.05; \*\*p<.001

Figure 1: Glasgow et al's Model of key variables influencing diabetes self-management



Glasgow, Hampson, Strycker, & Ruggiero (1997).

Figure 2: Proposed Revision of Glasgow's Model of Self-Management modified to include affect



Modified from Glasgow, Hampson, Strycker, & Ruggiero (1997).



Figure 3.

Study Recruitment

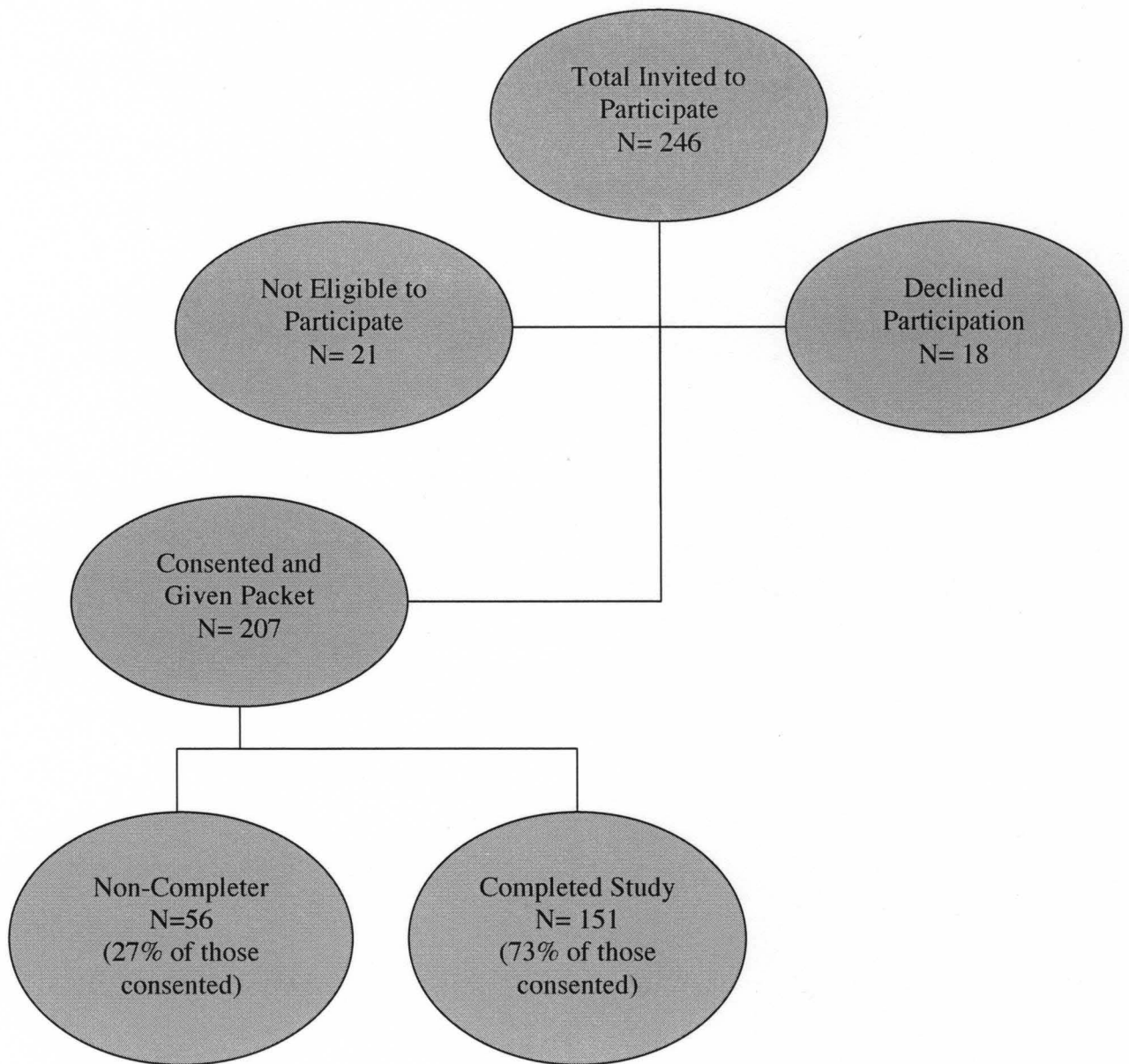
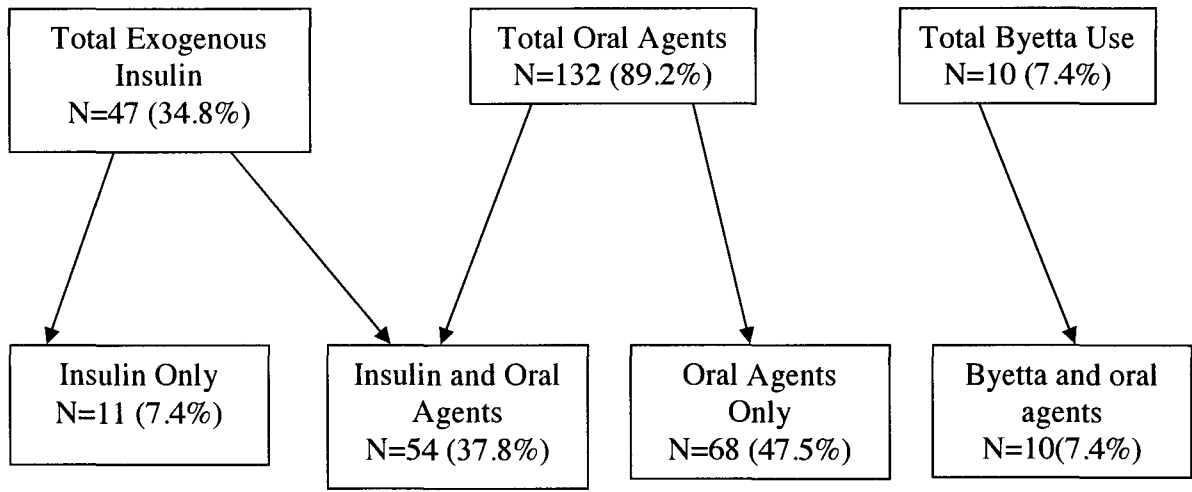


