

THE ROLE OF MOOD IN THE  
SELF-CARE ACTIVITIES OF INDIVIDUALS WITH  
TYPE 2 DIABETES

by

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## **ABSTRACT**

Controlling type 2 diabetes mellitus requires the individual to perform specific self-care behaviors. The current study investigated the impact of anxiety and depression on these behaviors. In addition, the study investigated the role of sociodemographic variables, sleep and pain in the performance of specific self-care behaviors.

Using data collected from primary care clinics providing integrated care to individuals with type 2 diabetics, the Chi-Square Test of Independence was conducted to investigate relationships. This was followed by a series of logistic regressions to identify variables that could predict changes in self-care. Depression and anxiety was measured by scores on the PHQ-9 and GAD-7. Levels of self-care were measured by information collected from patients completing the Summary of Diabetes Self-Care Activities.

Findings from this study suggest that self-care behaviors can be influenced by numerous factors: anxiety, age, ethnicity, gender, marital status, and sleep difficulty. Both a correlation and predictive relationship between anxiety and general diet scores were found, but anxiety did not have a statistically significant impact on any other individual self-care behavior. The current study makes a meaningful contribution to the literature by examining the influence of anxiety, depression, sociodemographic factors, sleep and pain on improvements in self-care behaviors.

## **DEDICATION**

This dissertation is dedicated to my mother, Shirley. Although she never saw me step foot in a college classroom, a childhood of unconditional love and her faith in me stayed in my heart and kept me moving forward.

## LIST OF ABBREVIATIONS AND SYMBOLS

AADE	American Association of Diabetes Educators
ADA	American Diabetes Association
ANOVA	Analysis of Variance
APA	American Psychiatric Association
$\beta$	Beta
CBT	Cognitive Behavioral Therapy
CDC	Centers for Disease Control and Prevention
CNP	Certified Nurse Practitioner
df	Degrees of Freedom
DSM-5	Diagnostic and Statistical Manual of Mental Disorders 5
DSME	Diabetes Self-Management Education
DSMS	Diabetes Self-Management Support
GAD – 7	Generalized Anxiety Disorder 7
GED	General Equivalency Diploma
H-L	Hosmer and Lemeshow
HPA	Hypothalamic Pituitary Adrenal
HS	High School
JDRF	Juvenile Diabetes Research Foundation
LCSW	Licensed Certified Social Worker
LPC	Licensed Professional Counselor

M	Mean
MD	Medical Doctor
MDD	Major Depressive Disorder
MI	Motivational Interviewing
MILES	Metformin in Longevity Study
n or N	Number
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
OR	Odds Ratio
p	Probability
$\phi$	Phi Coefficient
PDD	Persistent Depressive Disorder
PHQ – 9	Patient Health Questionnaire 9
QoL	Quality of Life
$R^2$	Coefficient of Determination
$r_{pb}$	Point Biserial Correlation
SD	Standard Deviation
SDSCA	Summary of Diabetes Self-Care Activities
S.E.	Standard Error
T1D	Type 2 diabetes mellitus
T2DM	Type 2 diabetes mellitus
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
YLD	Years lived with disability

WHO World Health Organization

$\chi^2$  Chi-Square

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## INTRODUCTION AND RESEARCH PROBLEM

### Background

Over the last few decades, public health agencies in the United States and throughout the world have recognized diabetes as a health crisis (Bonow & Gheorghide, 2004). In 2015, twenty-three million adults aged 18 years or older were diagnosed with the disease. Another seven million met criteria but were undiagnosed (Centers for Disease Control and Prevention [CDC], 2017). Adding to the concern is the rate of prediabetes, which can lead to the development of type 2 diabetes mellitus in 5 – 10% of cases annually (Tabak, Herder, Rathman, Brunner, & Kivimaki, 2012). In 2015, nearly 34% of undiagnosed adults had blood glucose levels indicating they were at risk for developing diabetes (CDC, 2017).

There are two types of diabetes: type 1 and type 2. Type 2 diabetes mellitus (T2DM) is the most common and preventable. Individuals with T2DM are either unable to make enough insulin or they are not able to use it efficiently. Insulin allows the body to take sugar (glucose) from the bloodstream and convert it to energy for use by cells. When the body is unable to use blood glucose, too much remains in the bloodstream, starving the cells of energy (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2016). Similarly, type 1 diabetes mellitus (T1D) also affects insulin. However, T1D occurs when pancreatic cells are destroyed by the body's immune system, causing the pancreas to stop producing insulin. Currently, the exact cause of the immune system attack in T1D is unknown, and medical experts are unsure if it can be prevented (Juvenile Diabetes Research Foundation [JDRF], 2018)

Those with uncontrolled diabetes are at risk for experiencing dangerous medical complications such as hypoglycemia, hyperglycemia, and diabetic ketoacidosis (Kushner, 2016). Over the long term, T2DM can lead to disability, the development of other life-threatening medical conditions, and mortality. For example, diabetic individuals are more likely to experience microvascular complications leading to kidney disease (Williams, 2017), blindness (Schorr et al., 2016), and amputation (Shaw, 2014). Furthermore, a diagnosis of diabetes increases the risk of developing cardiovascular diseases (Selvin et al., 2004) which can lead to heart disease and stroke (Solanki, Bhatt, & Johnston, 2018).

Unlike type 1 diabetes mellitus, T2DM can be prevented by making lifestyle changes that help delay the onset and mediate the long-term effects of the disease. Eating a healthy diet, increasing physical activity, and maintaining a healthy weight is crucial to reducing the risk of developing T2DM (NIDDK, n.d.). For this reason, treatment for both pre-diabetes and T2DM has focused on supplementing medication therapy with self-management education (Haas et al., 2012). The American Diabetes Association (ADA) strongly recommends that all individuals with diabetes receive some form of Diabetes Self-Management Education (DSME) or Diabetes Self-Management Support (DSMS) (Powers et al., 2017). Both types of self-management (DSME and DSMS) have been shown to be effective ways to not only improve outcomes for the individual (Brunisholz et al., 2014; Fan & Sidani, 2009; Weaver et al., 2014), but also reduce the cost burden on the healthcare system (Duncan, et al., 2011; Duncan, et al., 2009; Healy, Black, Harris, Lorenz, & Dungan, 2013).

DSME and DSMS programs are designed to address diabetes knowledge and the biological, psychological, and social needs of the patient (Powers et al., 2017). DSME and DSMS programs that follow the recommendations of the American Association of Diabetes

Educators (AADE) and the ADA include education and support to address healthy eating, increasing activity, monitoring of blood sugar, adherence with medication regimens, problem-solving, behaviors to reduce risks of complications, and healthy coping skills (AADE, 2018; ADA, 2017). The educational component of DSME and DSMS programs provide the patient with the knowledge needed to make lifestyle changes recommended by their medical practitioner. However, the required lifestyle changes are often significant and can create difficulty for the patient (Haas et al., 2012).

### **Diabetes and Mood**

Addressing knowledge is helpful, but it may not be enough. As discussed below, a well-documented relationship exists between diabetes and mood disturbances (Behan, Doyle, Masterson, Shiers, & Clarke, 2015; Golden et al., 2008) like depression and anxiety. This relationship affects the successful management of diabetes by either facilitating or interfering with the ability of the individual to perform the tasks required (Boyle, Allan, & Millar, 2003) and taught in DSME and DSMS programs. The link between mood and task performance is supported by past research showing that patients with mood disturbances are more likely to have difficulty complying with treatment recommendations and changing associated unhealthy behaviors (Hudson et al., 2016; Lin et al., 2004).

#### **Depression**

Depression is a common mood disorder seen in the diabetic population (Wang, Stang, Lopez, Bolge, & Zhu, 2016), individuals with diabetes are more likely to develop depression when compared with the general public (Anderson, Freedland, Clouse, & Lustman, 2001). A 2010 meta-analysis placed the incidence of comorbid depression and T2DM at approximately 24% (Nouwen et al., 2010), compared to 17% for the general population (Kessler et al., 2005).

A diagnosis of depression can include Major Depressive Disorder (MDD) and Persistent Depressive Disorder (PDD). Both disorders negatively affect feeling, thinking, sleeping, eating, working, and daily functioning (American Psychiatric Association [APA], 2013). The symptoms of depressive disorders cause the individual significant distress and impairment in social, occupational, or other functional domains (APA, 2013). For individuals with T2DM, depression can hinder the ability of the individual to successfully implement lifestyle changes (Gonzalez et al., 2008) and adhere to medication regimens (Lunghi, Zongo, Moisan, Grégoire, & Guénette, 2017).

Mood disturbances, such as depression, can diminish the willingness of an individual to perform required tasks; a key feature of the disorder is an impaired ability to take action and a lack of motivation (American Psychiatric Association, 2013; Smith, 2012). For example, an individual with depressive symptoms may wish to make dietary changes, engage in exercise, and lose weight, but his or her disorder/illness hinders their efforts to act. Support for the connection between depression and action has been found in research investigating the link between intention, action, and depression (Pomp, Lippke, Fleig, & Schwarzer, 2010).

### **Anxiety**

Anxiety is another disorder that can affect mood and is commonly experienced by those with T2DM (Egede & Dismuke, 2012; Smith et al., 2013). Symptoms of anxiety may include tense feelings, excessive worry, irritability, sleep problems, and fatigue (American Psychiatric Association, 2013). These symptoms lead to significant impairments in both social and occupational functioning. Further complicating the issue, anxiety affects the hypothalamic-pituitary-adrenal (HPA) axis (Graeff & Junior, 2010). Activation of the HPA axis due to stress, produces cortisol (Stephens & Wand, 2012) and raises blood sugar (Kirschbaum, 1997; Reynolds

et al., 2001). Changes in cortisol are known to alter a person's metabolism, which can lead to weight gain (Rabasa & Dickson, 2016). Excess weight adds to the disease burden of T2DM (Feldman et al., 2017) by increasing the risk of developing other health conditions (National Task Force on the Prevention and Treatment of Obesity, 2000).

Like depression, individuals with diabetes are disproportionately affected by anxiety (Smith et al., 2013). A recent study in India found the rate of anxiety among the diabetic population was 27.6% compared to 12.7% of the healthy controls (Rajput, Gehlawat, Gehlan, Gupta, & Rajput, 2016) and a recent U.S. study found the rate to be 17.7% (Boden, 2018). These numbers support a 2002 literature review that found 14% of participants met criteria for an anxiety disorder and 40% reported elevated levels of anxiety (Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002).

The changes in daily activities required of patients with T2DM can place a strain on their day-to-day lives (Powers, 2017), which can be overwhelming as those with anxiety already report lower levels of functioning (Cramer, Torgersen, & Kringlen, 2005). Also, anxiety can create a fear of future negative events leading the individual to resist participating in the necessary lifestyle changes (Grupe & Nitschke, 2013) required to promote improved health.

### **Treatment**

Recognition of the challenges faced by those with anxiety, depression and chronic illnesses such as diabetes, has led the American Diabetes Association to recommend collaborative, multidisciplinary care for these patients (ADA, 2018). Multidisciplinary care teams are commonly comprised of a medical professional (Medical Doctor [MD], Certified Registered Nurse Practitioner [CRNP]) and a behavioral health provider (Licensed Professional Counselor [LPC], Licensed Clinical Social Worker [LCSW]) who work to support the patient

(Gerrity, 2016). This model allows for the provision of both psychosocial and medical interventions that support and facilitate improved outcomes for diabetic patients with a mood disturbance (Steed, Cooke, & Newman, 2003; Markowitz, Gonzalez, Wilkinson, & Safren, 2011).

## **Theory**

The ADA recommends that patients with diabetes receive training through programs (DSME, DSMS) that require the individual to engage in lifestyle changes which include new self-management activities (Powers et al., 2017). Incorporating new behaviors and changing habits can be overwhelming for those with anxiety and depression, resulting in an increased likelihood of non-compliance with treatment recommendations (Gonzalez et al., 2008). Understanding how anxiety and depression impacts an individual's physical health as they attempt to make these changes can help providers address patient need and ultimately improve health outcomes.

Health behavior change models and behavioral theories together may provide a more thorough understanding of individual factors that hinder the adoption of recommended changes. Specifically, the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), and Albert Bandura's work exploring self-efficacy can be used to interpret the reason behind the adoption of a behavior. Both the TRA and the TPB assert that an individual must form the intent to engage in a behavior or else the behavior will not occur. Combined, the TRA and TPB assert that attitude, subjective norm, and control all work together to form intent and influence behavior. (Glanz, Rimer, & Viswanath, 2008). For individuals with anxiety or depression, negative cognitions may influence feelings of self-efficacy and prevent engagement in self-care activities (Tillema, Cervone, & Scott, 2001; Wolf, Herrmann, & Brandstätter, 2018).

Bandura explored the link between self-efficacy and motivation. He identified four sources of efficacy beliefs: (1) mastery experiences, (2) vicarious experiences, (3) verbal persuasion, and (4) emotional and physiological states. Bandura asserts that self-efficacy can be improved or damaged through these four mechanisms (Bandura, 1977). Of these four sources, emotional state may play the most significant role in influencing self-efficacy among individuals with depression and anxiety. When faced with stressful situations, an individual may experience fear and, in turn, avoid uncomfortable situations due to the belief that their coping mechanisms and abilities are inadequate (diminished self-efficacy). For individuals with anxiety or depression, this stress may be amplified and increase avoidance.

The Theory of Reasoned Action and the Theory of Planned Behavior, as well as Bandura's work, recognize the role of self-efficacy in motivating individuals to engage in self-management behaviors. Understanding the connection is important, as the relationship between mood and self-efficacy in an individual with comorbid physical and mental health issues leads to a decreased capacity to act independently when performing self-care activities, thus decreasing quality of life (Yildirim, Hacıhasanoğlu, Bakar, & Demir, 2013).

Individuals with diabetes must take action and assume responsibility for the required life-improving changes. It is essential that they believe they can perform tasks like increasing their amounts of daily exercise and engage in successful problem-solving. Specifically, patients must become more internally motivated to engage in life-changing behaviors (Ryan & Deci, 2000) that will lead to improved regulation of blood glucose levels in addition to feeling more competent in their ability to monitor levels (Williams et al., 2009) and perform other self-care activities.

## **Study Aims**

The proposed study aims to explore the role that anxiety and depression plays in the ability of individuals with type 2 diabetes to perform self-care activities. In addition, the study will assess whether demographic factors such as age, gender, ethnicity, current living arrangement, marital status, and education are correlated with self-care. These aims will be accomplished through a secondary analysis of data collected from a social-work-led diabetes management program provided in a primary care clinic in the Southeastern United States. This dataset is suitable for this study as it contains data from standardized assessments designed to measure the level of anxiety and depression, as well as data about self-care activities.

## **Research Questions**

This study aims to answer the following research questions:

Research Question 1: When levels of anxiety and depression change in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting, do levels of self-care activities change?

Research Question 2: Are there other variables, such as pain, sleep difficulty, age, gender, ethnicity, marital status, current living arrangement, and education, that influence levels of self-care activity change in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting?

Research Question 3: Do changes in levels of anxiety, depression or other factors serve as better predictors of self-care behavior change in patients with type 2 diabetes mellitus in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting?

## **Significance of the Study to Research**

A significant amount of research exists that emphasizes the link between mood and diabetes (de Groot, Anderson, Freedland, Clouse, & Lustman, 2001) and that individuals with diabetes are more likely than the general population to suffer from mood disturbances (Bener, OAA Al-Hamaq, & Dafeeah, 2011). Studies also support the role that mood plays in self-management behaviors (Browne, Nefs, Pouwer, & Speight, 2014). However, there are a limited number of studies that explore how mood disturbances impact self-care activities directly, the majority of which only investigate the impact of depression. A 2016 study (Mut-Vitcu, Timar, Timar, Oancea, & Citu) that used a single composite score from the Summary of Diabetes Self Care Activities (SDSCA) found that depression had an overall negative impact on self-care activities. Other studies identified a direct link between depression and adherence to changes in diet (Adam & Folds, 2014; Ciechanowski, Katon, Russo, & Hirsch, 2003; Ciechanowski, Katon, & Russo, 2000), exercise (Adam & Folds, 2014; Ciechanowski, Katon, Russo, & Hirsch, 2003), and medication adherence (Ciechanowski, Katon & Russo, 2000). Four studies (Devarajooch & Chinna, 2017; Egede & Osborn, 2010; McKellar, Hudson, et al., 2016; Humphreys & Piette, 2004) utilized Structural Equation Models to investigate the role depression plays in self-care activities. McKellar, Humphreys, & Piette (2004) found that depression limited self-care activities and resulted in poor glucose control. Devarajooch and Chinna (2017) did not find a significant direct association between depression and self-care. Instead, they found that depression impacted self-efficacy, which, in turn, affected self-care. Egede & Osborn (2010) found that 24% of the variability in self-care scores could be explained by diabetes knowledge, social support, and depression. In contrast, a 2016 study (Gaitonde & Shaya) found no statistically significant relationship between depression self-care behaviors. However, the

authors did identify a modest association between severe depression and frequency of blood sugar testing. With the exception of the Hudson et al. (2016) and McKellar, Humphreys, & Piette (2004) study all of the other investigations were cross-sectional. McKellar, Humphreys, & Piette (2004) measured depressive and diabetes symptoms at baseline and follow-up, but only measured self-care at follow-up. Hudson et al., (2016) used structural equation modeling and did not investigate individual self-care activities. The current study is the first available in the United States to use a longitudinal design to measure depression, anxiety, and specific self-care behavior at baseline and follow-up.

One study was available that investigated the role of anxiety and depression in specific self-care behaviors (Browne, Nefs, Pouwer, & Speight, 2014). The study was conducted using data from the Australian and Dutch Diabetes Management and Impact for Long-term Empowerment and Success (MILES) studies. Data for the MILES study was collected via an online survey and included data that focused on several psychosocial factors as well as diabetes management and access to healthcare (Hagger et al., 2016). This cross-sectional study utilized self-reported standardized measures for depression (Patient Health Questionnaire-9 [PHQ-9]), anxiety (Generalized Anxiety Disorder – 7 [GAD-7]) and self-care (The Summary of Diabetes Self-Care Activities [SDSCA]). While the focus of this research was to compare the impact of the study variables on young adults to those with type 1 diabetes mellitus and older T2DM patients, the authors did identify positive correlations between mood variables, adherence to diet and insulin injection recommendations.