Figure 4. Participant Diabetes Medication Use

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Note. Patients cannot be on Insulin and Byetta simultaneously, nor can they be on Byetta without Oral Agents. Additionally, 5 participants medicine regimen was not available from the chart and is not represented in this figure.

Measures Packet.



10. Approximate annual gross income for your **household**: (check one number)  
(Remember all information you provide will remain completely confidential)
- |                            |                      |                            |                        |
|----------------------------|----------------------|----------------------------|------------------------|
| <input type="checkbox"/> 1 | Less than \$ 10,000  | <input type="checkbox"/> 4 | \$40,000 - \$59,999    |
| <input type="checkbox"/> 2 | \$10,000 - \$19,999  | <input type="checkbox"/> 5 | \$60,000 - \$100,000   |
| <input type="checkbox"/> 3 | \$20,000 - \$ 39,999 | <input type="checkbox"/> 6 | Greater than \$100,000 |

11. Which category best describes **your** usual occupation? If you are not currently employed, which category best describes your **LAST** job? (check one number)

- 1 Professional (e.g., teachers/professors, nurses, lawyers, physicians, & engineers)
- 2 Manager/Administrator (e.g., sales managers)
- 3 Clerical (e.g., secretaries, clerks or mail carriers)
- 4 Sales (e.g., sales persons, agents & brokers)
- 5 Service (e.g., police, cooks, waitress, or hairdressers)
- 6 Skilled Crafts, Repairer (e.g., carpenters)
- 7 Equipment or Vehicle Operator (e.g., truck drivers)
- 8 Laborer (e.g., maintenance factory workers)
- 9 Farmer (e.g., owners, managers, operators or tenants)
- 10 Member of the military
- 11 Homemaker (with no job outside the home)
- 12 Other (please describe)\_\_\_\_\_

12. **Current employment situation** (check all that apply):

- 1 Full time at job
- 2 Part time at job
- 3 On leave with pay
- 4 On leave without pay
- 5 Disabled
- 6 Seeking work
- 7 Retired
- 8 Homemaker
- 9 Student

Below is a list of statements that describe how people sometimes feel. Please read each item carefully. Then circle the number next to each item which best describes **how true each statement has been for you in the past 7 days.**

	Not at all	A little	Moderately	Quite a bit	Extremely
1. I have trouble remembering things	0	1	2	3	4
2. My muscles ache	0	1	2	3	4
3. I feel upset	0	1	2	3	4
4. My legs feel weak	0	1	2	3	4
5. I feel cheerful	0	1	2	3	4
6. My head feels heavy	0	1	2	3	4
7. I feel lively	0	1	2	3	4
8. I feel nervous	0	1	2	3	4
9. I feel relaxed	0	1	2	3	4
10. I feel pooped	0	1	2	3	4
11. I am confused	0	1	2	3	4
12. I am worn out	0	1	2	3	4
13. I feel sad	0	1	2	3	4
14. I feel fatigued	0	1	2	3	4
15. I have trouble paying attention	0	1	2	3	4
16. My arms feel weak	0	1	2	3	4
17. I feel sluggish	0	1	2	3	4
18. I feel run down	0	1	2	3	4
19. I ache all over	0	1	2	3	4
20. I am unable to concentrate	0	1	2	3	4
21. I feel depressed	0	1	2	3	4
22. I feel refreshed	0	1	2	3	4
23. I feel tense	0	1	2	3	4
24. I feel energetic	0	1	2	3	4
25. I make more mistakes than usual	0	1	2	3	4
26. My body feels heavy all over	0	1	2	3	4
27. I am forgetful	0	1	2	3	4
28. I feel tired	0	1	2	3	4
29. I feel calm	0	1	2	3	4
30. I am distressed	0	1	2	3	4

### Mood

**Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the PAST WEEK by checking the appropriate box for each question.**