The proposed study differs from Browne, Nef, Pouwer, and Speight (2014) in several important ways. This research will investigate the impact of anxiety and depression on self-care in residents in the Southeastern United States. Study variables for this research were collected

through face-to-face interactions with a social worker during a behavioral assessment. The gathering of self-report data through a one on one interaction should minimize imprecise responses due to cognitive limitations. In addition, exploring these associations in an integrated environment will begin to develop a body of literature that examines the value of integrated services in primary care. Most importantly, this study will use longitudinal data to determine the impact of mood disturbances on self-care and begin to establish the strength of the relationship between mood and self-care.

Unlike the previously mentioned studies, this study will be the first of its kind to investigate the link between anxiety and specific self-care activities, and depression and specific self-care activities, with a longitudinal sample. This design is unique in that the pre-post assessments will reveal if a change in anxiety and depression can be correlated with changes in self-care activities.

### **Significance of the Study to Social Work Practice**

The world of healthcare continues to change. The passage of the Affordable Care Act in 2010, followed by the continual threat of repeal by current legislators, has created instability (Altimari, 2017) in the healthcare industry. Social workers are employed in various capacities in agencies that have been impacted by this uncertainty and serve clients with diabetes. These agencies include home health, hospital, nursing homes, and primary care. Within these environments, social workers are tasked with providing education, psychosocial support, referral services, and counseling (Bureau of Labor Statistics, 2017). These services are provided to support individuals and help families cope with chronic, acute, and terminal illnesses (Whitaker, Weismiller, Clark, & Wilson, 2006). For social workers treating patients who have T2DM, understanding the strength of the connection between biological, psychological, and social health

can better inform intervention models. Additionally, the information can be used to ensure that intervention programs provide the appropriate intervention at the most beneficial time in the treatment process.

As the healthcare industry struggles to deal with the burden placed on it by individuals with chronic health conditions such as diabetes, it is essential to determine what types of interventions are needed to address the full range of needs. While social workers have demonstrated a history of success in treating mental health issues such as depression and anxiety, few studies have evaluated the effectiveness of social work interventions on chronic illness. The few that exist have not shown an advantage in outcomes over standard care (Wagner, 2000). However, it could be argued that the existing studies have unfairly measured success based on short-term medical changes and have ignored the impact of mental health on more long-term outcomes, such as an increase in overall health and sense of well-being.

### **Significance of the Study to Policy**

The link between mental health and physical health has led to the recognition that a coordinated, multidisciplinary effort is necessary if healthcare systems are to address the full range of need of those they serve (Lemieux-Charles & McGuire, 2006). Despite efforts to support implementation of integrated behavioral and medical health services (Substance Abuse and Mental Health Services Administration, 2017), a shortage of behavioral health providers (Thomas, Ellis, Konrad, Holzer, & Morrissey, 2009) and limited options for funding (Maruthappu, Hasan, & Zeltner, 2015), present obstacles to communities seeking to implement these programs. Findings from this study could be used to inform legislative actions to support more supportive billing models and promote the recruitment, training, and retention of social workers to provide services to individuals with T2DM.

T2DM is preventable, its onset delayed and the long-term effects mediated by making positive lifestyle changes. Eating a healthy diet, increasing physical activity, and maintaining a healthy weight is crucial to reducing risk (NIDDK, n.d.). For this reason, treatment has focused on supplementing medication therapy with self-management education (Haas et al., 2012). The American Diabetes Association (ADA) strongly recommends that all individuals with diabetes receive some form of Diabetes Self-Management Education (DSME) or Diabetes Self-Management Support (DSMS) (Powers et al., 2017). Both types of self-management (DSME/DSMS) have been shown to be effective ways to reduce the cost burden on the healthcare system (Duncan, et al., 2011; Duncan, et al., 2009; Healy, Black, Harris, Lorenz, & Dungan, 2013) and improve outcomes for the individual (Brunisholz et al., 2014; Fan & Sidani, 2009; Weaver et al., 2014). DSME and DSMS programs are designed to educate individuals about diabetes and address the other biological, psychological, and social needs of the patient (Powers et al., 2017). However, the programs require the patient to make significant lifestyle changes (Haas et al., 2012).

## LITERATURE REVIEW

### Introduction

To understand how anxiety and depression may impact diabetic self-care, we must first understand diabetes, how it is treated, and how mood can impact performance of self-care behaviors and self-efficacy. Public health has a long history of designing and implementing disease management programs. Theories such as the Theory of Planned Behavior have been used to successfully develop program frameworks that guide interventions at the individual and community levels. However, while these theories and frameworks discuss personal control and personal beliefs they fail to explain how these personal factors impact outcomes. Albert Bandura's work (1977) exploring the impact of self-efficacy on behavior also offers a useful explanation for why individuals with a mood disorder may be unsuccessful in implementing new and potentially stressful lifestyle changes.

To build an understanding of how anxiety and depression influences self-care, this chapter will begin by offering a definition of diabetes, its complications, and its treatment as provided in primary care. In addition, information about the relationship between anxiety and depression and health will be discussed. A definition of depression and anxiety will be provided along with a brief discussion of common treatments used in primary care. Finally, public health models will be used to explain a possible mechanism that can lead individuals to act. Bandura's self-efficacy theory will be used to support the role of anxiety and depression in the formation of intentions to act.

## **Defining Diabetes**

Diabetes is a metabolic disorder caused by an inability of the body to produce or use insulin efficiently. The lack of insulin leads to hyperglycemia (excessive amounts of sugar in the blood) as the body cannot use sugar without insulin. This insulin deficiency or inadequacy, in turn, causes the body to begin using body fat as fuel in place of sugar. This process leads to a buildup of ketones that are poisonous to the body's organ systems; left untreated, organs fail, and death occurs. While T1D is genetic and related to factors that cannot generally be controlled by the individual, T2DM is preventable and can be effectively managed by behavior. The development and severity of type 2 diabetes mellitus is most often related to environmental causes such as obesity, diet, a lack of physical activity, and aging (NIDDK, n.d.).

While both types of diabetes present health risks for the individual, type 2 diabetes mellitus (T2DM) has become a public health crisis (Zimmet, 2017), perhaps due to the rapid increase in its prevalence. Beginning in the 1990s, researchers at the Centers for Disease Control identified a sharp upward turn in the incidence of the disease (Diabetes data and trends as cited in CDC, 2012). This rising trend has continued, and in 2007 it was recognized as a potential global epidemic (Tabish, 2007). By 2012, approximately 9.3% (29.1 million) of the U.S. population had diabetes. Contributing to the alarm, nearly 34% of undiagnosed adults had blood glucose levels indicating they were at risk for developing diabetes (CDC, 2017). Without intervention, it is projected that approximately one in four (25%) individuals will develop T2DM by 2050 (Boyle, Thompson, Gregg, Barker, & Williamson, 2010). Despite advances in modern medicine, it continues to be a leading cause of preventable death (American Diabetes Association, 2018b).

The chronic nature of diabetes, its potential for complications, and the necessary interventions take a heavy toll, not just on the individual but their families and the healthcare

system as well. Complications from diabetes, such as stroke (Karsito, 2008), chronic pain (Galer, Gianas, & Jensen, 2000), renal failure (Girman et al., 2012), and blindness (CDC, 2011) are common. These conditions often result in disability, a reduction in lifespan, and increased healthcare costs (Tabish, 2007). Diabetic patients are also at a higher risk of cardiovascular death, hospitalizations related to high blood pressure, kidney failure, and amputation (American Diabetes Association, 2018b; CDC, 2011).

Perhaps the most common comorbid and often deadly condition is hypertension (Fox et al., 2015; Sowers, Epstein, & Frohlich, 2001); more than 50% of patients with diabetes mellitus have a diagnosis of hypertension (Lastra, Syed, Kurukulasuriya, Manrique, & Sowers, 2013). Adding to the circulatory burden, and the risk of cardiovascular complications, 58% of individuals with T2DM had unhealthy cholesterol levels extreme enough to need supplemental medication (CDC, 2017).

Diabetic neuropathy and peripheral artery diseases are serious complications of diabetes that can lead to blindness (Schorr et al., 2016; CDC, 2011) and limb amputation (Ali et al., 2017). Research findings suggest that after 15 years, blindness will affect approximately 2% of those with diabetes, and approximately 10% will develop a severe visual impairment (World Health Organization, 2018). Another serious consequence of neuropathy is diabetic foot disease. Changes in blood vessels and nerves can lead to ulceration and subsequent limb amputation (Martins-Mendes et al., 2014). In adults, over 60% of all non-traumatic lower limb amputations were performed on diabetic patients (CDC, 2011).

In addition to health complications, diabetes affects other life domains. Poor health and chronic disease reduce economic productivity by contributing to increased absenteeism and work limitations (Tunceli et al., 2005). Chronic health conditions can negatively impact marital quality

(Whisman, Li, Sbarra, & Raison, 2014), interpersonal relationships, and social functioning (Altınok, Marakoğlu, & Kargin, 2016). Furthermore, diabetic sufferers are more likely to experience psychological distress (Li et al., 2009). When people with diabetes are affected by depression, a common comorbid condition (Hasan, Mamun, Clavarino, & Kairuz, 2015), they can experience lower levels of general self-efficacy (Devarajoo & Chinna, 2017), gain weight (Blaine, 2008), and report adverse effects on social interactions (Derntl et al., 2011) and social support (Burns, Deschênes, & Schmitz, 2015). All factors that can influence the overall functioning of the diabetic patient.

Diabetes is a costly condition. In 2012, it accounted for \$327 billion in expenditures to cover medical expenses, lost work, and wages. After adjusting for age and gender differences, the average medical expenditures for individuals with diabetes are 2.3 times higher, than for those without the disease (ADA, 2018b). Medical costs increase when there are co-morbid mood disorders like depression (Egede, Zheng, & Simpson, 2002) which often occur in the diabetic population (Lin, von Korff, & World Health Organization World Mental Health survey consortium, 2008).

### **Treating Diabetes**

As the medical community has come to recognize the need for early and aggressive management of T2DM, treatment guidelines have evolved. Combating the epidemic of diabetes requires a combination of medical interventions and self-management activities. Successful treatment models should include five focus areas to control T2DM symptoms. These include medications (American Diabetes Association, 2018), exercise (American Diabetes Association, 2018; Boulé, Haddad, Kenny, Wells, & Sigal, 2007), diet (American Diabetes Association, 2018; Bantle et al., 2008), social support (van Dam et al., 2005), education (Ellis et al., 2004), and self-

management (American Diabetes Association, 2018; Norris, Lau, Smith, Schmid, & Engelgau, 2002). Implementing treatment plans that include these areas can be difficult for those without emotional issues, but more so for those with mental health concerns. Medically focused treatment plans are problematic, as medical models of treatment have historically failed to emphasize the role of mental health, specifically mood, in the management and progression of the disease. Each of these recommendations is discussed in more detail in the following paragraphs. Although not a focus of this paper, understanding the complexity of treatment protocols serves to support the difficulty of combating the disease and its toll on the individual.

### **Medication**

The number of medications available to treat diabetes has increased over the last ten years. Some of the commonly prescribed medications, metformin, sulfonylureas, and insulin, can be complemented by an array of drugs to support better outcomes (Inzucchi et al., 2012). However, adherence to oral medications in patients can range from 36 to 93%. For insulin-dependent patients, rates of non-adherence can be over 60% (Cramer, 2004). A 2015 study identified seven barriers to medication compliance in diabetic patients, which include: (1) emotional issues affecting motivation, (2) quality of patient-provider relationship and communication, (3) patient knowledge, (4) medication administration requirements, (5) finances, (6) social and cultural beliefs, and (7) willful noncompliance (Brundisini, Vanstone, Hulan, DeJean, & Giacomini, 2015). In addition, many of these medications can interact with others (Triplitt, 2006), have unwanted side-effects (Grant, Devita, Singer, & Meigs, 2003), and result in significant out-of-pocket costs to the patient (Piette, Heisler, & Wagner, 2004; Piette, Heisler, & Wagner, 2004a ).

## **Diet**

T2DM is a disease that affects the way the body metabolizes glucose. The individual will either have difficulty producing enough insulin or be resistant to its effects, resulting in too much sugar (glucose) in the blood. Since sugars, both natural and refined, are found in the foods we eat, an essential component of diabetes management involves a diet focused on sugar intake. The American Diabetes Association includes nutrition therapy as one of the critical elements of any diabetes treatment plan (Evert et al., 2014). Eating plans should be designed to improve glucose and lipid levels, while simultaneously addressing health goals, health literacy, access to healthy foods, and personal and cultural preferences (Evert et al., 2014).

A central feature of a diabetic diet includes counting (Franz et al., 2017) and intake timing (Franz et al., 2017) of carbohydrates since restriction of this nutrient improves glycemic control (Feinman et al., 2015). This single step toward diet change can significantly improve blood glucose levels, help with weight loss, and can lead to the reduction or elimination of diabetic medication (Feinman et al., 2015). Despite the benefits of diet management, patients often find it difficult to comply with the required changes. The primary reason reported by patients includes a lack of desired foods and the inconvenience of eating proper foods in social situations (Shultz, Sprague, Branen, & Lambeth, 2001).

## **Exercise**

Physical activity is a crucial part of leading a healthy lifestyle and reducing the adverse effects of chronic illnesses (Pedersen & Saltin, 2006), especially diabetes (Sigal et al., 2006). For individuals suffering from type 2 diabetes mellitus, regular activity can help patients reduce weight, improve circulation, and lessen the need for medications (Zisser, Gong, Kelley, Seidman, & Riddell, 2011).

As with diet, compliance with recommended levels of physical activity can be problematic for some diabetic patients; adherence rates range from 10% to 80% (Praet & van Loon, 2009). Patients cite competing priorities, weather concerns, other health problems, and injury as primary reasons for noncompliance with exercise recommendations. However, diabetes educators have identified a lack of motivation as an additional barrier (Shultz, Sprague, Branen, & Lambeth, 2001).

### **Social Support**

For the patient, a diagnosis of diabetes requires daily activities that are sometimes complicated and require adjustments to routine activities. Research supports the need for ongoing assistance as the individual learns to adapt to their new lifestyle (Tillotson & Smith, 1996). Social support can be instrumental in affecting self-management behaviors (Tang, Brown, Funnell, & Anderson, 2008) and clinical outcomes (Stopford, Winkley, & Ismail, 2013; van Dam et al., 2005). Although limited in number and scope, studies have indicated that both family and support from others can influence the ability of the individual to carry out self-care activities and achieve positive outcomes (Fukunishi, et al., 1998; Miller & Dimatteo, 2013; van Dam et al., 2005). Past research has shown that support groups, when combined with supplemental education, have improved diabetes knowledge and psychosocial functioning in some individuals (Gilden, Hendryx, Clar, Casia, & Singh, 1992).

### **Education and self-management**

Because diabetes is a disease that is affected by daily activity, patients must be able to manage symptoms and treatment regimens on their own if they are to avoid health complications and slow the advancement of the disease. Programs aimed at teaching self-management skills are designed to increase a person's ability to manage their illness. These programs primarily focus on

the individual and their ability to achieve the behavioral change necessary to gain control of their disease (Haas et al., 2012). Diabetes Self-Management Education (DSME) programs are commonly recommended and utilized interventions for individuals with T2DM. These programs are designed to help patients increase knowledge, improve problem-solving abilities, and improve skill performance through training and instruction. Currently, there is no single curriculum or model for DSME programs. However, programs do share similar educational components designed to address self-care. Programs that follow the 2017 National Standards for Diabetes Self-Management Education and Support (Beck et al, 2017) include the seven self-care behaviors recommended by the American Association of Diabetes Educators (AADE) and endorsed by the American Diabetes Association (American Association of Diabetes Educators, 2018; American Diabetes Association, 2017). The AADE7 Self-Care Behaviors™ include education and support to address healthy eating, increasing activity, monitoring of blood sugar, adherence with medication regimens, problem-solving, behaviors to reduce risks of complications, and healthy coping skills (American Association of Diabetes Educators, 2018). These programs can also provide counseling that addresses emotional disturbances and assists patients with modifying behaviors to support improvements in their health (Haas et al., 2012). Order, type, and duration of instruction should be tailored to the needs of the individual (Beck et al., 2017). When properly taught, education and management skills empower patients to adopt necessary behaviors. As a result, health outcomes (Brunisholz et al., 2014; Duncan et al., 2011; Fan & Sidani, 2009) and psychosocial functioning (Rossi et al., 2015) improve, and healthcare costs decrease (Duncan et al., 2011; Duncan et al., 2009).

Although DSME has been shown to be highly effective (Norris, Lau, Smith, Schmid, & Engelgau, 2002; Warsi, Wang, LaValley, & Avorn, 2004), developing the skills needed to

successfully implement required self-care activities and lifestyle changes require cognitive, emotional, and physical effort from the individual (Funnell et al., 2010). These changes can place stress on individuals with diabetes and on their families. If individuals do not have adequate coping skills or have other life stressors, they may be unsuccessful at incorporating the lessons they have learned during instruction on self-management (Schwabe & Wolf, 2010). Also, the patients must believe they can learn and successfully follow the recommendations presented (Rosenstock, Strecher, & Becker, 1988).

### **Mood and Health**

As mentioned above, individuals must believe they are able to manage health conditions. Therefore, successful treatment of chronic health conditions like T2DM must go beyond traditional medical interventions, as physical health and mental health are inextricably linked (Hays, Marshall, Wang, & Sherbourne, 1994). As far back as 1954, the first Director General of the World Health Organization (WHO), Dr. Brock Chisholm, stated that “without mental health there can be no true physical health” (Kolappa, Henderson, & Kishore, 2013, p. 1). Since then, research has supported the role that mental health plays in physical health. Studies have found direct connections between mental disorders and pain (Dersh, Polatin, & Gatchel, 2002), psychosocial functioning (Keyes, 2002) and poorer health outcomes (Prince et al., 2007).

Mood disturbances are particularly problematic in that both men and women with depression and anxiety are more likely to experience physical health conditions (Johnson-Lawrence, Griffith, & Watkins, 2013; Trudel-Fitzgerald, Ying, Singh, Okereke, & Kubzansky, 2016). One nationally representative study in the U. S. showed there was a higher occurrence of mental disorders among patients with chronic diseases treated at primary care clinics (Gili et al., 2010) and an increase in the prevalence of mental disorders in relation to the number of co-

occurring chronic disorders (Gili et al., 2010). Mental disorders are associated with substantial levels of disability and loss of quality of life (Alonso et al., 2004). As of 2010, depression was ranked as the second leading cause of years lived with disability (YLD) worldwide (Ferrari et al., 2013).