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	All of the time (5-7 days)
Was bothered by things that usually don't bother me				
I had trouble keeping my mind on what I was doing				
I felt depressed				
I felt that everything I did was an effort				
I felt hopeful about the future				
I felt fearful				
My sleep was restless				
I was happy				
I felt lonely				
I could not "get going"				

**These questions below are about your level of concern about your health, worries, and frustration, and how you feel about your diabetes. Please choose the answer that best describes how you FEEL about each question asked.**

1. How serious is your diabetes?

- 1 \_\_\_\_\_ Not at all serious
- 2 \_\_\_\_\_ Slightly
- 3 \_\_\_\_\_ Fairly
- 4 \_\_\_\_\_ Very
- 5 \_\_\_\_\_ Extremely Serious

2. How worried are you about developing complications of diabetes (like eye problems, foot ulcers, or heart attacks)?

- 1 \_\_\_\_\_ Not at all worried
- 2 \_\_\_\_\_ Slightly
- 3 \_\_\_\_\_ Fairly
- 4 \_\_\_\_\_ Very
- 5 \_\_\_\_\_ Extremely worried

3. How important is following your self-care recommendations (for example: diet, exercise, and glucose testing) for controlling your diabetes?

- 1\_\_\_\_\_ Not at all important
- 2\_\_\_\_\_ Slightly
- 3\_\_\_\_\_ Fairly
- 4\_\_\_\_\_ Very
- 5\_\_\_\_\_ Extremely important

4. How frustrated do you feel when trying to take care of your diabetes (e.g., diet, exercise, glucose testing)?

- 1\_\_\_\_\_ Not at all frustrated
- 2\_\_\_\_\_ Slightly
- 3\_\_\_\_\_ Fairly
- 4\_\_\_\_\_ Very
- 5\_\_\_\_\_ Extremely frustrated

5. How important is controlling your blood glucose levels for avoiding complications from diabetes?

- 1\_\_\_\_\_ Not at all important
- 2\_\_\_\_\_ Slightly
- 3\_\_\_\_\_ Fairly
- 4\_\_\_\_\_ Very
- 5\_\_\_\_\_ Extremely important

6. How much has having diabetes changed your activities (that is, your family and social events, work, and hobbies)?

- 1\_\_\_\_\_ None
- 2\_\_\_\_\_ Slightly
- 3\_\_\_\_\_ Moderately
- 4\_\_\_\_\_ A lot
- 5\_\_\_\_\_ Completely

7. How important do you believe healthy eating is for controlling your diabetes?

- 1\_\_\_\_\_ Not at all important
- 2\_\_\_\_\_ Slightly
- 3\_\_\_\_\_ Fairly
- 4\_\_\_\_\_ Very
- 5\_\_\_\_\_ Extremely important



8. How likely do you think it is that healthy eating will prevent future complications of your diabetes?

- 1 \_\_\_\_\_ Not at all likely
- 2 \_\_\_\_\_ Slightly
- 3 \_\_\_\_\_ Fairly
- 4 \_\_\_\_\_ Very
- 5 \_\_\_\_\_ Extremely likely

### Health and Well-Being

The following items ask for your views about how you feel and how well you are able to do your usual activities. For each of the following questions, please mark an "X" in the one box that best describes your answer.

1. In general, would you say your health:

- |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>Excellent</b>         | <b>Very Good</b>         | <b>Good</b>              | <b>Fair</b>              | <b>Poor</b>              |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2. The following questions are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

- |                                   |                                      |                                       |
|-----------------------------------|--------------------------------------|---------------------------------------|
| <b>Yes,<br/>limited<br/>a lot</b> | <b>Yes,<br/>limited<br/>a little</b> | <b>No, not<br/>limited<br/>at all</b> |
|-----------------------------------|--------------------------------------|---------------------------------------|

**Moderate activities**, such as moving a table, pushing a vacuum cleaner,

- |  |                          |  |                          |  |                          |
|--|--------------------------|--|--------------------------|--|--------------------------|
| bowling, or playing golf.....                  | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Climbing <b>several</b> flights of stairs..... | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |

3. During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

- |                                |                                 |                                 |                                     |                                 |
|--------------------------------|---------------------------------|---------------------------------|-------------------------------------|---------------------------------|
| <b>All of<br/>the<br/>time</b> | <b>Most<br/>of the<br/>time</b> | <b>Some<br/>of the<br/>time</b> | <b>A little<br/>of the<br/>time</b> | <b>None<br/>of the<br/>time</b> |
|--------------------------------|---------------------------------|---------------------------------|-------------------------------------|---------------------------------|

**Accomplished less** than you

- |                 |                          |                          |                          |                          |                          |
|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| would like..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

Were limited in the **kind** of work

- |                          |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| or other activities..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

4. During the **past 4 weeks**, how much of the time 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)?

**All of the time      Most of the time      Some of the time      A little of the time      None of the time**

**Accomplished less** than you would like..... ..... ..... ..... .....

Did work or other activities **less carefully than usual**.... ..... ..... ..... .....

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

**Not at all      A little bit      Moderately      Quite a bit      Extremely**  
                                                                                       

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

**All of the time      Most of the time      Some of the time      A little of the time      None of the time**

Have you felt calm and peaceful?..... ..... ..... ..... .....

Did you have a lot of energy?                      ..... ..... ..... .....

Have you felt downhearted and depressed?..... ..... ..... ..... .....

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

**All of the time      Most of the time      Some of the time      A little of the time      None of the time**

	<b>Not a Problem<sub>1</sub></b>	<b>Rarely a Problem<sub>2</sub></b>	<b>Often a Problem<sub>3</sub></b>	<b>Always a Problem<sub>4</sub></b>
1. Worrying about the future and the possibility of serious complications.				
2. Feeling guilty or anxious when you get off track with your diabetes management.				
3. Feeling scared when you think about living with diabetes.				
4. Feeling discouraged about your diabetes regimen.				
5. Worrying about low blood sugar reactions.				
6. Feeling constantly burned-out by the constant effort to manage diabetes.				
7. Not knowing if the mood or feelings you are experiencing are related to your blood glucose level.				
8. Coping with the complications of diabetes.				
9. Feeling that diabetes is taking up too much mental and physical energy.				
10. Feeling constantly concerned about food.				
11. Feeling depressed when you think about living with diabetes.				
12. Feeling angry when you think about living with diabetes.				
13. Feeling overwhelmed by your diabetes regimen.				
14. Feeling alone with diabetes.				
15. Feelings of deprivation regarding food and meals.				
16. Not having clear and concrete goals for your diabetes care.				
17. Uncomfortable interactions around diabetes with family/friends.				
18. Not accepting diabetes.				
19. Feeling that friends/family are not supportive of diabetes management efforts.				
20. Feeling unsatisfied with your diabetes physician.				

## Diabetes Self-Care

The questions below ask you about your diabetes self-care *during the last 7 days*. If you were sick during the past 7 days, *please think back* to the last 7 days that you were **not** sick.

### DIET

How many of the last **SEVEN DAYS** have you followed a healthful eating plan?

0 1 2 3 4 5 6 7

On how many of the last **SEVEN DAYS** did you eat five or more servings of fruits and vegetables?

0 1 2 3 4 5 6 7

On how many of the last **SEVEN DAYS** did you eat high fat foods such as red meat or full-fat dairy products?

0 1 2 3 4 5 6 7

On how many of the last **SEVEN DAYS** did you space carbohydrates evenly through the day?

0 1 2 3 4 5 6 7

### EXERCISE

On how many of the last **SEVEN DAYS** did you participate in at least 30 minutes of physical activities?

0 1 2 3 4 5 6 7

On how many of the last **SEVEN DAYS** did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work:

0 1 2 3 4 5 6 7

### BLOOD SUGAR TESTING

On how many days of the last **SEVEN DAYS** did you test your blood sugar?

0 1 2 3 4 5 6 7

On how many of the last **SEVEN DAYS** did you test your blood sugar the number of times recommended by your health care provider?

0 1 2 3 4 5 6 7

### MEDICATIONS

On how many of the last **SEVEN DAYS** did you take your recommended diabetes medications?

0    1    2    3    4    5    6    7

On how many of the last **SEVEN DAYS** did you take your recommended insulin injections?

0    1    2    3    4    5    6    7

On how many of the last **SEVEN DAYS** did you take your recommended number of diabetes pills?

0    1    2    3    4    5    6    7

### SMOKING

Have you smoked a cigarette (even one puff) during the past **SEVEN DAYS**?

0. No

1. Yes. *If yes*, how many cigarettes did you smoke on an average day?  
\_\_\_\_\_Average Number of cigarettes

## CURRICULUM VITAE

**Chelsea L. Rothschild**

### BIOGRAPHICAL INFORMATION

School Address: Department of Psychological and Brain Sciences  
University of Louisville  
Louisville, KY 40292  
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Home Address &  
Contact Information: 2752 Gaston Ave. Apt. 814  
Dallas, TX 75226  
(502) 494-0623 (mobile)

Citizenship: U.S.A.

### EDUCATION

2009-2010 **APA Accredited Internship** – Department of Veterans  
Affairs, VA North Texas Healthcare System, Dallas, TX

2004-present **Ph.D. Student in Clinical Psychology**, University of Louisville  
*Dissertation Title: Emotional Distress as a key construct in The  
Personal Model of Diabetes Management: Associations of Fatigue,  
Diabetes-Specific Distress, and Depressive Symptomatology with Self-  
Management and Quality of Life in Type 2 Diabetes Mellitus*  
Chair: Barbara Stetson, Ph.D.  
Expected Completion: May 2010

2004 **M.A.**, Psychology, University of Louisville

2002 **B.A.**, Psychology, University of Louisville

1993-1997 Audiology/Deaf Education Baccalaureate Coursework  
University of Tennessee, Knoxville

### RESEARCH AND CLINICAL INTERESTS

Behavioral Medicine and Clinical Psychology in Primary Care Settings, Impact of Depressive  
Symptomatology, Diabetes Specific Distress, and Fatigue on Self-Management of Diabetes