The relationship between diabetes and mood may be bi-directional. Research has shown that this link can have lifetime consequences. Older individuals who report a history of good mental health have significantly better health, and individuals with good physical health report their current mental health status as positive (Ohrnberger, Fichera, & Sutton, 2017). Supporting this bidirectional relationship to diabetes are findings demonstrating that individuals with depression are at a higher risk of developing diabetes (Golden et al., 2008; Knol et al., 2006; Mezuk, Eaton, Albrecht, & Golden, 2008), and a diagnosis of diabetes increases the risk of developing depression (Mezuk, Eaton, Albrecht, & Golden, 2008; Nouwen et al., 2010). The existence of this connection demands that medical personnel understand how mood disorders impact their patients.

### **Defining Depression**

Depression is one of the most common mental health conditions. Worldwide, more than 300 million people suffer from this disorder. In the U. S., an estimated 16 million adults reported at least one major depressive episode in their lifetime. It has been estimated that close to 17% of all U. S adults report an episode of depression at some point in their lifetime (Kessler et al., 2005). Unfortunately, once an adult experiences depression, symptoms are more likely to reoccur (Hardeveld, Spijker, De Graaf, Nolen, & Beekman, 2010).

While each experience with depression may vary, the Diagnostic and Statistical Manual 5 (DSM-5) has clear guidelines that must be met if an individual is to meet criteria for the diagnosis (American Psychiatric Association, 2013). The most commonly diagnosed depressive

disorder is Major Depressive Disorder (MDD). MDD is a mood disorder that results in impairments in an individual's feelings, thinking, sleeping, eating, working, and daily functioning. The DSM-5 requires that the individual experience symptoms for at least two weeks, and exhibit a decreased level of functioning. The person must have either a depressed mood or loss of interest or pleasure not attributable to a medical, other mental health issue, or substance use issue. Other symptoms can include changes in eating and weight, sleep, movement and speech (as noticed by others), fatigue, difficulty concentrating, and feelings of worthlessness or inappropriate guilt. Individuals may also think frequently about death or suicide. The symptoms must cause clinically significant distress and impairment in social, occupational, or other functional domains (American Psychiatric Association, 2013).

The presentation of these symptoms can lead the individual to withdraw socially (Derntl et al., 2011; Girard et al., 2014), decrease participation in pleasurable activities (American Psychiatric Association, 2013), develop negative self-focused thought (American Psychiatric Association, 2013; Philippi et al., 2018), and increased avoidance behaviors (Ferster, 1973; Moulds, Kandris, Starr, & Wong, 2007). Physically, the individual may experience disruptions in sleep patterns, changes in appetite, chronic fatigue, muscle aches, and headache. Also, depression can lead to overeating or bingeing as individuals attempt to find ways to cope with emotional distress (Devonport, Nicholls, & Fullerton, 2017). Ineffective coping mechanisms contribute to weight gain, obesity, and unhealthy nutritional intake (Devonport, Nicholls, & Fullerton, 2017), factors that support the development of illnesses, such as T2DM (Chan, Rimm, Colditz, Stampfer, & Willett, 1994; Colditz, Willett, Rotnitzky, & Manson, 1995).

As previously stated, it is well established that chronic physical health conditions are linked to mood disorders (Johnson-Lawrence, Griffith, & Watkins, 2013; Trudel-Fitzgerald,

Ying, Singh, Okereke, & Kubzansky, 2016). Individuals with diabetes are more likely to develop depression when compared with the general population. The incidence of depression in patients with T2DM is estimated to be around 24% (Nouwen et al., 2010).

It is hypothesized that this comorbidity may be linked to limitations placed on activity due to physical illness (Prince, Harwood, Thomas, & Mann, 1998; Simon, 2001). These physical limitations can prevent the individual from engaging in social activities (Prince, Harwood, Thomas, & Mann, 1998), and impact professional status as patients with both depression and chronic disease are more likely to miss work (Buist-Bouwman, Graaf, Vollebergh, & Ormel, 2007). With such a high prevalence of depression within the population (24% compared to 17% in the nondiabetic population), medical and mental health personnel must screen for and recognize the potential impacts of this association on Quality of Life (QoL). Research has firmly established the link between diabetes and significant reductions in QoL (Ali et al., 2010; Schram, Baan, & Pouwer, 2009).

Previous research has indicated that individuals with depression and diabetes have medical costs roughly three times higher than those without (Egede, Bishu, Walker, & Dismuke, 2016). Even more burdensome, individuals with depression report increased severity and variety of diabetic complications (Williams, Clouse, & Lustman, 2006). The increase in severity may be related to chemical changes identified in individuals with depression, such as increased levels of cortisol. Also, stress hormones like cortisol place the body in a constant fight-or-flight state. Elevated levels of cortisol can lead to hypertension (Whitworth, Williamson, Mangos, & Kelly, 2005) which can lead to heart disease, a common condition seen in the diabetic population (Barrett-Connor, 2003). Furthermore, cortisol may lead to insulin resistance, creating more complications for the diabetic patient (Chiodini, 2007). Making it worse for the patient, there is a

link between “all-cause mortality” (Sullivan et al., 2012) when depression and diabetes co-occur. In fact, complications from uncontrolled diabetes and the increased risk of cardiovascular conditions present in individuals with depression creates a hazardous pairing that increases mortality risks (Black, Markides, & Ray, 2003; Egede, Nietert, & Zheng, 2005; Ismail, Winkley, Stahl, Chalder, & Edmonds, 2007 ; Lin et al., 2009; Young et al., 2010).

Although the directionality of the relationship is not understood, there appears to be a link between glycemic control and depression in both types of diabetes (Lustman et al., 2000). Some studies have revealed elevated blood sugar levels in depressed patients. The strength of this relationship increases when symptoms of depression become more severe (Whitworth et al., 2016). However, it could be argued that blood sugar readings may be more related to the impact of depression on self-care activities (Schmitt et al., 2017).

### **Treating Depression**

While the purpose of this paper is not to discuss treatments, it is useful to understand how depression is commonly managed in primary care. Understanding common treatments used in the primary care setting can help provide context of the experience of the patient and mental health provider. Medications are the most common treatment for depression in the primary care setting (Mojtabai & Olfson, 2011). However, a 2003 study by Solberg, et al., indicated that only half of those treated primarily with medications show improvement. Other studies suggest that the majority of adult primary care patients with depression do not recover or fail to maintain improvements (Vuorilehto, Melartin, & Isometsä, 2009; Stegenga, Kamphuis, King, Nazareth, & Geerlings, 2012).

It could be argued that medication is most often used in this setting as primary care patients are less likely to accept treatment for depression than those seen in mental health centers

(Van Vorhees et al., 2003). One possible solution suggested by researchers is Motivational Interviewing (Arkowitz & Burke, 2008; Keeley et al., 2016). Motivational Interviewing (MI) is client-centered and uses a series of collaborative questions to elicit behavior change by helping clients to explore and resolve ambivalence. At its foundation, it seeks to strengthen internal motivation and develop a commitment to change (Miller & Rollnick, 2013). MI has been effective in treating patients in medical settings (Rubak, Sandbæk, Lauritzen, & Christensen, 2005), and its treatment modality addresses motivation and ambivalence, issues that commonly impact individuals with depression (Miller & Rollnick, 2013). A recent study (Keeley et al., 2016) with low-income patients with comorbid physical health issues showed improvements in depression using MI.

### **Defining Anxiety**

It is estimated that 29 % of the US population will be affected by anxiety at some point over their life course, making anxiety one of the most common issues affecting the mental health of the general population (Kessler et al., 2005). As such, it is essential to understand how the disorder and its correlated symptoms impact the overall health of the individual.

The DSM-5 (American Psychiatric Association, 2013) recognizes the following disorders as classifications under anxiety: panic disorder, generalized anxiety disorder, post-traumatic stress disorder, phobias, and separation anxiety disorder. Symptoms of the disorder include tense feelings, excessive worry, irritability, sleep problems, and fatigue (American Psychiatric Association, 2013). These symptoms impact mood and lead to significant impairments in both social and occupational functioning.

The impact of anxiety on the individual is directly related to the amount of distress experienced. The more significant the difficulty, the more the individual's life is impacted and

the lower quality of life (Olatunji, Cisler, & Tolin, 2007). However, even minimal symptoms of anxiety can negatively affect the individual and lead to a reduced sense of satisfaction with life, leading to recurring feelings of fear, panic, or a general sense of discomfort that impacts all life domains and limits the ability to relax and enjoy life (American Psychiatric Association, 2013).

Although the correlation is not as strong (Egede & Dismuke, 2012) as with depression, individuals with diabetes are disproportionately affected by anxiety (Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002). It is estimated that approximately 14% of individuals with diabetes meet criteria for Generalized Anxiety Disorder (Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002), and up to 35% of those with diabetes report severe anxiety (Bener, OAA Al-Hamaq, & Dafeeah, 2011). While there has been extensive research into the impact of depression on diabetes, little attention has been paid to the problems associated with anxiety in the diabetic population. The lack of information is both surprising and concerning as depression and anxiety often co-occur in the population (Khuwaja et al., 2010; Rubin & Payrot, 2001). As with depression, anxiety can impact both physical and behavioral factors (Katon, Lin, & Kroenke, 2007).

Medically, anxiety is associated with dysregulation of the hypothalamic-pituitary-adrenal axis (HPA). The HPA axis controls reactions to stress and regulates digestion, the immune system, mood, energy storage, and energy expenditure. When the HPA is activated in response to stress, the adrenal glands make cortisol (Graeff & Junior, 2010). Cortisol raises blood sugar to prepare the body to either fight or flee. Anxiety disorders affect the sympathetic nervous system and release of adrenaline, resulting in increases in heart rate and respiration, increases in blood pressure, and muscle tension. The release of adrenaline when stressed impacts glycemic control (Verberne, Korim, Sabetghadam, & Llewellyn-Smith, 2016). Stress responses can also alter

metabolism (Tamashiro, Sakai, Shively, Karatsoreos, & Reagan, 2011), leading to weight gain (Dallman, 2009). These factors all add to the disease burden of T2DM.

The treatment regimen for individuals with T2DM requires changes in behavior that rely on day-to-day functioning. Functional impairment in those with anxiety includes irritability and excessive worry (American Psychiatric Association, 2013) that can limit the ability of the individual to develop supportive social relationships (Zimet, Dahlem, Zimet, & Farley, 1988). Professionally those with symptoms of anxiety may experience more unemployment (Michael, Zetsche, & Margraf, 2007), higher number of missed workdays (Stein et al., 2005), lower pay, and reduced work productivity and achievement (Waghorn, Chant, White, & Whiteford, 2005). These deficits may lead the individual with diabetes to avoid stressful actions that elicit feelings of fear that increase negative emotions.

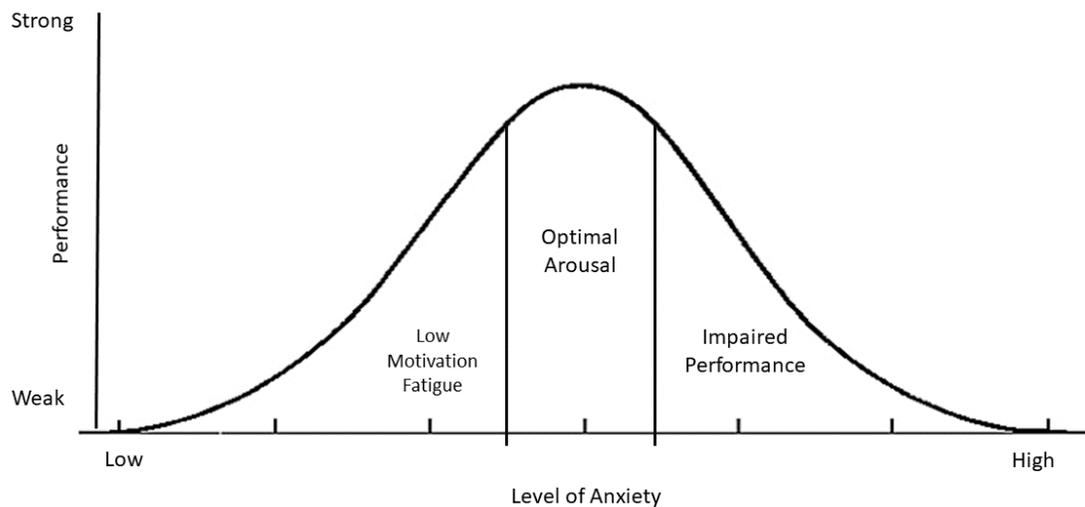
Anxiety can be conceptualized as a state in which an individual is unable to function expectedly. Deficits in functioning may be due to a physical or cognitive state that prevents them from reinterpreting or removing an event or cognition that is perceived as a threat, ultimately creating an emotional response to a situation that prevents them from acting in a way that will result in goal achievement. While it may seem intuitive that individuals with anxiety would be more likely to practice approach behaviors, meaning they actively seek to resolve a problem, due to a fear of potential negative consequences, the opposite may be true. At times, individuals with anxiety disorders are more likely to avoid situations even when there is no danger to themselves (van Uijen, van den Hout, & Engelhard, 2017).

Moreover, anxious individuals are more likely to remain physically inactive (Helgadóttir, Forsell, & Ekblom, 2015) and smoke (Mykletun, Overland, Aarø, Liabø, & Stewart, 2008); behaviors which contribute to lack of diabetes control and an increased risk of complications

(Fagard, 2009; Hayes & Kriska, 2008). For example, Strine et al. (2005) reported that smoking, physical inactivity, and obesity are significantly associated with a lifetime diagnosis of anxiety. Consequently, these are behaviors that are counter to treatment recommendations, and known to increase the risk of developing and worsening diabetes (Chang, 2012; Sullivan, Morrato, Ghushchyan, Wyatt, & Hill, 2005).

One possible explanation for the lack of approach behaviors in the anxious individual may be explained by research performed in the field of sports psychology. When examining athletic performance, sports psychologists have found that the way an individual copes with anxiety can affect performance (Woodman & Hardy, 2003). Those who have extremely high levels of anxiety are more likely to underperform when it matters most. This relationship may be best explained by Yerkes and Dodson's law (Figure 2.1). This law was developed in 1908 after a study of mice determined that some anxiety could have a positive impact on learning, but too much had the opposite effect. High levels of anxiety negatively impacted learning in mice, leading the researchers to conclude that performance peaks when there is an optimal level of anxiety, but a reverse effect occurs when anxiety increases. This relationship between anxiety and performance has been referred to as the inverted-U curve due to the reverse effect of performance that may occur. Therefore, individuals with high levels of anxiety who fear adverse outcomes (failure to perform as expected) may be unable to achieve desired goals. Given this explanation, it is easy to understand how an individual experiencing anxiety may worry about accomplishing the goal and develop strategies to reduce anxiety at the expense of achieving the goal. Educators have also explored the effect of anxiety on performance. Studies have found that fear of failure played a role in procrastination among students (Solomon & Rothblum, 1984). Put

simply, fear that others will negatively evaluate an individual's performance affects performance, self-confidence and increased anxiety.



*Figure 2.1.* Visual Representation of Yerkes and Dodson's Law

### **Treating Anxiety**

There are plenty of investigations exploring the impacts of various treatments on anxiety. For this reason, this paper limits its discussion to those most commonly used in primary care. As is the case with depression, medications are the most common treatment for anxiety in primary care settings (Roy-Byrne et al., 2010), with antidepressants serving as the first-line treatment (Craske & Stein, 2016). However, if rapid relief of symptoms is needed, a combination therapy of antidepressant and benzodiazepine administration (Goddard et al., 2001) can be used.

Evidence-based treatments for anxiety disorders typically include a psychosocial intervention like Cognitive Behavioral Therapy (CBT) (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007). Due to time commitments and availability of trained staff, these treatments are not always available in a primary care setting (Craske et al., 2011). To address mental health needs in primary care Motivational Interviewing has become more prevalent and has been shown to

provide an advantage over other interventions in health care settings (Lundahl et al., 2013). As with depression, Motivational Interviewing can help anxious individuals increase internal motivation and decrease ambivalence about change (Miller & Rollnick, 2013).

The prevalence of comorbid depression and anxiety in the diabetic population and its potential impact on diabetic self-care makes a strong argument for the inclusion of protocols that require assessment and interventions as a part of the treatment planning process. However, it would be irresponsible not to examine and treat each disorder individually as research has failed to identify the role each illness has on the individual. Symptomology of the different disorders may have different impacts on the individual and their ability to manage their illness. Therefore, identification and targeted treatments for anxiety and depression that are given a superior position in the treatment hierarchy may better prepare patients to develop healthy behaviors, reduce financial costs, delay the development of more severe symptoms and reduce adverse outcomes.

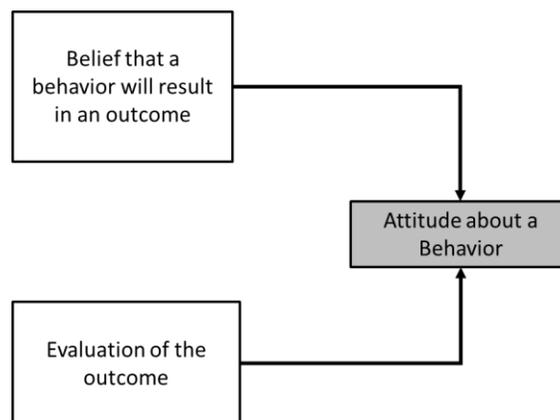
## **Theory**

A key component of diabetes care requires individuals to engage in educational programs that promote lifestyle change and includes the use of self-management activities (American Diabetes Association, 2015; Garber et al., 2013). In order to comprehend how mood might impact an individual's ability or motivation to engage in behavior change, it is essential to understand what mechanisms exist within and without the individual to create the desired change. Health behavior change models and behavioral theories are frequently used by public health to develop interventions designed to target specific populations, such as those with T2DM (Peyrot, 1999). As their foundation, these models rely on some mixture of skill acquisition, self-efficacy, and cost-benefit. With a foundation in the social sciences, the Theory of Reasoned

Action and the Theory of Planned Behavior offer a useful public health model often cited in diabetes self-management research. As such, they are useful to discuss to understand how depression and anxiety may impact components of care models and reduce the likelihood that individuals will engage in the prescribed behaviors.