Mellitus, Health Behavior Change as Primary Prevention for Chronic Disease, Impact of Depression and Anxiety on Chronic Pain, and Integrative Medicine

### CLINICAL EXPERIENCE

2009-present **Medical Track Internship**, Veterans Administration North Texas Healthcare System, Dallas

- *PRIME/Ambulatory Care Rotation*: Provided brief individual therapy for individuals based on consult from Primary Care Provider. Interventions included ACT, Motivational Interviewing, and CBT. Conducted weekly smoking cessation group. Supervisor: Bradley Benedict, PsyD
- *Copper Team*: Responsible for assessment and treatment of individuals with a range of psychological health problems. Responsibilities include individual and group therapy utilizing an ACT approach. Group populations included Military Sexual Trauma, Women's Support, PTSD Vietnam Veterans, and a CBT-based coping skills group. Supervisor: Gloria Emmett, Ph.D
- *Medical/Surgical Rotation*: Provide psychological evaluation for individuals pursuing organ transplantation, bariatric surgery, and Inteferon treatment for Hepatitis C. Conduct weekly MOVE groups which targets weight loss in a population of veterans. Supervisor: Teresa Hale, Ph.D.
- *Polytrauma*: Responsible for conducting neuropsychological testing to veterans who experience severe injuries to multiple organ systems, including Traumatic Brain Injury (TBI) at a VISN-17 Network Site. Responsibilities include conducting comprehensive assessment, individual and group psychotherapy. Supervisors: Shanan Roth, Ph.D. and Andrea Zartman, Ph.D.
- *OIF/OEF ongoing therapy*: Conducted individual therapy for individuals with Military Sexual Trauma and combat trauma from the OIF/OEF era. Utilized Cognitive Processing Therapy to treat individuals that have been exposed to military and/or civilian trauma. Also co-led Seeking Safety Group which is designed to address co-occurring PTSD and Substance Use Disorder. Supervisors: Alina Suris, Ph.D. and Reed Robinson, Ph.D.

2008-2009 **Graduate Student Therapist**, University of Louisville Pain Management Center, Louisville, KY.

Conducted psychological assessment as a part of a multi-disciplinary pain management team. Assessments included screening for presence of psychopathology, spinal chord stimulator implantation, and a variety of self-management strategies to optimize treatment regimen. Utilized a cognitive behavioral framework for both treatment and case conceptualization.

(Supervisor: Brian Monsma, Ph.D.)

- 2006-2009      **Clinic Graduate Teaching Assistant**, Noble H. Kelley Psychological Services Center, University of Louisville.  
 Conducted intake interviews for potential clinic clients, developed integrative reports, conducted chart audits, presented new conceptualization of new patients to clinical teams, performed crisis management including voluntary and involuntary hospitalization, provided referral information to clients seeking additional services, provided support and training to therapists, arranged monthly clinical colloquia for the clinical students and faculty, community outreach, assessment scoring and interpretation, answered incoming clinic calls, and managed client scheduling and check-in for over 30 student therapists. Taught Clinical Interviewing Skills course to first-year Ph.D. students. (Supervisor: Bernadette Walter, Ph.D.)
- 2007-2008      **Graduate Student Therapist**, Noble H. Kelley Psychological Services Center, University of Louisville  
 Conducted treatment of individuals experiencing Axis-I, Axis-II, and medical diagnoses, using mindfulness and acceptance techniques. Learned techniques of Acceptance and Commitment Therapy and John Kabat-Zinn. Therapy centered around bringing awareness into the present moment as a method of decentering the client from their distressing events in their lives.  
 (Supervisor: Paul Salmon, Ph.D.)
- 2006 - 2007      **Graduate Student Therapist**, Noble H. Kelley Psychological Services Center, University of Louisville  
 Conducted weekly treatment of individuals and couples experiencing interpersonal and psychological concerns, using interpersonal therapy (IPT). Received training in theoretical orientations and techniques of IPT. Followed protocol for therapy based on a Time Limited Interpersonal Therapy framework. Learned to apply the OQ-45, IIP, and IMI to therapy.(Supervisor: Stanley Murrell, Ph.D.)
- 2005-2008      **Graduate Student Therapist**, Noble H. Kelley Psychological Services Center, University of Louisville  
 Assessment: Conducted psychodiagnostic assessments for Personality, ADHD, Learning Disabilities, Developmental Disabilities, and educational placement. Included administration, scoring, and interpretation. Provided feedback to clients directly with recommendations when appropriate.  
 (Supervisors: Paul Bock, Ph.D. and Bernadette Walter, Ph.D.)
- 2006 - 2007      **Psychological Examiner**, Private Practice of Dr. Steven Simon, Louisville, Kentucky  
 Conducted psychological and neuropsychological assessments for the Kentucky Department for Disability Determinations. Used a fixed battery of instruments, including WAIS-III, WMS-III, WRAT-3, Bender, and Trailmaking Tests. Additionally, MMPI-2, TOMM, Color Trails, WTAR, and cognitive screening instruments also used.
- 2004 - 2006      **Graduate Student Therapist**, Home-Based Primary Care Team/Geriatrics & Extended Care, Veterans Affairs Hospital, Louisville, KY



Conducted in-home assessment and long-term treatment of older veterans. Specific responsibilities included smoking cessation treatment, relaxation training, facilitating change in health behavior, improving diabetes self-care, and cognitive-behavioral therapy. Other responsibilities included attendance at interdisciplinary team meetings and assistance with treatment planning. (Supervisor: Barbara Stetson, Ph.D.)

- 2002 - 2003    **Senior Youth Counselor**, Maryhurst, Inc., Louisville, KY  
Assisted clients with activities of daily living within a locked milieu setting. Co-facilitated groups dealing with sexual and emotional trauma, independent living, and social skills. Managed PTSD-related symptoms due to severe trauma, as well as chronic mental illness. (Supervisor: Christine Sedita-Parson)
- 2002 - 2003    **Group Facilitator**, Intervention to reduce Impulsive Decision Making and Enhance Problem Solving Skills. Substance Abuse Unit, Maryhurst, Inc., Louisville, KY  
Facilitated 12-week cognitive-behavioral intervention group within a locked treatment facility catering to adolescent females dealing with trauma related issues. (Supervisor: Linda Burke M.S.)
- 1999            **Crisis counselor**, Rape Crisis Center, Frisco, CO.  
Assisted clients via telephone to handle crisis situations, and provided resources and referral information. (Supervisor: Melissa Williams)

#### **PUBLISHED MANUSCRIPTS**

Beacham, A.O., Stetson, B.A., Braekkan, K.C., **Rothschild, C.L.**, & Lynnfield, K. Causal attributions regarding personal exercise goal attainment in exerciser schematics and aschematics. *International Journal of Sports and Exercise Psychology*, *In press*, 2011.

#### **MANUSCRIPTS UNDER REVIEW/ IN PREPARATION**

- Rogers, W., Stetson, B., Bonner, J., **Rothschild, C.**, Meyer, J., Krishnasamy, S., Richardson, K., and Mokshagundam, S. P. (Under review). Social isolation and neighborhood characteristics in low-income adults with type 2 diabetes: Relation to health indicators and quality of life.
- Stetson, B.A. Schlundt, D.G., **Rothschild, C.L.**, Mokshagundam, S.P. (Under Review). *The Personal Diabetes Questionnaire (PDQ): A Comprehensive Tool for Assessment of Diabetes Self-Management*.
- Studs, J.L. and **Rothschild, C.** *Addressing the dimensionality of fatigue: A factor analysis examining fatigue subscales from several valid instruments*. Manuscript in Preparation.

#### **PUBLISHED ABSTRACTS**

Burgard, M., **Rothschild, C.**, Stetson, B.A., Beacham, A.O., Mokshagundam, S.P. (2004). The role of optimism in perceptions of vitality, physical and social functioning in diabetic patients. *Annals of Behavioral Medicine*, 27, S080.

- Stetson, B.A., Beacham, A.O., Meyer, J.A., Ulmer, C.S., **Rothschild, C.L.**, Bonner, J.E. (2005). Exercise cognitions differ by number of exercise relapse occurrences. *Annals of Behavioral Medicine*, 29, S160.
- Stetson, B.A., Beacham, A.O., **Rothschild, C.L.**, Meyer, J.A. Bonner, J.E., Ulmer, C.S. (2005). Combined utility of the transtheoretical/stage of change and relapse prevention models in understanding the process of ongoing exercise. *Annals of Behavioral Medicine*, 29, S159.
- Bonner, J., Stetson, B.A., Meyer, J.A., **Rothschild, C.L.**, Ulmer, C.S., and Beacham, A.O. (2006). The role of personality and schema in predicting exercise-related guilt. *Annals of Behavioral Medicine*, 31, S156.
- Meyer, J. Bonner, J., **Rothschild, C.**, Rogers, W., Foster, M., Richardson, K., Robertson, E., Reitz, P., Stetson, B. (2008). Acceptance and Experiential Avoidance: Associations with Quality of Life and Self-Care in Adults with Type 2 Diabetes. *Annals of Behavioral Medicine*, 35, S46.
- Rogers, W., Meyer, J. **Rothschild, C.**, Bonner, J. Das, N., Richardson, K., Mokshagundam, S. P., Krishnasamy, S., Kong, M., Stetson, B. (2009). Social isolation is associated with geographic socioeconomic status and quality of life in at-risk, underserved adults with type 2 diabetes. *Annals of Behavioral Medicine*, 37 (Supplement), S199.
- Richardson, K., Rogers, W., Bonner, J., **Rothschild, C.**, Meyer, J., Das, N., Mokshagundam, S. P., Krishnasamy, S., Kong, M., Stetson, B. (2009). Geographic socioeconomic status, health literacy, and perceived barriers to self-care in at-risk, underserved adults with type 2 diabetes. *Annals of Behavioral Medicine*, 37 (Supplement), S197.

### **EDITORIAL REVIEW**

- Meyer, R. & Weaver, C. (2005) *Law and Mental Health: A Case-Based Approach*. New York: Guilford. Completed library research and organized and prepared conceptual materials for systematic review. Summarized material and edited book chapter in text book.