### **Public Health Models**

The Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) combine to make a single framework for understanding behavior change. Both assert that the individual must form the intent to engage in a behavior or else the behavior will not occur (Glanz, Rimer, & Viswanath, 2008). The TRA begins with the concept of attitude, specifically, the attitude of the individual about the requested behavior. According to the framework, the attitude about the behavior is formed based on two beliefs: (1) the belief that the behavior will result in an outcome, and (2) that the outcome is beneficial (Figure 2.2) (Glanz, Rimer, & Viswanath, 2008).



*Figure 2.2.* TRA Formation of Attitude

The TRA then adds the idea of a subjective norm, meaning that an individual must believe that others expect the behavior to occur, and they must be motivated to fulfill the expectations of others in their community (Figure 2.3).

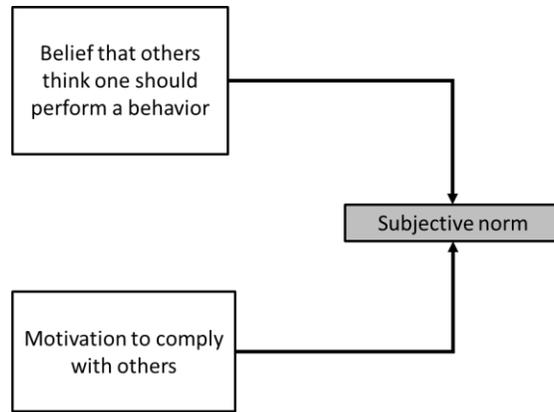


Figure 2.3. TRA Formation of Subjective Norm

Using these concepts, the TRA asserts that when an individual has a positive attitude about the behavior and view the behavior as an expected norm, they will form the intent to complete the behavior (Figure 2.4). Intention, the theory argues, is essential if a behavior is to be performed (Glanz, Rimer, & Viswanath, 2008).

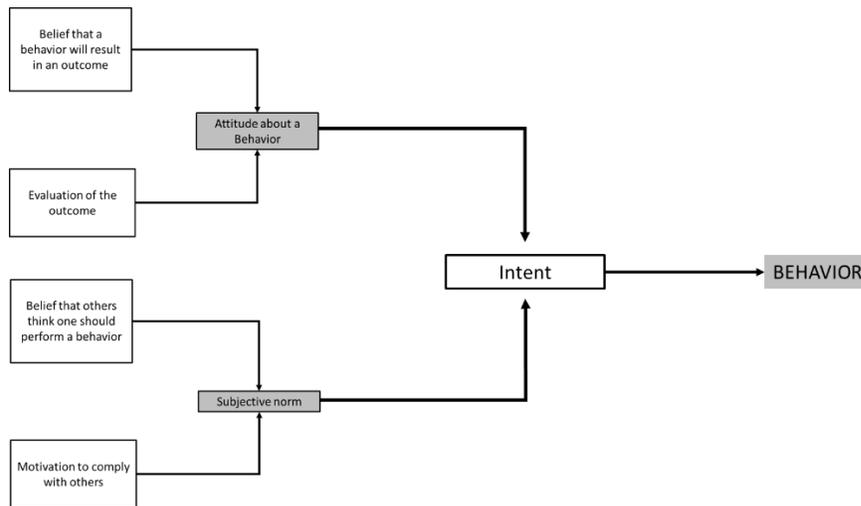


Figure 2.4. Theory of Reasoned Action

Thus, education about the impacts of behavior (outcomes) and introduction to exemplar others (norm) has the potential to change beliefs about the benefits of the required practices. This change influences attitude and increases the individual's intention to perform an action and result

in the adoption of adaptive self-management behaviors. However, mood states can impact the ability to form the intention and increase or decrease the likelihood a behavior will occur.

The Theory of Planned Behavior (TPB) adds to the existing TRA constructs by positing that the additional element of control serves to moderate the individual's intention (Figure 5). The more an individual believes they have control and power, the more likely they are to perceive they can create change. Perceived control, along with attitude and subjective norms, are the constructs that determine one's intention to perform and, ultimately, their performance of a behavior (Glanz, Rimer, & Viswanath, 2008). Due to the internal focus on control, this aspect of the model has the greatest potential to be impacted by anxiety and depression.

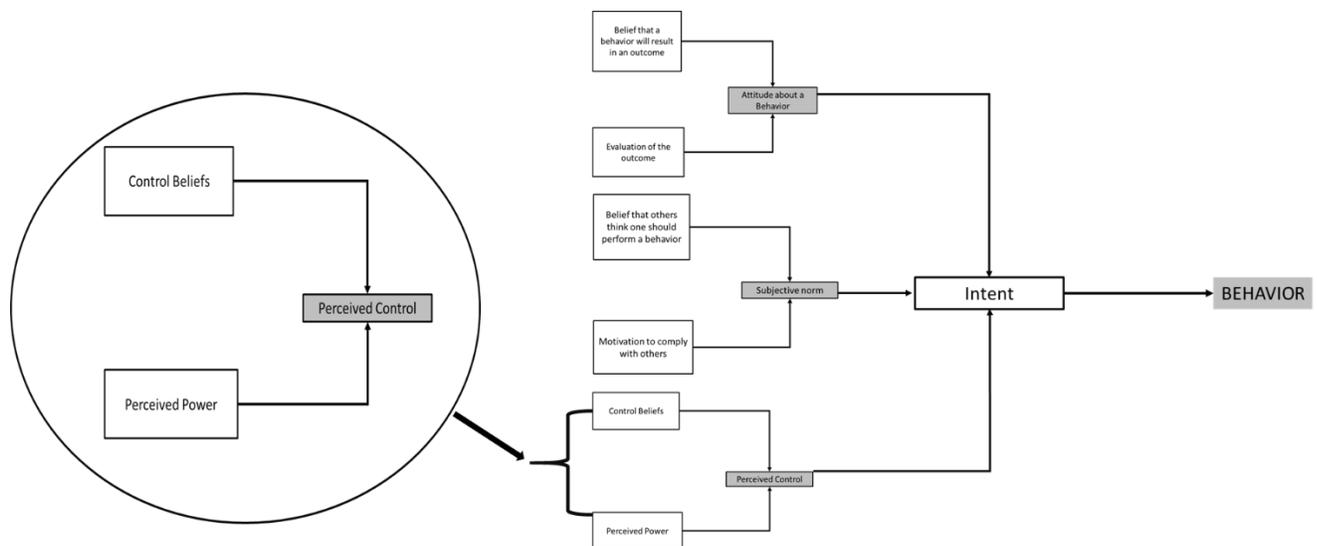


Figure 2.5. The Theory of Planned Behavior

Based on the concept of the TPB, interventions designed to create behavior change will have their best chance of success if all three constructs (control, norms, and attitudes) are addressed. Attitudes can be addressed through psychoeducation by improving an individual's understanding of their illness and how changes in behavior can result in a positive impact on their health. Changing subjective norms can be achieved through community outreach that

addresses maladaptive cultural ideas or through the introduction of exemplar others to patients. Developing control can be achieved by building a sense of self-efficacy through skill acquisition and education. However, the best implementation of these strategies (psychoeducation, changing norms and building skills) can be ineffective in individuals with anxiety or depression. The individual with a mood disturbance may have difficulty believing that they are capable of mastering the required activities and this fear of failure could impact feelings of self-efficacy and hinder motivation.

### **Self-Efficacy and Motivation**

It is well understood that learning and behavior are a result of cognitive processes (thoughts lead to behavior). DSME programs, the most commonly used interventions in primary care, attempt to alter behavior by increasing knowledge and building a sense of mastery through skill acquisition and improving self-efficacy. Patient compliance is often measured using the self-management skills taught to patients in the DSME program.

Self-efficacy can be understood as a person's belief that they are capable of successfully performing a task or achieving a goal (Zimmerman, 2000). Personal control is similar to self-efficacy as both concern themselves with perceptions of individual power and control (Bandura, 2004). Bandura originally developed the concept of self-efficacy that is currently used in social work. In 1977, Bandura published "*Self Efficacy Toward a Unifying Theory of Behavioral Change.*" In this article, Bandura asserted that "personal efficacy" determines whether a behavior will occur, how much energy the individual will expend in completing an activity, and the activities duration (Bandura, 1977). Bandura also suggests that self-efficacy is more important in the initiation of behavior than expectations of a favorable outcome.

A central feature of positive psychology, a person's level of self-efficacy determines their belief in their ability to accomplish a task and produce a favorable outcome. Individuals who believe in their ability are more likely to expect success and are more likely to attempt a task (Multon, Brown, & Lent, 1991). Bandura's work identified four sources of efficacy beliefs: mastery experiences, vicarious experiences, verbal persuasion, and emotional and physiological states. Bandura asserts that self-efficacy can be improved or damaged through these four mechanisms. Self-efficacy is improved when individuals attempt tasks and achieve success, but damaged when they meet with failure. Observing others achieve success increases our belief that we can succeed, as does persuasive support from others. Of the four sources identified by Bandura, emotional state may play the most significant role in determining self-efficacy among individuals with depression and anxiety. Stress, perceived vulnerability, and negative emotions can impact perceptions of performance ability and confidence, all factors experienced by individuals with a mood disturbance.

According to Bandura (2004), self-efficacy can be used to predict behavior change and may play a more prominent role than positive reinforcement. Bandura explains that even if the individuals believe that a behavior will result in an outcome, they will not attempt execution if they do not feel they have the competency to perform the task. These "efficacy expectations" also determine how much effort individuals will exert and how long they will attempt a behavior when faced with difficulties. In other words, higher levels of self-efficacy will result in the initiation of behaviors, persistence, and greater intensity of effort.

When faced with stressful events the individual may fear and avoid uncomfortable situations if they believe their coping mechanisms and abilities will be inadequate (diminished self-efficacy). For individuals with an anxiety or depression, this stress may be amplified. As

previously mentioned, both depression and anxiety hinder task performance and increase stress. A person without these disorders is more likely to appraise a situation as tolerable and manageable while the individual with moderate to severe anxiety or depression may view it as a threat or loss (Beck & Clark, 1988). As such, self-efficacy can be impacted by addressing maladaptive emotional states.

In 2004, Bandura published an article that focused on the role of Social Cognitive Theory in disease prevention. He explained how the belief of an individual in their power to achieve a goal by their actions could be useful in predicting whether a behavior will occur. Bandura (2004) suggests that the role of self-efficacy plays a significant part in predicting health behavior change. Individuals with low self-efficacy have difficulty believing that their actions will result in positive change and are therefore less likely to try. Conversely, individuals with higher levels of self-efficacy believe their actions will result in goal achievement even when faced with barriers to task performance.

Health behavior models, such as the Theory of Reasoned Action and The Theory of Planned Behavior, help predict outcomes based on the presence or absence of certain factors. However, they fail to offer ways to address other factors such as how mood influences behavior. According to Bandura (2004), increasing a person's sense of self-efficacy increases the likelihood of behavior change and should be included in public health campaigns. This idea of increasing self-efficacy has been successfully used to support some T2DM interventions (Davies et al., 2008). However, treating emotional states has not been given equal attention in DSME programs and outside professionals have provided separate treatment for individuals with anxiety and depression, resulting in fragmented care that fails to address the link between physical and emotional health (Croft & Parish, 2013).

## **Behavior Change Models and Mood**

Both the Theory of Planned Behavior and Bandura's work recognize the role of self-efficacy in motivating individuals to engage in self-management behaviors. The relationship between mood and self-efficacy leads to a decreased capacity to act independently when performing self-care activities, thus decreasing the quality of life (Yıldırım, Hacıhasanoğlu, Bakar, & Demir, 2013).

People with diabetes must be able to take action and assume responsibility for required life changes. It is essential that they believe that they can perform tasks and engage in daily problem-solving. Specifically, patients must become more internally motivated to engage in healthy behaviors (Ryan & Deci, 2000) that will lead to improved regulation of blood glucose levels, and feel more competent in their ability to monitor blood sugar levels as well as perform other self-care activities.

The bidirectional relationship that exists between diabetes and mood (Golden et al., 2008) can impact the ability of the person to successfully manage their diabetes as these individuals are less likely to perform important behaviors (Lin et al., 2004). For example, depression increases the likelihood that individuals will not comply with medication regimens that assist with glycemic control (Ciechanowski, Katon, & Russo, 2000), makes them more likely to miss medical appointments, and decreases likelihood of following diet recommendations and monitoring blood glucose (Gonzalez et al., 2008). Depressive symptoms can lead the individual to withdraw from beneficial social activities (Derntl et al., 2011) and develop a sense of inadequacy and self-loathing that limit the individual's willingness to try new things (Ferster, 1973; Moulds, Kandris, Starr, & Wong, 2007) required to manage their disease.

One of the key features of depression involves diminished interest in activities and feelings of worthlessness (American Psychiatric Association, 2013). When individuals emotions leave them feeling incapable of performing basic activities, they may desire to complete necessary actions but they fail to act as the sense of worthlessness (belief they are inadequate) prevents the action from occurring. The patients may desire to exercise more but may not believe they can successfully complete the activity. This belief-desire mechanism drives motivation in depressed individuals (Smith, 2012). Therefore, despite the knowledge of what they should do and the desire to comply, people with diabetes may lack the belief that their actions will be useful in achieving the goal. This lack of belief can impact feelings of self-efficacy, which can lead to less engagement in self-care activities (Siguroardottir, 2005). This explains why individuals with a mood disturbance may be unable to comply with medically prescribed self-care recommendations.

When treating patients with depression and anxiety, it is essential to understand how these disorders influence the ability of individuals to carry out the required skills and behavior change. Cognitive ability is important, but given that individuals have the mental ability to comprehend and learn skills, they must also intend to engage in the activity. Individuals with high levels of self-efficacy will continue to work toward task completion despite any difficulty encountered, while those with lower self-efficacy will give up when they encounter resistance. Symptoms found in individuals with anxiety and depression can negatively impact self-efficacy.

### **Research Questions and Hypothesis**

The research questions were selected based on a review of literature that revealed limited information on the impact of mood on self-care in individuals with type 2 diabetes mellitus. Meta-analytic literature reviews have revealed a strong connection between depression and diabetes (de Groot, Anderson, Freedland, Clouse, & Lustman, 2001; Mezuk, Eaton, Albrecht, &

Golden, 2008) and anxiety and diabetes (Smith et al., 2013). However, explorations of the impact of mood on diabetic self-care activities with U.S. populations are limited (Al-Amer, Ramjan, Glew, Randall, & Salamonson, 2016; Browne, Nefs, Pouwer, & Speight, 2014; Wu et al., 2011; Wu et al., 2013). This study will be the only one available that measures both anxiety and depression using instruments commonly collected in primary care environments. This distinction is vital as many primary clinics are utilizing integrated models of care to help combat the disease burden of diabetes.

Using data from a primary care clinic that provides integrated services to its diabetic patients, this study aims to answer the following research questions:

**Research Question 1:** When levels of anxiety and depression change in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting, do levels of self-care activities change?

**Research Question 2:** Are there other variables such as pain, sleep difficulty, age, gender, ethnicity, marital status, current living arrangement, and education influence levels of self-care activity change in individuals receiving DSME based psychoeducation and support services from a social worker in a primary care setting?

**Research Question 3:** Do changes in levels of anxiety, depression or other factors serve as better predictors of self-care behavior change in patients with type 2 diabetes mellitus in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting?

**H<sub>1</sub>:** When anxiety and depression improves, self-care behaviors in individuals with type 2 diabetes mellitus will improve.

**H<sub>2</sub>:** Other factors are associated with self-care behaviors in type 2 diabetic patients

**H3:** Individuals with type 2 diabetes mellitus who experience improvement in anxiety and depression will demonstrate increased frequency of self-care behaviors.

Public health prevention programs are built from models that emphasize the importance of individual perception and action. These approaches rely heavily on the capacity of the individual to not only implement behaviors but also call for the individual to be motivated to begin and continue required activities. Educational programs can build capacity by teaching skills and increasing knowledge. Educational programs build self-efficacy through skill building. However, they fail to address the needs of the individual who has emotional barriers. As presented previously, anxiety and depression influence thought and action. Individuals with depression and anxiety experience negative self-talk and avoid potentially unpleasant activities. If treatment programs for individuals with T2DM are to have the most significant impact on the individual, the existence of a mood disturbance must be identified and addressed. Study hypotheses were developed based on the work of Bandura (1977), Ferster (1973), and Grupe and Nitschke (2013), who presented research that supported a link between mood state and motivation.

## METHODOLOGY

This study will utilize data collected from a program funded as a part of the Deepwater Horizon Medical Benefits Class Action Settlement which created a series of integrated health programs across the Gulf Coast of the United States. One project goal was to establish a fully integrated behavioral health unit within a Federally Qualified Health Center. The program staff, consisting of licensed social workers, addressed the psychosocial dimensions of health by creating targeted interventions that supported individuals with chronic physical and emotional issues. The interventions provided by the licensed social workers are based on individual patient need and physician orders.

### **Design**

The study is quasi-experimental, utilizing ex-post facto data as the participants are not randomly assigned, and it will involve the use of variables not manipulated by the researcher or collected for research purposes.

The data included in this study were collected as a part of the standard treatment protocol for all patients seen by the program social workers. The integrated health program collects patient-level data through a SQL database explicitly designed for program use. The database includes demographic information, mental health assessment scores, and biometric data. Data is collected on all patients seen by the licensed social workers and social work student interns according to program protocol. The data used in this study were collected over four years. Data analysis employed descriptive statistics for the sociodemographic variables, levels of depression

and anxiety, and self-care activities in order to describe the respondents. Ideally, the analysis would include parametric tests to increase the strength of the study conclusions. However, the data collected was not normally distributed. Log, Square-root, and Arcsine transformations were attempted using SPSS version 25. In addition, outliers were removed, and categories were created in an attempt to transform the data into a normal distribution, all-unsuccessful. As a result, continuous values were categorized to create nominal variables to use in non-parametric tests.

Bivariate analysis included Point-Biserial Correlation Coefficients, Cochran-Armitage Tests of Trend, and Chi-Square tests of Independence to determine if correlations exist between suspected variables of influence and changes in self-care behaviors. Tests were selected based on the type of variable: nominal, ordinal, or continuous. Friedman's tests were run to determine if there was a time effect on the variables of interest.

The Point-Biserial Correlation Coefficient was used to determine if there is a linear relationship between age and self-care, followed by a Chi-Square Test of Independence. The chi-square is an appropriate statistical test when the purpose of the research is to examine the relationship between two nominal level variables. To evaluate the significance of the results, the calculated chi-square coefficient ( $\chi^2$ ) and the critical value coefficient were compared. In order to determine if there is a relationship between ordinal variables of interest and change in self-care behaviors, a Cochran –Armitage test for trend was performed. For all correlations when the calculated value is larger than the critical value, an alpha of .050, the null hypothesis will be rejected. Finally, a binary logistic regression was run to determine which independent variables serve as predictors to a change in self-care behaviors.

## **Procedures**

Program protocol utilizes several assessments given throughout the treatment process (see Figure 3.1). In addition to collecting sociodemographic information, all diabetic patients are initially screened to determine mental health status by collecting the results from the Patient Health Questionnaire 9 (PHQ-9) and Generalized Anxiety Disorder 7-item (GAD-7) scales. These visits are face to face and, when possible, performed when the patient is in the clinic to see their physician. If the patient is unable to see the social worker following their medical visit due to time constraints, a separate appointment is scheduled at a day and time convenient for the patient.

At the end of the initial session, the patient is provided with information related to program services and logs that will allow them to keep track of food intake, exercise performed, and blood sugar levels. Patients are also provided with the Summary of Diabetes Self Care Activities (SDSCA) assessment. At subsequent face-to-face visits, the SDSCA is re-administered, and tracking logs are collected and reviewed with the patient. At the fourth visit or at three months, the PHQ-9 and GAD-7 are re-administered. At the final visit (or at six months) all assessments are re-administered (see appendix for copies of assessments). Although the program is designed to be provided during pre-scheduled appointments over six months, to increase participation and promote success, appointments are scheduled to accommodate the patient's availability.

For this reason, the assessment and intervention timelines serve as a framework and can be adjusted as needed. All patients enrolled in the program receive a DSME-based educational component; patients with symptoms of anxiety or depression are provided brief solution-focused therapy to address emotional issues. The standard protocol may be delayed until the mental

health issues are more manageable if the program social worker identifies a significant mental illness that could hinder the treatment process. Clients with a current addiction to alcohol or drugs are not eligible for enrollment in the program.

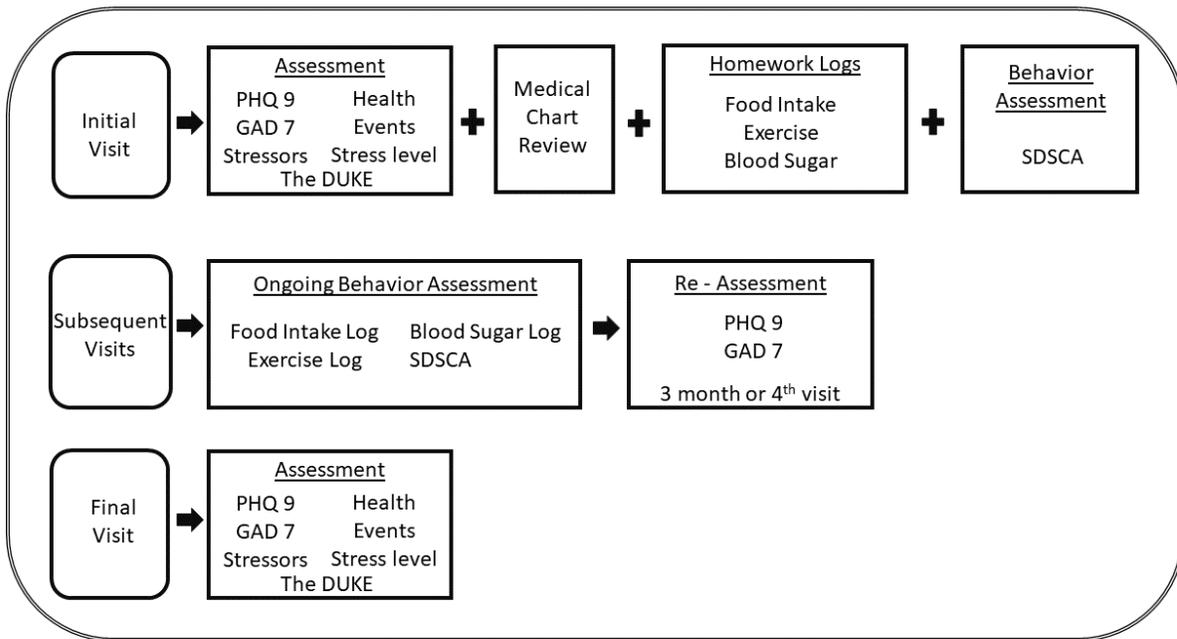


Figure 3.1. Assessment Workflow

### Sampling Strategy

Program social workers offer their services to all diabetic patients with an A1c > 9. The A1c lab test measures the average level of sugar in the bloodstream over the previous three months (National Institute of Diabetes and Digestive and Kidney Diseases, 2018). An A1c greater than 6.5 meets criteria for a diagnosis of diabetes (American Diabetes Association, 2018a), however, this program targeted patients with an A1c of 9 or greater at the request of the Chief Medical Officer, as these patients are at the highest risk of complications and early mortality (Manderfeld, 2018).

Potential patients of the primary care clinic are given a brief introduction of services provided by either the social worker or the medical provider. The offering and explanation of program services can be done in person or via phone contact. Only patients accepting services are enrolled in the program and receive the intervention. To allow for comparisons, only patients who have completed two appointments are included in this study. Patients with an addiction, who are actively suicidal, have a cognitive impairment, a delusional disorder, or who are on opioid pain medications are not eligible for services in the program.

This study utilized a purposive sample selected from a pre-existing clinical database. The sample included 625 diabetic patients who had PHQ 9, GAD 7, and SDSCA information recorded in the database. While a purposive sample limits generalizability, it is the most feasible, with the limited number of available primary data sources which can contribute to the study. The principle investigator created the database to collect de-identified patient health information for reporting and outcome tracking. All patients receiving services from the program are required to sign treatment consents that include permission to use de-identified data for research purposes.

## **Measures**

This study investigates the association between depression and anxiety and the performance of self-care activities in diabetic patients utilizing DSME-based psychoeducation and support services provided by a social worker in a primary care setting. The variables of interest were chosen based on an extensive overview of theory and relevant literature on the connection between mental health and diabetes (Knol et al., 2006; Mezuk, Eaton, Albrecht, & Golden, 2008; Parihar, Thakar, Yin, & Allen, 2016; Nouwen et al., 2010; Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002; Bener, OAA Al-Hamaq, & Dafeeah, 2011.) However, there is limited information on how the existence of a mood disturbance influences specific self-

care activities, which are critical in the treatment of diabetes (American Diabetes Association, 2018).

### **Independent variables**

The primary independent variables of interest are depression and anxiety. This study is based on the idea that individuals with chronic health conditions who suffer from a mood disturbance are less likely to perform the self-care activities required of them by their primary care physicians. The inability to perform these tasks must be addressed to improve health outcomes, especially for individuals with diabetes. This author chose to use depression and anxiety to predict an individual's ability to engage in self-care activities successfully. While there are other mental health issues that can impact the ability of the individual to perform self-care, depression and anxiety are the most commonly occurring within the population (Anderson, Freedland, Clouse, & Lustman, 2001; Andreoulakis, Hyphantis, Kandylis, & Iacovides, 2012; Knol et al., 2006; Smith et al., 2013) and are commonly treated in primary care (Hirschfeld, 2001). Items used to measure depression and anxiety are described below.

### ***Depression***

The PHQ-9 is a depression assessment that can be self-administered or administered by a clinician and is commonly used in the primary care setting. The PHQ-9 was administered by the clinician for all participants in this study. It includes nine questions based on criteria for depression found in the DSM IV. Each of the nine questions asks the respondent to score thoughts or behaviors as "0" (not at all) to "3" (nearly every day). Scoring is accomplished by summing the responses to obtain a total score. The severity of symptoms are categorized as mild (score of 5-9), moderate (10-14), and severe (>14). Early evaluations of its validity used the 20-item Short-Form General Health Survey to determine if items were accurate measures of

depression (construct validity) and criterion validity was assessed by comparing scores to the impressions of a mental health professional (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 has evidence of good internal consistency and criterion, and construct validity (Kroenke, Spitzer, & Williams, 2001). Scoring recommendations for the PHQ-9 are based on functional deficits and provide the clinician with guidelines to determine severity. Values are minimal (1-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27) (Kroenke, Spitzer, & Williams, 2001).

### *Anxiety*

As with the PHQ-9, the GAD-7 can be self-administered or provided by a clinician. It is also commonly used in the primary care setting. It includes seven items based on criteria for Generalized Anxiety Disorder as indicated by the DSM-IV. Each of the seven questions asks the respondent to score thoughts or behaviors as “0” (not at all) to “3” (nearly every day). Scoring is accomplished by summing the responses to obtain a total score. The severity of symptoms are categorized as mild (score of 5-9), moderate (10-14), and severe (>15). The GAD-7 has demonstrated good reliability, as well as criterion, construct, factorial, and procedural validity in primary care settings (Spitzer, Kroenke, Williams, & Löwe, 2006) and population-based samples (Löwe et al. 2008).

### **Dependent variables. Diet change and adherence, level of exercise, medication adherence, performance of foot care, and blood sugar testing**

The Summary of Diabetes Self-Care Activities (SDSCA) questionnaire is a widely used self-report measure of self-management activities performed by the diabetic patient (Toobert, Hampson, & Glasgow, 2000). Each question asks the respondent how many days over the previous seven they engaged in specific activities. The SDSCA is comprised of 25 questions

broken into five subscales measuring specific aspects of the required regimen (Table 3.1). These include diet (5 items), exercise (2 items), medication adherence (3 items), foot care (5 items), and blood sugar testing (2 items). The remaining eight questions were not used in this study. All scale scores range from 0 to 7, with higher scores suggesting better self-management. The SDSCA has demonstrated adequate psychometric properties in various studies (Bean, Cundy, & Petrie, 2007; Toobert, Hampson, & Glasgow, 2000). While the instrument was generally reliable, Toobert et al. (2000) found some inconsistencies in results for items measuring specific diet adherence. Currently, the SDSCA is used in various settings (Ofstedal, Bru, & Karlsen, 2011; Sacco et al., 2007; Sultan, Attali, Gilberg, Zenasni, & Hartemann, 2011) to measure compliance.

Table 3.1

*SDSCA Questions used in this study*

<b>Question Number</b>	<b>Question</b>	<b>Subscale Category</b>
1	How many of the last SEVEN DAYS have you followed a healthful eating plan?	Diet
2	On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?	Diet
3	On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?	Diet
4	On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products?	Diet
5	On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking.)	Exercise

6	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?	Exercise
7	On how many of the last SEVEN DAYS did you test your blood sugar?	Blood Sugar Testing
8	On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?	Blood Sugar Testing
9	On how many of the last seven days did you check your feet?	Foot Care
10	On how many of the last seven days did you inspect the inside of your shoes?	Foot Care
5A	On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?	Diet
6A	On how many of the last SEVEN DAYS, did you take your recommended diabetes medication?	Medication
7A	On how many of the last SEVEN DAYS did you take your recommended insulin injections?	Medication
8A	On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?	Medication
9A	On how many of the last seven days did you wash your feet?	Foot Care
10A	On how many of the last seven days did you soak your feet?	Foot Care
11A	On how many of the last seven days did you dry between your toes after washing?	Foot Care

When calculating the medication score, the author used a single item (6a) to determine medication adherence. This item asks if the patient has taken diabetes medication. The scale has

an additional composite score for measuring medication adherence and includes two questions that ask if the patient has taken their insulin (7a) and their pills (8a) as prescribed. Not all patients with the integrated health program are prescribed insulin; per assessment instructions, only item 6a was used.

### **Control Variables**

All respondents share a diagnosis of diabetes; however, they differ in other characteristics, such as self-identified gender, marital status, ethnicity, living arrangement, level of education, and age. All variables are self-reported during the initial assessment. The intervention does not influence these variables. Gender (male and female), ethnicity (Caucasian and minority), living arrangement (alone and with family/friends), and marital status (single or married) were coded as dichotomous variables due to the limited variation in the answers provided. Education level (less than HS, diploma/GED, and college credit) was separated into three categories. Age comprised an interval variable representing the age in years of the patient at the time of the initial assessment performed by the program social worker or intern.

Other items of interest included in the dataset included two from the DUKE Health Profile (Questions 10 and 11) (Parkerson Jr, Broadhead, & Tse, 1990). These questions ask how much trouble the patient has had with sleeping (question 10) and if the patient is hurting, or aching in any part of the body (question 11). Values are none, some, or a lot.

### **Analysis Plan**

IBM SPSS Statistics version 25 was used for data analysis. An alpha level of .05 was used to determine significance across the study. Only valid data entries were used for data computation. Records with missing values for variables of interest (GAD-7, PHQ-9, and SDSCA scores) were dropped from the analysis. Analysis of the remaining records revealed some

variables were missing from the demographic data, sleep scores, and pain scores. No pattern of missing data was discovered. The omissions were random and most likely related to either refusal of the patient to respond or oversight by the social worker.

### **Univariate analysis**

Descriptive analysis was used to present the data in summary form. Additionally, this analysis determined the distribution of the data; a necessary step to ensure that further analysis utilized the proper statistical tests. Mood scores, level of self-care, age, gender, marital status, living arrangements, ethnicity, pain presence, sleep difficulty, and education are presented. Standard deviation, mean, minimum, and maximum were calculated for continuous variables. For categorical variables, frequencies and percentages were reported.

### **Bivariate analysis**

A Friedman test was conducted to determine whether changes in self-care activities from pretest to posttest differ across time. The Friedman test is the non-parametric alternative to the one-way repeated measured ANOVA. Unlike the repeated measured ANOVA, the Friedman test does not assume normality nor sphericity. Like the repeated measure ANOVA, the Friedman test is used when the purpose of the research is to evaluate whether differences exist on one dependent variable that is repeated across time points. The Friedman test is an appropriate statistical analysis when the purpose of research is to assess whether mean differences exist on one variable (mood, self-care) measured across time. The variables of interest in this analysis are level of self-care (improvement vs. no improvement) and mood (improvement vs. no improvement), and the independent variable is time (time 1 vs. time 2 vs. time 3).

Since the independent variables vary in the types of measurement, three separate types of correlations were run (Point-biserial correlation, Chi-Square, and Cochran-Armitage Test of

trend). Correlations were used to investigate the relationship between the dependent variable (self-care) and other variables included in the data set (age, gender, ethnicity, current living arrangement, pain presence, sleep difficulty, marital status, and education). For continuous variables, the Point-biserial correlation was computed. For ordinal values, the Cochran-Armitage Test of trend was run; for dichotomous variables, a Chi-Square Test of independence was computed. These tests determine the strength of the relationship between the dependent variable (self-care) and other variables of interest included in the data set (age, gender, ethnicity, current living arrangement, pain presence, sleeping difficulty, marital status, and education).

A Point-biserial correlation coefficient, Chi-Square, and Cochran-Armitage Test of trend are bivariate measures of association (strength) of the relationship between two variables. When the research question seeks to determine the strength of a relationship between a continuous independent variable (age) and a dichotomous dependent variable (improvement vs. no-improvement in self-care), a Point-biserial correlation can be used. When the research question seeks to determine the strength of a relationship and the variables are dichotomous (ethnicity, gender, living arrangement, and marital status) a Chi-Square can be used. The Cochran-Armitage Test of trend measures an association between an ordinal independent variable (education, sleep difficulty, and pain presence) and a dichotomous dependent variable is (improvement vs. no-improvement in self-care).

Correlations vary from 0 (no relationship) to 1 (perfect linear relationship) or -1 (perfect negative linear relationship). A positive coefficient indicates a direct relationship; as one variable increases, the other variable increases. Negative correlation coefficients indicate an indirect relationship; as one variable increases, the other variable decreases.

### **Multivariate Analysis**

A binary logistic regression was conducted to assess which independent variables (mood, age, education level, ethnicity, gender, living arrangements, marital status, pain presence, and sleep difficulty) can be used to predict an improvement in self-care behaviors as measured by the SDSCA. In this case, the binary logistic regression is the appropriate statistical analysis as it allows for an analysis that can be used when the predictor variables are a combination of continuous and discrete (Tabachnick & Fidell, 2001). The binary logistic regression analysis was selected as it does not assume linearity, normality, and equal variances. This fit with the limitations of the data set. The overall model significance for the binary logistic regression was examined using the  $\chi^2$  omnibus test of model coefficients. The Nagelkerke  $R^2$  was examined to assess the percent of variance accounted for by the independent variables. Predicted probabilities of an event occurring were determined by  $\text{Exp}(\beta)$ .

### **IRB Approval**

The data used for this study was collected from records obtained from a DSME-based psychoeducation and support service program provided in a primary care setting. Use of the dataset for analysis has been approved by The University of Southern Mississippi's Institutional Review Board (protocol number: R2CH3-1602260, period of approval: 02/26/2018 – 02/25/2019). Approval from the University of Alabama IRB was received on October 17, 2018 (protocol id: 18-09-1493).

## ANALYSIS AND RESULTS

This chapter presents the results of the analysis described in Chapter 3 along with a brief discussion. First, an explanation of how the sample was extracted from the database is presented. Next, descriptive information for the sample is given, followed by bivariate analysis (i.e., point-biserial correlation, Cochran-Armitage test of trend, and chi-square test) and logistic regression results. All results are discussed in relation to the study hypothesis.

### **Data Preparation**

The original sample was extracted into Microsoft Excel from a clinical database designed and maintained by program staff. The entire sample consisted of 2,450 patient records, 625 of which had diabetes, representing 1,482 chronic care service visits by licensed social workers and their interns. Before the data could be merged into SPSS for analysis, several steps were taken to clean and code the data set. Records not containing assessment scores for the GAD-7, PHQ-9, or the SDSCA were removed from the dataset, as these visits did not contain information that would answer the research questions. Patients with only one visit were omitted since these records did not contain any comparison data.

The second step consisted of consolidating demographic data and summing assessment scores. Although the program collects demographic information at every visit, some of the data points were inconsistently collected after the initial visit. As a result, demographic information collected at the initial visit was selected for inclusion in the dataset. If demographic data was missing from the initial visit, the first available value from a subsequent visit was included as the

baseline value. The GAD-7 and PHQ-9 scores were summed based on recommendations from validation studies (Löwe, 2008; Kroenke, Spitzer, & Williams, 2001). The SDSCA was scored according to recommendations of the scale author (Toobert, Hampson, & Glasgow, 2000). Scoring the SDSCA resulted in eight subscale scores (general diet, fruit and vegetable consumption, high fat food consumption, additional diet requirements, medication adherence, glucose (blood sugar) monitoring, exercise, and foot care).