### **UNPUBLISHED CONFERENCE PRESENTATIONS**

- Stetson, B., Schlundt, D., **Rothschild, C.**, Prgers, W. Floyd, J., Krishnasamy, S., Mokshagundam, S.P. (Under Review). Reliability and Validity of a Theoretically-Based Diabetes Self-Management Assessment Tool. Submitted to the 31<sup>st</sup> Annual Meeting of the Society of Behavioral Medicine, Seattle, April, 2010.
- Rogers, W., Meyer, J., **Rothschild, C.**, Bonner, J., Das, N., Richardson, K., Mokshagundam, S.P., Krisnasamy, S., Kong, M., Stetson, B. (2008) *Social isolation is associated with geographic socioeconomic status and quality of life in at-risk, underserved adults with type 2 diabetes*. Poster presented at the 30th Annual Meeting of the Society of Behavioral Medicine, Montreal, Canada.

- Richardson, K., Rogers, W., Bonner, J., **Rothschild, C.**, Meyer, J., Das, N., Mokshagundam, S.P., Krisnasamy, S., Kong, M., Stetson, B. (2008) *Geographic socioeconomic status, health literacy and perceived barriers to self-care in at-risk, underserved adults with type 2 diabetes*. Poster presented at the 30th Annual Meeting of the Society of Behavioral Medicine, Montreal, Canada.
- Meyer, J., Stetson, B., Bonner, J., **Rothschild, C.**, Ulmer, C., Beacham, A. (November, 2006) *Demoralization and affective state and associations with exercise characteristics in a sample of community exercisers*. Poster presented at the 40<sup>th</sup> Annual meeting of the Association for the Advancement of Cognitive and Behavioral Therapies, Chicago, IL
- Stetson, B., O'Malley, K., **Rothschild, C.**, Kostiwa, I., Rogers, J., and Bonner, J. (November, 2006) *Environmental and affective associations with physical function in Veterans receiving interdisciplinary Home Based Primary Care*. Poster presented at the 40<sup>th</sup> Annual meeting of the Association for the Advancement of Cognitive and Behavioral Therapies, Chicago, IL
- Bonner, J., Stetson, B., Beacham, A., Ulmer, C., **Rothschild, C.**, & Meyer, J. (November, 2005) *Associations between exercise schema and exercise behavior related to psychological well-being in community dwelling adults*. Poster Presented at the 39<sup>th</sup> annual meeting of the Association for Behavioral and Cognitive Therapies, Washington, DC.
- Stetson, B., Bonner, J., Meyer, J., Ulmer, C., **Rothschild, C.**, Kurian, R., Mokshagundam, S.P. (November, 2005) *Home-based physical activity behaviors in older men with diabetic neuropathy following cessation of supervised resistance training*. Poster presented at the 39th Annual Meeting of the Association for Behavioral and Cognitive Therapies, Washington, D.C.
- Stetson, B., Beacham, A., Meyer, J., Ulmer, C., **Rothschild, C.**, & Bonner, J. (March, 2005) *Exercise cognitions differ by number of exercise relapse occurrences*. Poster presented at the 26<sup>th</sup> annual meeting of the Society of Behavioral Medicine, Boston, MA.
- Stetson, B.A., Beacham, A.O., Meyer, J.A., Bonner, J., Ulmer, C., and **Rothschild, C.L.** (November, 2004) *Consistency of physical activity patterns and relationship to mood in community dwelling adults*. Poster presented at the 38<sup>th</sup> annual meeting of the Association for the Advancement of Behavioral Therapy, New Orleans, Louisiana.
- Stetson, B.A., Schlundt, D., Mokshagundam, S.P., Bonner, J., and **Rothschild, C.** (November, 2004) *How do age cohort and distress impact health promotion in persons with chronic disease? Age differences in distress and perceived exercise barriers in mid-life and older adults with Diabetes*. Poster presented at the 38<sup>th</sup> annual meeting of the Association for the Advancement of Behavioral Therapy, New Orleans, Louisiana.

#### **COMMUNITY ORAL /PUBLIC SERVICE PRESENTATIONS**

- Rothschild, C.L. (2008, March) *Stress and physical health in elderly populations*. Kling Center, Louisville, Kentucky.
- Rothschild, C.L. (2007, April) *Seminars on stress and shift work*. Various clinical departments, University of Louisville Hospital, Louisville, Kentucky.

Rothschild, C.L. (2006, October) *Stress management techniques*. National City Bank Wellness Group, Louisville, Kentucky.

## **RESEARCH EXPERIENCE**

2009-present **Internship Research Project**, VA North Texas Healthcare System, Dallas, TX.  
Conducted literature review and data analysis as part of an intern-led research study examining the effects of childhood and military sexual trauma on quality of life in a population of women Veterans.