Finally, assessment dates were matched to create the sample for analysis. Patients were initially sorted based on the date the SDSCA was administered. Dates of assessment with matching dates for the GAD-7 and PHQ-9 were then selected. For example, if a patient had the SDSCA administered on the first of the month, that score was matched with an administration of the GAD-7 or PHQ-9 given within 14 days. Any patients without two matching scores (GAD-7 and SDSCA or PHQ-9 and SDSCA) were eliminated from the dataset. Before the import into SPSS, the author examined all variables to screen for outliers and missing data points.

Analysis required that patients have at least two visits with assessment scores for the GAD-7, PHQ-9, and SDSCA. To maximize the number of records available for analysis, records were split into two groups. One group included patients with at least two instances of both a GAD-7 and SDSCA score (Anxiety group) and the second group included patients with at least two instances of both a PHQ-9 and SDSCA score (Depression group).

To determine if the scores on the GAD-7 and SDSCA changed over time, the Friedman test (a non-parametric alternative to the Repeated Measures ANOVA) was run. To perform the Friedman test, records that included three matching assessment dates (SDSCA, PHQ-9, and GAD-7) were extracted from the two data sets (Anxiety group and Depression group). Before performing the bivariate analysis and multivariate analysis scores for the GAD-7, PHQ-9, and

eight subscales on the SDSCA were recoded into dichotomous values, improvement and no improvement.

### **Participant Characteristics**

Demographic information collected included age, current living arrangement, education level, ethnicity, gender, and marital status. Descriptive data were analyzed for the two groups included in the study, Anxiety group and Depression group. Gender (male and female), ethnicity (Caucasian and minority), living arrangement (alone and with family/friends), and marital status (single or married) were coded as dichotomous variables due to the limited variation in the answers provided. Education level (less than HS, diploma/GED, and college credit) was separated into three categories. Age comprised an interval variable representing the age of the patient at the time of the initial assessment performed by the program social worker or intern.

Information on sleep (0 = None, 1 = Some, and 2 = a lot) and pain (0 = None, 1 = Some, and 2 = a lot) from the Duke Health Profile were included in the study to determine if these variables impact outcomes.

#### **Anxiety group**

There were a total of 99 patients with two GAD-7/SDSCA pairs. There were 60 (60.6%) females and 39 (39.4%) males in the sample; 46 (46.5%) were Caucasian and 53 (53.52%) were minorities. Twenty-seven (27.3%) lived alone and 68 (68.7%) resided with family or friends. Sixty-three were single (63.6%) and 31 (31.3%) were married. Education levels within the sample included 27 (29.3%) without a high school diploma, 29 (29.3%) with a diploma or GED, and 36 (36.4%) with college credit. Age comprised an interval variable representing the age of the patient first recorded by the social worker or social work intern. The mean age was 52.37,

with a standard deviation of 10.09. The minimum age was 24 and the maximum age was 73.

Participant characteristics for this group are listed in Table 4.1.

Table 4.1  
*Demographic Information - Anxiety Group (n = 99)*

	N	%
Gender (n=99)		
Female	60	60.6
Male	39	39.4
Ethnicity (n=99)		
Minority	53	53.5
Caucasian	46	46.5
Living Arrangement (n=95)		
Alone	27	27.3
Family/Friends	68	68.7
Marital Status (n=94)		
Single	63	63.6
Married	31	31.3
Education Level (n=92)		
Less than HS	27	27.3
Diploma/GED	29	29.3
College Credit	36	36.4

### **Depression group**

There were a total of 114 patients with two PHQ-9/SDSCA pairs. There were 72 (63.2%) females and 42 (36.8%) males in the sample; 56 (49.1%) were Caucasian and 57 (50.0%) were minorities. Twenty-eight (24.6%) lived alone and 81 (71.1%) resided with family or friends. Seventy-two were single (63.2%) and 37 (32.5%) were married. Education levels within the sample included 31 (27.2%) without a high school diploma, 42 (36.8%) with a diploma or GED, and 32 (28.1%) with college credit. Age comprised an interval variable representing the age of the patient first recorded by the social worker or social work intern. The mean age was 52.27, with a standard deviation of 10.48. The minimum age was 22 and the maximum age was 73. Participant characteristics for this group are listed in Table 4.2.

Table 4.2

*Demographic Information – Depression Group (n = 114)*

	N	%
Gender (n=114)		
Female	72	63.2
Male	42	36.8
Ethnicity (n=113)		
Minority	57	50.0
Caucasian	56	49.1
Living Arrangement (n=109)		
Alone	28	24.6
Family/Friends	81	71.1
Marital Status (n=109)		
Single	72	63.2
Married	37	32.5
Education Level (n=105)		
Less than HS	31	27.2
Diploma/GED	42	36.8
College Credit	32	28.1

**Research Question 1**

When levels of anxiety and depression change in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting, do levels of self-care activities change?

**H<sub>1</sub>:** When anxiety and depression improves, self-care behaviors in individuals with type 2 diabetes mellitus will improve.

To determine if there were significant changes in scores among the variables of interest and if there was a time effect, the Friedman test was run to determine if there were any statistically significant differences between the distribution of scores across the three administrations of the GAD-7 and SDSCA. There were a total of 51 patient records with three administrations of the GAD-7 and the SDSCA. GAD-7 scores ranged from 0 to 21 at the first

administration, 0 to 21 at the second administration, and 0 to 20 at the third administration. The mean score for the first administration was 6.26 with a standard deviation of 5.68. The mean score for the second administration was 4.96 with a standard deviation of 6.24. For the third administration the mean score was 4.96 with a standard deviation of 5.649. Patients averaged a slight improvement in anxiety overall ( $M=1.30$ ,  $SD=5.46$ ).

The SDSCA does not provide a composite score. Instead, it is comprised of 25 questions that create eight subscales designed to measure specific aspects of behaviors. Seventeen questions ask about self-care, the remaining eight refer to care team recommendations or smoking and were not used in this study. Possible scores range from 0 to 7, with higher scores indicating more positive behaviors. Only the items asking about self-care behaviors were included in this analysis. The integrated health program did not assess smoking behaviors as the clinics had a separate program to address that behavior. Questions about care team recommendations were not included in the database.

All of the scores showed improvement from the first administration to the third administration. However, only General Diet scores ( $p = .017$ ), Glucose testing ( $p = .006$ ), and Foot Care ( $p = .010$ ) had a statistically significant result. Results of the Friedman test can be found in Table 4.3.

Table 4.3

*Friedman Test for Anxiety group (n=51)*

Variable	<i>t</i> <sub>1</sub> Mean(SD), Median	<i>t</i> <sub>2</sub> Mean(SD), Median	<i>t</i> <sub>3</sub> Mean(SD), Median	Friedman Test statistic ( <i>p</i> )
Anxiety	6.26 (5.68), 4.50	4.96 (6.23), 2.00	4.96 (5.65), 3.00	.306
General Diet Score *	3.46 (2.46), 4.00	4.43 (2.48), 5.00	4.66 (2.20), 5.00	.017
Fruit/ Veg Consump	3.69 (3.06), 4.00	3.71 (2.89), 5.00	4.32 (2.61), 5.00	.084
High fat Consump	4.08 (2.62), 5.00	4.76 (2.16), 5.00	4.45 (2.33), 5.00	.470
Additional Diet	3.37 (3.28), 3.00	3.63 (3.01), 3.00	4.35 (2.96), 6.00	.229
Medication Adherence	6.34 (1.61), 7.00	6.41 (1.68), 7.00	6.62 (1.19), 7.00	.874
Glucose Testing **	4.48 (2.88), 6.25	5.66 (2.33), 7.00	5.31 (2.24), 7.00	.006
Exercise	3.02 (2.41), 3.00	3.54 (2.11), 3.50	3.50 (2.46), 3.50	.400
Foot Care**	5.35 (1.95), 6.10	6.01 (1.38), 6.80	6.26 (1.12), 7.00	.010

\**p*<.05, \*\**p*<.01

There were a total of 61 patient records with three administrations of the PHQ-9 and the SDSCA. PHQ-9 scores ranged from 0 to 27 at the first administration, 0 to 26 at the second administration, and 0 to 22 at the third administration. The mean score for the first administration was 8.44 with a standard deviation of 6.95. The mean score for the second administration was 6.05 with a standard deviation of 6.65. For the third administration the mean score was 5.15 with a standard deviation of 6.11. Patients scores on the PHQ-9 improved overall (*M*=3.30, *SD*=4.88).

The Friedman test showed score improvement from the first administration to the third administration of the PHQ-9. Only two subscale scores failed to show statistical significance: fruit/vegetable consumption (*p*=.084) and high fat food consumption (*p*=.995). Results of the Friedman test for the sample can be found in table 4.4.

Table 4.4

*Friedman Test for Depression group (n = 61)*

Variable	<i>t</i> <sub>1</sub> Mean(SD), Median	<i>t</i> <sub>2</sub> Mean(SD), Median	<i>t</i> <sub>3</sub> Mean(SD), Median	Friedman Test statistic ( <i>p</i> )
Depression***	8.44 (6.95), 6.00	6.05 (6.65), 4.00	5.15 (6.11), 3.00	< .001
Gen Diet Score**	3.41 (2.41), 3.50	4.57 (2.46), 5.00	4.70 (2.14), 5.00	.001
Fruit/ Veg Consump.	3.28 (3.03), 3.00	3.33 (2.92), 3.00	3.87 (2.75), 4.00	.084
High fat Consump.	4.38 (2.43), 5.00	4.56 (2.22), 5.00	4.44 (2.27), 5.00	.995
Specific Diet*	3.21 (3.28), 2.00	3.97 (3.02), 5.00	4.52 (2.84), 6.00	.023
Med Adherence*	5.98 (2.05), 7.00	6.49 (1.55), 7.00	6.62 (1.38), 7.00	.026
Glucose Testing*	4.66 (2.79), 6.50	5.48 (2.49), 7.00	5.53 (2.21), 7.00	.011
Exercise*	3.03 (2.31), 3.50	3.80 (2.17), 3.50	3.52 (2.43), 3.50	.036
Foot Care***	5.12 (1.98), 5.60	6.03 (1.36), 6.80	6.22 (1.14), 7.00	< .001

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

A Chi-Square test of independence was run to determine if correlations existed between anxiety and self-care and depression and self-care. All expected cell frequencies were greater than five. The only statistically significant association between improvement in mood (anxiety and depression) and improvement in the subscale scores on the SDSCA was found between anxiety and an improvement in general diet scores ( $\chi^2(1) = 5.076, p = .024$ ). The association was small,  $\phi = 0.226, p = .024$  (Cohen, 1988). Results of the Chi-Square tests for these variables are shown in Table 4.5.

Table 4.5

*Chi-Square Results Anxiety and Depression vs. SDSCA*

<b>ANXIETY</b>							
SDSCA Subscale		No					
Item	N	Improvement	Improvement	X2	df	P value	
General Diet*	99	20	35	5.076	1	0.024	
Fruit Improve	99	18	25	2.168	1	0.141	
High Fat Improve	97	19	19	0.327	1	0.567	
Addl Diet	99	19	23	0.044	1	0.834	
Med	96	10	8	0.670	1	0.413	
Glucose	96	20	23	0.004	1	0.949	
Exercise	97	19	30	2.310	1	0.129	
Foot	97	23	30	0.422	1	0.516	
<b>DEPRESSION</b>							
SDSCA Subscale		No					
Item	N	Improvement	Improvement	X2	df	P value	
General Diet	114	22	43	0.583	1	0.445	
Fruit Improve	114	14	26	0.090	1	0.764	
High fat Improve	112	18	31	0.156	1	0.693	
Addl Diet	113	16	29	0.083	1	0.773	
Med	112	9	18	0.010	1	0.918	
Glucose	110	18	27	0.107	1	0.744	
Exercise	113	12	36	0.316	1	0.574	
Foot	112	23	41	0.028	1	0.865	

\*p&lt;.05.

**Research Question 2**

Are there other variables such as pain, sleep difficulty, age, gender, ethnicity, marital status, current living arrangement, and education that influence levels of self-care activity change in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting?

**H2:** Other factors besides mood are associated with an improvement in self-care behaviors in type 2 diabetic patients.

### **Anxiety group**

A point-biserial correlation was run between all outcome variables on the SDSCA (general diet, fruit and vegetable consumption, high fat food consumption, specific diet, medication adherence, glucose (blood sugar) monitoring, exercise, and foot care), and age to determine if correlations existed. The existence of outliers was assessed by boxplot; normality was assessed by Shapiro-Wilk's test ( $p > .05$ ); and homogeneity of variances was assessed by Levene's test for equality of variances. When any of the assumptions were violated, transformations were performed. When outliers were present, tests were run with and without the outliers to determine if differences in significance existed. One subscale correlation, specific diet, could not be transformed. When age could not be transformed, it was recoded as an ordinal variable, and the Cochran-Armitage Test of Trend was run. The Cochran-Armitage test of trend did not show a statistically significant linear trend between age and improvements in specific diet scores ( $p = .826$ ). The only significant correlation identified was a moderate one, between age and improvements in general diet,  $r_{pb(99)} = .226$ ,  $p = .025$ , with younger individuals more likely to improve general diet than older,  $M = 54.91$  ( $SD = 8.99$ ) vs.  $M = 50.35$  ( $SD = 10.55$ ). Age accounted for 5.1% of the variability in improvement in general diet scores. The significance of the correlation was further supported by the results of The Cochran Armitage Test of Trend ( $p = .023$ ).

Bivariate associations for the ordinal level variables (education, pain levels, and sleep difficulty) for each of the eight subscale scores are shown in Table 4.6. The Cochran Armitage Test of Trend revealed that no statistically significant ( $p > .05$ ) linear relationship existed between level of education and pain and improvement in any of the eight subscale scores. Sleep difficulty related to an improvement in fruit/vegetable consumption only. The Cochran-Armitage

test of trend showed a statistically significant linear trend,  $p = .025$ , with more sleep difficulty associated with a higher proportion of patients improving their intake of fruit and vegetables. All other subscale scores (general diet, high fat food consumption, additional diet change, medication adherence, glucose testing, exercise performance, and foot care) revealed no statistically significant ( $p > .05$ ) linear relationship with sleep difficulty among the sample with two GAD-7 scores.

Table 4.6

*Anxiety Group*

		Level of Measurement					
EDUCATION		Less than H.S.	Diploma/GED	College Cred.			
SDSCA							
Subscale Item	N	n(%)	n(%)	n(%)	Score	df	P value
General Diet	92	14 (51.9)	24 (66.7)	14(48.3)	0.093	1	0.760
Fruit/Veg	92	11 (40.7.3)	16 (44.4)	9 (31.0)	0.581	1	0.446
High fat	90	10 (37.0)	13 (37.1)	13 (46.4)	0.512	1	0.474
Specific Diet	92	12 (44.4)	16 (44.4)	10 (34.5)	0.589	1	0.443
Med	89	4 (15.4)	6 (17.1)	6 (21.4)	0.338	1	0.561
Glucose	90	11 (40.7)	17 (48.6)	12 (42.9)	0.230	1	0.880
Exercise	90	10 (37.0)	20 (57.1)	13 (46.4)	0.464	1	0.496
Foot	90	11 (42.3)	20 (57.1)	18 (62.1)	2.115	1	0.146
PAIN		A lot	Some	None			
SDSCA							
Subscale Item	N	n(%)	n(%)	n(%)	Score	df	P value
General Diet	89	27 (62.8)	13 (38.2)	8 (66.7)	0.474	1	0.491
Fruit/Veg	89	16 (37.2)	12 (35.3)	6 (50.0)	0.325	1	0.568
High fat	89	16 (37.24)	13(38.2)	5 (41.7)	0.068	1	0.794
Specific Diet	89	17 (39.5)	13 (38.2)	6(50.0)	0.223	1	0.637
Med	86	10 (23.8)	5 (15.2)	1(9.1)	1.650	1	0.199
Glucose	86	19 (46.3)	18 (54.5)	3 (25.0)	0.587	1	0.444
Exercise	87	17 (41.5)	23(67.6)	4(33.3)	0.256	1	0.613
Foot	88	25 (58.1)	14(42.4)	9(75)	0.076	1	0.783

## SLEEP DIFFICULTY

SDSCA		A lot	Some	None	Score	df	P value
Subscale Item	N	n(%)	n(%)	n(%)			
General Diet	89	19(61.3)	11(50.0)	18(50)	0.824	1	0.364
Fruit/Veg*	89	16(51.6)	9(40.9)	9(25.0)	5.040	1	<b>0.025</b>
High fat	89	13(41.9)	7(31.8)	14(38.9)	0.053	1	0.819
Specific Diet	89	15(48.4)	7(31.8)	14(38.9)	0.568	1	0.451
Med	86	7(22.6)	2(9.1)	7(21.2)	0.014	1	0.905
Glucose	86	14(46.7)	11(50.0)	15(44.1)	0.047	1	0.829
Exercise	87	14(46.7)	9(42.9)	21(58.3)	0.959	1	0.327
Foot	88	15(48.4)	18(72.7)	17(48.6)	0.002	1	0.964

\*p<.05.

A chi-square test of independence was run to determine if an association existed between the dichotomous variables of ethnicity, gender, living arrangement, and marital status, and the eight self-care subscale scores for patients with two GAD-7/SDSCA pairs. All expected cell frequencies were greater than five. There was a statistically significant association between ethnicity and foot care ( $\chi^2(1) = 5.74$ ,  $p = .017$ ), marital status and specific diet improvements ( $\chi^2(1) = 3.990$ ,  $p = .046$ ), and marital status and improved medication adherence ( $\chi^2(1) = 8.74$ ,  $p = .003$ ). There was a small association (Cohen, 1988) between marital status and specific diet improvements ( $\phi = 0.216$ ), between ethnicity and foot care ( $\phi = 0.243$ ), and between marital status and improved medication adherence ( $\phi = 0.310$ ).

Table 4.7

*Patients with 2 GAD-7/SDSCA pairs*

		<b>Level of Measurement</b>					
<b>ETHNICITY</b>							
SDSCA		Minority	Caucasian				
Subscale Item	N	n(%)	n(%)	X <sup>2</sup>	df	P value	
General Diet	99	27 (50.9)	28 (60.9)	0.983	1	0.322	
Fruit/Veg	99	21 (39.6)	19 (41.3)	0.029	1	0.865	
High fat	97	18 (34.6)	20 (44.4)	0.978	1	0.323	
Specific Diet	99	24 (45.3)	18 (39.1)	0.382	1	0.537	
Med	96	8 (15.7)	10 (22.2)	0.670	1	0.413	
Glucose	96	26 (49.1)	17 (39.5)	0.870	1	0.351	
Exercise	97	24 (45.3)	25 (56.8)	1.280	1	0.258	
Foot*	97	22 (43.1)	31 (67.4)	5.740	1	0.017	
<b>GENDER</b>							
SDSCA		Male	Female				
Subscale Item	N	n(%)	n(%)	X <sup>2</sup>	df	P value	
General Diet	99	23(59.0)	32(53.3)	0.305	1	0.581	
Fruit/Veg	99	19(48.7)	21(35.0)	1.847	1	0.174	
High fat	97	14 (37.8)	24 (40.0)	0.045	1	0.832	
Specific Diet	99	15 (38.5)	27 (45.0)	0.414	1	0.520	
Med	96	9 (23.1)	9 (15.8)	0.807	1	0.369	
Glucose	96	16 (43.2)	27 (45.8)	0.058	1	0.809	
Exercise	97	16 (42.1)	33 (55.9)	1.768	1	0.184	
Foot	97	22 (56.4)	31 (53.4)	0.083	1	0.774	
<b>LIVING ARRANGEMENT</b>							
SDSCA		Alone	Family/Friends				
Subscale Item	N	n(%)	n(%)	X <sup>2</sup>	df	P value	
General Diet	95	13 (48.1)	39 (57.4)	0.661	1	0.416	
Fruit/Veg	95	9 (24.3)	28 (41.2)	0.500	1	0.480	
High fat	93	11 (42.3)	26 (38.8)	0.096	1	0.757	
Specific Diet	95	7 (25.9)	32 (47.1)	3.567	1	0.059	
Med	92	2 (7.7)	15 (22.7)	2.799	1	0.094	
Glucose	93	13 (50.0)	29 (43.3)	0.341	1	0.559	
Exercise	93	15 (57.7)	31 (46.3)	0.978	1	0.323	
Foot	93	16 (59.3)	35 (53.0)	0.300	1	0.584	

## MARITAL STATUS

SDSCA Subscale Item	N	Single n(%)	Married n(%)	X <sup>2</sup>	df	P value
General Diet	94	31 (49.2)	21 (67.7)	2.888	1	0.089
Fruit/Veg	94	23 (36.5)	15 (48.4)	1.217	1	0.270
High fat	92	25 (40.3)	11 (36.7)	0.113	1	0.736
Specific Diet*	94	21 (33.3)	17 (54.8)	3.990	1	0.046
Med**	91	6 (10.0)	11 (35.5)	8.738	1	0.003
Glucose	92	26 (42.6)	16 (51.6)	0.670	1	0.413
Exercise	92	31 (50.0)	14 (46.7)	0.090	1	0.764
Foot	92	34 (54.8)	15 (50.0)	0.190	1	0.663

\*p<.05, \*\*p<.01.

### Depression Group

A point-biserial correlation was run between all outcome variables on the SDSCA (general diet, fruit and vegetable consumption, high fat food consumption, specific diet, medication adherence, glucose [blood sugar] monitoring, exercise, and foot care) and age. The existence of outliers was assessed by boxplot; normality was assessed by Shapiro-Wilk's test ( $p > .05$ ); and homogeneity of variances was assessed by Levene's test for equality of variances. When any of the assumptions were violated, transformations were performed. When outliers were present, tests were run with and without the outliers to determine if differences in significance existed. There were no significant correlations identified between all outcome variables on the SDSCA (general diet, fruit and vegetable consumption, high fat food consumption, specific diet, medication adherence, glucose [blood sugar] monitoring, exercise, and foot care) and age for the data set containing patients with two PHQ-9/SDSCA scores.

Bivariate associations for the ordinal level variables (education, pain levels, and sleep difficulty) for each of the eight subscale scores are shown in Table 4.8. As with the previous sample, the Cochran Armitage Test of Trend revealed that no statistically significant ( $p > .05$ ) linear relationship exists between the level of education and pain and improvement in any of the

eight subscale scores. Similar to the previous sample, the Cochran-Armitage test of trend showed a statistically significant linear trend,  $p = .032$ , with more sleep difficulty associated with a higher proportion of patients improving their intake of fruit and vegetables. All other subscale scores (general diet, high fat food consumption, additional diet change, medication adherence, glucose testing, exercise performance, and foot care) revealed no statistically significant ( $p > .05$ ) linear relationship to sleep difficulty among the sample with two PHQ- 9 scores.

Table 4.8

*Patients with 2 PHQ-9/SDSCA Pairs*

EDUCATION		Level of Measurement			Score	df	P value
		Less than H.S.	Diploma/G ED	College Cred.			
SDSCA Subscale Item	N	n(%)	n(%)	n(%)			
General Diet	105	17 (54.8)	27 (64.3)	17 (53.1)	0.022	1	0.882
Fruit/Veg	105	10 (32.3)	17 (40.5)	10 (31.3)	0.009	1	0.926
High fat	103	10 (32.3)	22 (53.7)	14 (45.2)	1.044	1	0.307
Specific Diet	104	12 (38.7)	17 (41.5)	11 (34.4)	0.129	1	0.720
Med	103	5 (16.1)	7 (17.1)	10 (32.3)	2.401	1	0.121
Glucose	103	10 (32.3)	19 (46.3)	12 (38.7)	0.269	1	0.604
Exercise	104	12 (38.7)	23 (54.8)	13 (41.9)	0.065	1	0.799
Foot	104	17 (54.8)	23 (56.1)	20 (62.5)	0.382	1	0.537
PAIN		A lot	Some	None			
SDSCA Subscale Item	N	n(%)	n(%)	n(%)	Score	df	P value
General Diet	100	28 (68.2)	15 (37.5)	11 (73.3)	0.051	1	0.822
Fruit/Veg	100	14 (31.1)	14 (35.0)	6 (40.0)	0.423	1	0.515
High fat	100	20 (44.4)	16 (40.0)	6 (40.0)	0.158	1	0.691
Specific Diet	99	17 (37.8)	13 (33.3)	8 (53.3)	0.525	1	0.469
Med	98	11 (25.0)	18 (20.0)	2 (14.3)	0.804	1	0.370
Glucose	96	19 (44.2)	20 (51.3)	4 (28.6)	0.339	1	0.561
Exercise	99	21 (47.7)	20 (50.0)	7 (46.7)	0.000	1	0.986
Foot	99	25 (55.6)	21 (52.5)	10 (71.4)	0.531	1	0.466

## SLEEP DIFFICULTY

SDSCA		A lot	Some	None	Score	df	P value
Subscale Item	N	n(%)	n(%)	n(%)			
General Diet	100	22 (66.7)	12 (46.2)	20 (48.8)	2.192	1	0.139
Fruit/Veg*	100	14 (42.4)	12 (46.2)	8 (19.5)	4.619	1	0.032
High fat	100	16 (48.5)	10 (38.5)	16 (39.0)	0.632	1	0.427
Specific Diet	99	15 (45.5)	9 (34.6)	14 (35.0)	0.793	1	0.373
Med	98	8 (24.2)	3 (11.5)	10 (25.6)	0.042	1	0.837
Glucose	96	15 (46.9)	11 (42.3)	17 (44.7)	0.027	1	0.868
Exercise	99	15 (46.9)	9 (34.6)	24 (58.5)	1.192	1	0.275
Foot	99	16 (48.5)	18 (69.2)	22 (55.0)	0.234	1	0.629

\*p<.05.

A chi-square test of independence was run to determine if an association existed between the dichotomous variables of ethnicity, gender, living arrangement, and marital status, and the eight self-care subscale scores. All expected cell frequencies were greater than five. There was a statistically significant association between ethnicity and exercise improvement ( $\chi^2(1) = 5.13, p = .024$ ), living arrangements and specific diet improvements ( $\chi^2(1) = 4.85, p = .028$ ), marital status and improved medication adherence ( $\chi^2(1) = 8.95, p = .003$ ). There were small associations (Cohen, 1988) between ethnicity and exercise improvement ( $\phi = 0.214$ ), living arrangements and specific diet improvements ( $\phi = 0.212$ ), and a moderate association (Cohen, 1988) between marital status and improved medication adherence ( $\phi = 0.289$ ).

Table 4.9

*Patients with 2 PHQ-9/SDSCA pairs*

		<b>Level of Measurement</b>					
<b>ETHNICITY</b>							
	SDSCA		Minority	Caucasian			
	Subscale Item	N	n(%)	n(%)	X <sup>2</sup>	df	P value
	General Diet	113	30 (52.6)	34 (60.7)	0.751	1	0.386
	Fruit/Veg	113	20 (35.1)	20 (19.8)	0.005	1	0.944
	High fat	111	22 (39.3)	26 (47.3)	0.721	1	0.396
	Specific Diet	112	23 (41.1)	22 (39.3)	0.037	1	0.847
	Med	111	10 (17.9)	14 (25.5)	0.945	1	0.331
	Glucose	109	26 (45.6)	19 (36.5)	0.924	1	0.336
	Exercise*	112	22 (38.6)	33 (60.0)	5.131	1	0.024
	Foot	111	28 (50.0)	36 (65.5)	2.715	1	0.099
<b>GENDER</b>							
	SDSCA		Male	Female			
	Subscale Item	N	n(%)	n(%)	X <sup>2</sup>	df	P value
	General Diet	114	27 (64.3)	38 (52.8)	1.433	1	0.231
	Fruit/Veg	114	19 (45.2)	21 (29.2)	3.008	1	0.083
	High fat	112	16 (40.0)	32 (44.4)	0.207	1	0.649
	Specific Diet	113	17 (40.5)	28 (39.4)	0.012	1	0.913
	Med	112	12 (28.6)	12 (17.1)	2.036	1	0.154
	Glucose	110	16 (40.0)	29 (41.4)	0.021	1	0.883
	Exercise	113	20 (47.6)	35 (49.3)	0.030	1	0.863
	Foot	112	23 (54.8)	41 (58.6)	0.156	1	0.693
<b>LIVING ARRANGEMENT</b>							
	SDSCA		Alone	Family/Friends			
	Subscale Item	N	n(%)	n(%)	X <sup>2</sup>	df	P value
	General Diet	109	15 (53.6)	47 (58.0)	0.168	1	0.682
	Fruit/Veg	109	8 (28.6)	30 (37.0)	0.657	1	0.418
	High fat	107	9 (33.3)	37 (34.4)	1.374	1	0.241
	Specific Diet	108	6 (21.4)	36 (45.0)	4.849	1	0.028
	Med	107	3 (11.1)	20 (25.0)	2.308	1	0.129
	Glucose	106	11 (40.7)	32 (40.5)	0.000	1	0.983
	Exercise	108	15 (53.6)	37 (46.3)	0.445	1	0.505
	Foot	107	18 (64.3)	43 (54.4)	0.819	1	0.365

## MARITAL STATUS

SDSCA		Single	Married	X <sup>2</sup>	df	P value
Subscale Item	N	n(%)	n(%)			
General Diet	109	38 (52.8)	24 (64.9)	1.456	1	0.228
Fruit/Veg	109	24 (33.3)	14 (37.8)	0.218	1	0.640
High fat	107	29 (40.8)	17 (47.2)	0.396	1	0.529
Specific Diet	108	23 (32.4)	18 (48.6)	2.729	1	0.099
Med**	107	9 (12.9)	14 (37.8)	8.951	1	0.003
Glucose	106	24 (34.8)	20 (54.1)	3.684	1	0.055
Exercise	108	34 (47.9)	17 (45.9)	0.037	1	0.848
Foot	107	41 (57.7)	19 (52.8)	0.239	1	0.625

\*p<.05, \*\*p<.01.

### Research Question 3

Do changes in levels of anxiety, depression or other factors serve as better predictors of self-care behavior change in patients with type 2 diabetes mellitus in individuals receiving DSME-based psychoeducation and support services from a social worker in a primary care setting?

**H<sub>3</sub>:** Individuals with type 2 diabetes mellitus who experience improvement in anxiety and depression will demonstrate increased frequency of self-care behaviors.

To determine which variables could serve as predictors, a series of binomial logistic regressions were performed to ascertain the effects of age, improvement in anxiety, improvement in depression, ethnicity, gender, living arrangement, marital status, pain levels, and sleep difficulty on the likelihood that patients will experience an improvement in self-care activities as measured by the eight subscales of the SDSCA. The author began by running all potential variables against each of the eight SDSCA subscale variables. None of these models produced a significant result. To develop a model the author employed a stepwise selection process as described by Bursac et al. (2008). Based on the correlation coefficients generated from the previous analysis, variables were added to the model one at a time based on p-value. Lowest (more significant) p-values were added first. After each addition, a logistic regression was run.

Variables were entered into and removed from the model. Each addition (forward) could result in either an elimination (backward) of the newly added or a previously added variable. The stepwise selection process was ended when there was no longer a significant effect to be obtained. This method creates a model by entering and removing predictors based solely on a level of statistical criteria (Tabachnick & Fidell, 2001; Hosmer & Lemeshow, 1989).

When the model included a continuous variable (age), linearity with respect to the logit of the dependent variable was assessed via the Box-Tidwell procedure. This was accomplished by applying a Bonferroni correction using all terms in the model and calculating the significance level by dividing .05 (minimally acceptable p-value) by the number of terms in the model. The resulting value was used to determine the new level at which statistical significance was accepted (Tabachnick & Fidell, 2001). Ordinal variables (sleep difficulty, pain presence, and education) were recoded into dichotomous values. Sleep Difficulty and Pain Presence were recoded as yes vs. no. Education was recoded in no diploma vs. diploma/GED/ college credit.

### **Anxiety group**

For the patients with two GAD-7/SDSCA pairs, there were only four of the SDSCA subscale variables that were able to be fitted to a significant model. The logistic regression model for a change in general diet scores was statistically significant,  $\chi^2(5) = 11.54$ ,  $p < .05$ . There was one case that had standardized residual with a value over 2.5 standard deviations, which was removed, resulting in an improvement in the model,  $\chi^2(5) = 14.42$ ,  $p < .05$ . The adjusted model explained 19.4% (Nagelkerke  $R^2$ ) of the variance in the dependent variable and correctly classified 66.30% of cases. The Hosmer and Lemeshow Goodness-of-Fit statistic ( $H-L > .05$ ) revealed a good model fit as well (Tabachnick & Fidell, 2001). Of the five predictor variables, two were statistically significant, improvement in anxiety and marital status (as shown in Table

4.10). Individuals who experienced an improvement in anxiety were 3.8 times more likely to improve general diet scores than those who did not experience improvement in anxiety. Married individuals were 3.3 times more likely to show an improvement in general diet scores than those who were single.

Table 4.10

*Logistic Regression Predicting an Improvement in General Diet based on Improvement in Anxiety, Ethnicity, Gender, Living Arrangement, and Marital Status.*

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>Odds Ratio</i>	<i>95% C.I. for Odds Ratio</i>	
							<i>Lower</i>	<i>Upper</i>
Improved Anxiety**	1.338	0.483	7.662	1	0.006	3.812	1.478	9.830
Ethnicity	.445	.473	.883	1	.347	1.560	.617	3.943
Gender	-.699	.490	2.032	1	.154	.497	.190	1.300
Living Arrangement	-.053	.534	.010	1	.921	.948	.333	2.698
Marital Status*	1.202	.552	4.730	1	.030	3.325	1.126	9.819

\* $p < .05$ , \*\* $p < .01$ .

The logistic regression model for improvement in fruit and vegetable scores was statistically significant,  $\chi^2(3) = 8.61$ ,  $p < .05$ . The model explained 12.5% (Nagelkerke  $R^2$ ) of the variance in the dependent variable and correctly classified 68.5% of cases. The Hosmer and Lemeshow Goodness-of-Fit statistic ( $H-L > .05$ ) revealed a good model fit as well (Tabachnick & Fidell, 2001). Of the three predictor variables only one, sleep difficulty, was statistically significant (as shown in Table 4.11). Surprisingly, the results reveal an unexpected relationship between sleep difficulty and improvements in fruit and vegetable intake. Individuals with sleep difficulty are 2.82 times more likely to improve their intake of fruit and vegetables than those without sleep difficulty.

Table 4.11

*Logistic Regression Predicting an Improvement in Fruit and Vegetable Scores based on Improvement Gender, Pain, and Sleep Difficulty.*

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	Odds Ratio	95% C.I.for Odds Ratio	
							Lower	Upper
Gender	-0.788	0.472	2.794	1	0.095	0.455	0.180	1.146
Pain Presence	-0.482	0.682	0.500	1	0.479	0.618	0.162	2.349
Sleep difficulty*	1.036	0.488	4.504	1	0.034	2.818	1.082	7.335

\*p<.05.

The logistic regression model for improvement in medication adherence scores was statistically significant,  $\chi^2(4) = 11.706$ ,  $p < .05$ . There was one case with a standardized residual with a value over 2.5 standard deviations, which was removed, resulting in an improvement in the model,  $\chi^2(4) = 16.85$ ,  $p < .05$ . The adjusted model explained 31.4% (Nagelkerke  $R^2$ ) of the variance in the dependent variable and correctly classified 81.3% of cases. The Hosmer and Lemeshow Goodness-of-Fit statistic ( $H-L > .05$ ) revealed a good model fit as well (Tabachnick & Fidell, 2001).

Of the four predictor variables, only one was statistically significant, marital status (as shown in Table 4.12). Married individuals are 6.4 times more likely to show an improvement in medication adherence than those who are single.

Table 4.12

*Logistic Regression Predicting an Improvement in Medication Adherence based on Age, Living Arrangement, Marital Status, and Pain Presence.*

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	Odds Ratio	95% C.I.for Odds Ratio	
							Lower	Upper
Age	-0.028	0.033	0.730	1	0.393	0.972	0.912	1.037
Living Arrangement	0.330	0.919	0.129	1	0.719	1.392	0.230	8.429
Marital Status**	1.858	0.674	7.605	1	0.006	6.408	1.712	23.994
Pain Presence	0.865	1.187	0.531	1	0.466	2.374	0.232	24.305

\*\*p<.01.