2008-2009 **Doctoral Dissertation Data Collection**, for Ph.D. in Clinical Psychology, University of Louisville Department of Psychological and Brain Sciences.  
Dissertation Title: Emotional Distress as a key construct in The Personal Model of Diabetes Management: Associations of Fatigue, Diabetes-specific Distress, and Depressive Symptomatology with Self-Management and Quality of Life in Type Diabetes Mellitus  
Chair: Barbara Stetson, Ph.D.  
Committee Members: Benjamin Mast, Ph.D., Paul Salmon, Ph.D., Jamie Studts, Ph.D., Sandra Sephton, Ph.D., Sri Prakash Mokshagundam, M.D.

2006 **Predoctoral Research Assistant**, Behavioral Oncology Lab, Department of Medicine, University of Kentucky  
Conducted factor analysis comparing several validated fatigue patients in a population of orofacial pain patients in preparation for manuscript submission.  
(Supervisor: Jamie Studts, Ph.D.)

2002-2009 **Predoctoral Research Assistant**, Health Behavior Research Program, Department of Psychological and Brain Sciences, University of Louisville.  
*Diabetes Self Management Study*: Conducted data collection at the Metro Health Diabetes Education Classes across the Louisville community, Ambulatory Care Clinic and Endocrinology Clinic at the University of Louisville for a theoretically based self-report study focusing on impact of attitudes and beliefs about diabetes. Population included low income, underserved minority which enhanced cultural diversity experiences.  
*Examining the Relapse Prevention Model in Community Exercisers*. Relapse Prevention Model based study of high-risk situations pertaining to exercise. Independently coded descriptive attribution of high-risk situations for exercise relapse. Data collection, data management, and data entry, theoretically based self-report study focused on validating measures pertaining to health related behavior, mindfulness, and physical activity. Participant recruitment from community-based sites, university undergraduate subject pool. Examined exercise schemas addressing the maintenance phase of physical activity in preparation for manuscript submission.  
*Maintenance of Exercise Following Completion of VAMC Physical Activity Study for Individuals with Diabetes*. Developed intervention manual for theoretically based physical activity program for adults with Type 2 Diabetes Mellitus, components included phone screening protocol and script, initial eligibility

checklist, monthly newsletters with content based on the Relapse Prevention Model, weekly session contact. Followed participants in a home based exercise study with older adult males with peripheral neuropathy and comorbid diabetes mellitus from the Louisville VAMC. Components included data entry, completion of 3 and 6 month follow ups in person, monthly telephone interviews. Supervisor: Barbara A. Stetson, PhD  
*Joslin Center for Diabetes Study.* Analyzed large existing data set examining optimism and quality of life in a theoretically based study focusing on beliefs and perceptions of individuals with diabetes. Conducted additional analyses validating the Personal Diabetes Questionnaire examining all domains of self-management of diabetes.

- 2003      **Predoctoral Research Assistant**, Cognitive Development Lab, Department of Psychological and Brain Sciences, University of Louisville  
 Developed research protocol which examined eye movement patterns when completing an analogical reasoning task for reading acquisition  
 (Supervisor: Barbara M. Burns, Ph.D.)
- 2001      **Undergraduate Research Assistant**, Department of Psychological and Brain Sciences, University of Louisville.  
 Library research to evaluate the empirical literature pertaining to forensic hypnosis. Examined theoretical underpinnings and clinical outcome data.  
 (Supervisor: Robert Meyer, Ph.D.)

**HONORS AND AWARDS**

- 2005      **Certificate of Outstanding Service**, University of Louisville Department of Psychological and Brain Sciences
- 2004      **Graduate Dean’s Citation for Outstanding Research**, University of Louisville
- 2004 - 2008      **Grawemeyer Foundation Student Research Funding** (annual award)
- 2002      **Graduate Student Scholarship**, College of Arts and Sciences, University of Louisville.
- 2001 - 2002      **Dean’s List**, College of Arts and Sciences, University of Louisville

**TEACHING EXPERIENCE**

- 2005 - 2006      **Graduate Teaching Assistant**, Department of Psychological and Brain Sciences, University of Louisville  
 Assisted in the undergraduate instruction of Abnormal Psychology.  
 Supervisors: Paul Salmon, Ph.D. and Robert Meyer, Ph.D.
- 2004 - 2005      **Graduate Teaching Assistant**, Department of Psychological and Brain Sciences, University of Louisville  
 Assisted in the undergraduate instruction of Introduction to Psychology.  
 Taught three weekly recitation sections and proctored examinations.  
 Supervisors: Edna Ross, Ph.D., Paul DeMarco, Ph.D., and Maureen McCall, Ph.D.

2003 - 2004    **Graduate Teaching Assistant**, Department of Psychological and Brain Sciences, University of Louisville (Fall, 2003).  
Assisted in the undergraduate instruction of Honors Developmental Psychology and Identity Development in Women.  
Supervisor: Barbara M. Burns, PhD

**MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS**

Society of Behavioral Medicine, 2004-present  
American Psychological Association, 2004-present  
Psi Chi Honors Society, 2002-present  
Golden Key Honors Society, 2001-present  
Association for the Advancement of Behavioral Therapy/Association for the Advancement of Cognitive and Behavioral Therapy, 2004-present