The logistic regression model for improvement in foot care score was statistically significant,  $\chi^2(5) = 17.45$ ,  $p < .05$ . The model explained 25.6% (Nagelkerke  $R^2$ ) of the variance in the dependent variable and correctly classified 67.1% of cases. The Hosmer and Lemeshow Goodness-of-Fit statistic ( $H-L > .05$ ) revealed a good model fit as well (Tabachnick & Fidell, 2001). Of the five-predictor variables, only one was statistically significant, ethnicity (as shown in Table 4.13). Caucasians are 5.6 times more likely to show an improvement in foot care than minorities.

Table 4.13

*Logistic Regression Predicting an Improvement in Foot Care based on Age, Improvement in Anxiety, Ethnicity, Education Level, Living Arrangement, and Pain Presence.*

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	Odds Ratio	95% C.I. for Odds Ratio	
							Lower	Upper
Age	-0.046	0.030	2.422	1	0.120	0.955	0.901	1.012
Improvement in Anxiety	-0.083	0.506	0.027	1	0.870	0.921	0.342	2.483
Ethnicity**	1.716	0.542	10.012	1	0.002	5.562	1.921	16.099
Education Level	0.549	0.589	0.869	1	0.351	1.731	0.546	5.491
Living Arrangement	-0.892	0.613	2.116	1	0.146	0.410	0.123	1.363
Pain Presence	-1.614	0.830	3.783	1	0.052	.199	0.039	1.013

\*\* $p < .01$ .

### **Depression Group**

For the patients with two PHQ-9/SDSCA pairs, there were only three of the SDSCA subscale variables that were able to be fit to a significant model. The logistic regression model for improvement in fruit and vegetable consumption was statistically significant,  $\chi^2(6) = 16.260$ ,  $p < .05$ . There were three cases with standardized residuals with a value over 2.5 standard deviations, which was removed, resulting in an improvement in the model,  $\chi^2(6) = 24.43$ ,  $p < .001$ . The model explained 32.3% (Nagelkerke  $R^2$ ) of the variance in the dependent variable and correctly classified 72% of cases. The Hosmer and Lemeshow Goodness-of-Fit statistic ( $H-L >$

.05) revealed a good model fit as well (Tabachnick & Fidell, 2001). Of the six predictor variables, only two were statistically significant, amount of sleep difficulty and gender (as shown in Table 4.14). Males were 4.4 times more likely to exhibit an improvement in the consumption of fruits and vegetables than females. Individuals with more sleep difficulty were 8.9 times more likely to exhibit an improvement in the recommended fruit and vegetable consumption than those without less sleep difficulty.

Table 4.14

*Logistic Regression Predicting an Improvement in Fruit and Vegetable consumption based on Age, Improvement in Depression, Gender, Marital Status, Pain Presence, and Sleep Difficulty.*

	<i>B</i>	S.E.	<i>Wald</i>	<i>df</i>	<i>p</i>	Odds Ratio	95% C.I.for Odds Ratio	
							Lower	Upper
Age	.024	.028	.716	1	.397	1.024	.969	1.081
Improved Depression	.302	.566	.285	1	.593	1.353	.446	4.107
Gender**	1.481	.539	7.552	1	.006	4.395	1.529	12.635
Marital Status	.558	.563	.983	1	.321	1.747	.580	5.262
Pain Presence	-1.103	.838	1.734	1	.188	.332	.064	1.713
Sleep difficulty**	2.182	.683	10.202	1	.001	8.865	2.324	33.825

\*\*p<.01.

The logistic regression model for improvement in medication adherence was statistically significant,  $\chi^2(9) = 18.33$ ,  $p < .05$ . Four cases had standardized residuals with a value over 2.5 standard deviations, which were removed, resulting in an improvement in the model,  $\chi^2(9) = 29.07$ ,  $p < .01$ . The improved model explained 48.5% (Nagelkerke  $R^2$ ) of the variance in the dependent variable and correctly classified 90.6% of cases. The Hosmer and Lemeshow Goodness-of-Fit statistic ( $H-L > .05$ ) revealed a good model fit as well (Tabachnick & Fidell, 2001). Of the nine predictor variables, only two were statistically significant, marital status (as shown in Table 4.15) and age. Married individuals had 23 times higher odds to exhibit an

improvement in medication adherence than those who are single. For every year increase in age, the odds of improving medication adherence decreased by 8%.

Table 4.15

*Logistic Regression Predicting an Improvement in Medication Adherence based on Age, Education Level, Ethnicity, Gender, Improvement in Depression, Living Arrangement, Marital Status, Pain Presence, and Sleep Difficulty.*

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	<i>Odds Ratio</i>	<i>95% C.I. for Odds Ratio</i>	
							<i>Lower</i>	<i>Upper</i>
Age*	-.084	.039	4.507	1	.034	.920	.851	.994
Education Level	1.123	1.280	.770	1	.380	3.074	.250	37.760
Ethnicity	1.402	.879	2.548	1	.110	4.065	.726	22.744
Gender	-.271	.883	.094	1	.759	.763	.135	4.303
Improved Depression	-.480	.810	.351	1	.554	.619	.126	3.028
Living Arrangement	-.108	1.342	.006	1	.936	.898	.065	12.447
Marital Status**	3.121	.952	10.743	1	.001	22.659	3.506	146.429
Pain Presence	1.142	1.442	.627	1	.428	3.132	.186	52.840
Sleep Difficulty	-.523	.789	.439	1	.508	.593	.126	2.783

\* $p < .05$ , \*\* $p < .01$ .

The logistic regression model for an improvement in exercise was statistically significant,  $\chi^2(4) = 10.23$ ,  $p < .05$ . The model explained 12.4% (Nagelkerke  $R^2$ ) of the variance in the dependent variable and correctly classified 65.7% of cases. The Hosmer and Lemeshow Goodness-of-Fit statistic ( $H-L > .05$ ) revealed a good model fit as well (Tabachnick & Fidell, 2001). Of the four predictor variables, only one was statistically significant, ethnicity (as shown in Table 4.16). Caucasian patients were 3.3 times more likely to demonstrate an improvement in exercise than minorities.

Table 4.16

*Logistic Regression Predicting an Improvement in Exercise based on Ethnicity, Age, Living Arrangement, and Marital Status.*

	<i>B</i>	S.E.	<i>Wald</i>	<i>df</i>	<i>p</i>	Odds Ratio	95% C.I.for Odds Ratio	
							Lower	Upper
Age	-0.035	0.022	2.682	1	0.101	0.965	0.926	1.007
Ethnicity**	1.184	0.427	7.705	1	0.006	3.267	1.416	7.537
Living Arrangement	-0.656	0.545	1.446	1	0.229	0.519	0.178	1.512
Marital Status	0.285	0.481	0.350	1	0.554	1.330	0.518	3.414

\*\*p<.01

## DISCUSSION

This study assessed the impact of mood on the self-care activities of diabetic patients seen by social workers providing DSME-based psychoeducation and support. Descriptive statistics were analyzed to identify trends in the available data. The existence of correlations between mood and other potential predictor variables included in the available data was assessed. Once correlations were identified, an analysis was performed to determine significant predictors of self-care. This chapter provides a discussion of the results presented in Chapter 4. The chapter begins with a statement of the study's purpose and rationale. After primary study findings are summarized, implications for social work practice, policy and research will be discussed. The chapter concludes with a discussion on the strengths and limitations of this study and how this information contributes to the overall knowledge base on the role of mood in the self-care activities of diabetic patients.

The current study is the first available longitudinal study to evaluate the role of mood in specific self-care activities of diabetic patients receiving services from a DSME-based psychoeducation and support program in a primary care setting. While there are numerous investigations that identify a relationship between depression and self-care, none have used a pre-test/post-test analysis and few have assessed how self-care behaviors relate to anxiety and depression separately (Adam & Folds, 2014; Browne, Nefs, Pouwer, & Speight, 2014; Devarajoo & Chinna, 2017; Egede & Osborn, 2010; Gaitonde & Shaya, 2016; Kav, Yilmaz, Bulut, & Dogan, 2017; Mut-Vitcu, Timar, Timar, Oancea, & Citu, 2016; Walker et al., 2012). To

address the gaps in the literature, this study sought to determine whether changes in anxiety and depression directly influence change in self-care behaviors. The following specific behaviors were included in the analysis: improvement in general diet, increase in fruit consumption, a decrease in high-fat food consumption, improvement in specific dietary requirements, improvement in glucose testing, improvement in medication adherence, improvement in exercise, and improvement in foot care. The current study also assessed whether other variables (demographics, pain presence, sleep difficulty) influenced changes in the self-care variables of interest.

The author used data from a clinical database created for use in an integrated health program for all analyses. Since the program protocol is only suggestive, meaning that the schedule of assessments and interventions is very flexible, it was difficult to obtain a sample of patients with depression, anxiety, and self-care scores all provided within the same time period. For this reason, the dataset was split into patients with matched anxiety and self-care assessments (GAD-7/SDSCA) and patients with matched depression and self-care assessments (PHQ-9/SDSCA).

## **Findings Summary**

### **Relationships between mood and self-care behaviors**

The primary aim of this study was to determine if there was a relationship between anxiety and depression and self-care behaviors. Due to the non-normal distribution of the dataset, non-parametric tests (Chi-Square) were run to determine if correlations existed between improvement in anxiety and improvement in self-care behaviors and improvement in depression and improvement in self-care behaviors. Both anxiety and depression scores were examined in terms of their relationship with each of the eight behaviors measured by the Summary of

Diabetes Self Care Activities (SDSCA); Improvement in General Diet, Improvement in Fruit and Vegetable Intake; Improvement in High Fat food Intake, Improvement in Specific Diet, Improvement in Medication Adherence, Improvement in Glucose Testing, Improvement in Exercise, and Improvement in Foot Care. Analyses revealed the only significant correlation between mood and self-care behaviors existed between improvement in anxiety and improvement in general diet scores. However, the Chi-Square Test of Independence revealed the association between general diet and anxiety was small ( $\phi = .226$ ).

No correlations existed between anxiety and the other self-care behaviors. Considering the comorbidity of anxiety and T2DM (Smith et al., 2013), the author anticipated that other behaviors would be impacted. There are few investigations into the role of anxiety in self-care behaviors in patients with T2DM, so it is difficult to determine if the results of this study are specific to this population or more global. One explanation may be found in studies correlating poor health to anxiety as a one-way relationship; individuals with poor health are more likely to report anxiety symptoms (Strine, et al., 2005; Wu, Parkerson, & Doraiswamy, 2002). These studies suggest that poor health is a predecessor to anxiety. Anxiety adds to the disease burden of patients with T2DM but does not have a strong influence on self-care behaviors. One argument could be used to support the lack of a correlation. Kőszegi (2003) posits that patients make decisions based on fear about the future, leading to the avoidance of situations that induce anxiety or fear. Fear and anxiety could lead patients to perform self-care behaviors to avoid failure.

The lack of statistical significance in relation to depression found in the current study is surprising given that findings from several studies have supported the impact of depression on self-care behaviors among individuals with T2DM (Alavi, Molavi, & Eslami, 2018;

Ciechanowski, Katon, Russo, & Hirsch, 2003; Lin et al., 2004; Mut-Vitcu, Timar, Timar, Oancea, & Citu, 2016). A recent study (Alavi, Molavi, & Eslami, 2018) found a clear connection between both anxiety and depression in the self-care activities of elderly adults with diabetes. Findings were similar in a 2008 meta-analysis that evaluated evidence found in 47 different published studies (Gonzales et al.). Findings from these studies suggest that the relationship between depression and self-care is prevalent in the diabetic population and should be seen in this sample. The lack of a significant finding warrants further investigation with this population of patients with diabetes.

To determine if mood could serve as a predictor of self-care behaviors, the author performed a series of logistic regressions that included demographic, sleep, pain, and mood variables. The model predicting an improvement in general diet scores was the only one to include mood (anxiety) as a significant predictor. Improvement in anxiety had a positive association with general diet scores, indicating that individuals with improvements in anxiety were more likely to improve general diet scores on the SDSCA (OR = 3.325).

Other models included mood, but improvement in anxiety and improvement in depression were not significant predictors. Improvement in anxiety was included in the model predicting improvements in foot care but was not significant. Likewise, depression was included in two of the regression models, predicting improvements in fruit and vegetable consumption and medication adherence, but failed to reach a level of significance. This result is surprising because, as mentioned earlier, there is support for the connection between depression and poor performance on self-care activities.

Mood disturbances cause distress in the individual sufferer (American Psychiatric Association, 2013), as does type 2 diabetes mellitus (Polonsky, 1995). The combination of

stressors can lead the individual to a lessening of internal resources and inhibit functioning (Detweiler-Bedell, Friedman, Leventhal, Miller, & Leventhal, 2008). Given this, and the prevalence of depression and anxiety among individuals with T2DM, the difficulty with self-care behaviors may be related to the severity of the disorder. An explanation may be found in support for differences based on the level of severity. A recent investigation found that the only significant association with self-care behavior existed among individuals with Major Depressive Disorder (Shin et al., 2017). However, this finding differs from an earlier study with older adults that found effects at all levels of depressive symptoms (Gonzalez et al., 2007). Based on the conflicting evidence found in these two studies, and the results of this study, it is unclear whether severity impacts self-care behavior.

Due to the small sample size available for this study, it was not possible to analyze self-care behaviors as they relate to the level of anxiety or depression. Another limitation of this analysis was the level of severity found in this dataset. The average score for the first administration of the GAD-7 was 7.05; the second administration was 5.6. Based on the author scoring recommendations, this score indicates mild anxiety (Spitzer, Kroenke, Williams, & Löwe, 2006). The average PHQ-9 score was 8.40 at the first administration and 6.38 at the second administration. The scale author suggests ten as a cutoff score for Major Depressive Disorder (Kroenke, Spitzer, & Williams, 2001). Only 29% of the GAD-7 scores were over 10, and 35% of the PHQ-9 scores were over 10 in the datasets with two paired scores, suggesting that the severity of depression for the population was less than severe. Scores from the datasets with three GAD-7/SDSCA scores and three PHQ-9/SDSCA are very similar. At the first administration of the GAD-7, the mean score was 6.26; it was 4.96 at the third administration. The average PHQ -9 score at the initial administration was 8.44, and it was 5.15 at the third

administration. The results from the GAD-7 and PHQ-9 indicate a lower level of severity in these patients. Therefore, the lack of significant relationships found in this study may be related to the low prevalence of severe anxiety and depression in the population.

### **Relationships between other variables and self-care behaviors**

The author sought to determine the relationship between mood and self-care. However, it would be irresponsible not to explore the possibility that other factors may influence self-care behaviors. Previous investigations have suggested that demographics, doctor-patient relationships, stress, and social factors can predict self-care behaviors (Albright, Parchman, & Burge, 2001; Glasgow, 1995). In support of this idea, the current study found correlations existed between age and general diet scores; sleep difficulty and fruit/vegetable intake; marital status and medication adherence; marital status and specific diet; ethnicity and foot care; and ethnicity and exercise.

#### ***Age***

There was a significant correlation between age and general diet scores ( $r_{pb}(94) = .312$ ,  $p = .002$ ). Age also appeared in the logistic regression models for medication adherence and foot care among the GAD-7/SDSCA group and the fruit/vegetable improvement, medication adherence, and exercise models among the PHQ-9/SDSCA group.

Age only appeared as a significant predictor in one model, the medication adherence model for the PHQ-9/SDSCA group (OR=.920). Results indicated that younger individuals were more likely to improve their medication adherence than older adults. The reason for this is not explainable with the available data. One recent study may help explain why change is slower to occur in older adults. Matamales and colleagues (2016) identified a pathway in the brain that

allows mammals to adapt to change. When mice were studied, their results clearly showed a decline in the ability to adapt with age.

### *Sleep difficulty*

Logistic regression models revealed an unexpected relationship between sleep difficulty and improvement in fruit and vegetable intake for both the Anxiety group (OR = 2.82) and the Depression group (OR=8.87). The presence of sleep difficulty increased the likelihood of an improvement in fruit and vegetable intake. This relationship may seem counterintuitive, but correlations have been found between increased nocturnal eating and poor sleep in the diabetic population (Hood, Reutrakul, & Crowley, 2014). It is plausible that these individuals have developed a pattern of nighttime eating and are attempting to improve their dietary intake and choosing fruits and vegetables in an attempt to follow self-management recommendations.

The existing connections between sleep quality and obesity (Patel & Hu, 2008) has generated interest in the relationship between food and sleep. Some studies have identified certain foods as potential sleep promoters, to include fruits and vegetables, but their limitations do not offer definitive conclusions (St-Onge, Mikic, & Pietrolungo, 2016). Other studies investigating dietary intake and sleep have found associations, but have failed to determine direction or causality (St-Onge, Mikic, & Pietrolungo, 2016). Therefore, the correlation between sleep and fruit/vegetable intake found in this study is not comparable to other available research without additional data.

### *Marital status*

A 2012 study by Mayberry and Osborn that investigated the link between family support, medication adherence, and glycemic control identified the support of family members as being significant in whether an individual will adhere to medication regimens. Participants in

Mayberry's study reported that supportive family members helped them adhere to diabetes self-care behaviors and unsupportive family members were a hindrance. The connection between family support explains the results from this dataset containing individuals with two GAD-7/SDSCA scores; analysis indicated that married individuals are more likely to improve general diet scores (OR=3.32) and medication adherence (OR=6.41) than those who are single. Among the dataset containing individuals with two PHQ-9/SDSCA scores, a similar result was found between medication scores (OR=22.66) and marital status.

In addition to the previously mentioned study identifying a correlation between family supports and medication adherence (Mayberry & Osborn, 2012) there have been explorations into the role of social networks on health behavior. Several studies exploring the role of diet choice in individuals with diabetes found that spouses are frequently involved in all aspects of meal planning and preparation (Miller & Brown, 2005; Trief et al., 2003). Social control may help manage more specific diet recommendations as spouses persuade their partners to adhere to medical recommendations (August & Sorkin, 2010). Curiously, there was no correlation found between marital status and improvements in general diet ( $\chi^2=1.45$ ).

### ***Ethnicity***

Results from the Anxiety group indicated a correlation between foot care and ethnicity; the logistic regression analysis predicted Caucasians are more likely to improve foot care than minorities (OR=5.56). At first glance, this result is in opposition to a 2007 study (Nwasuruba, Khan, & Egede) that found African Americans were more likely to perform home foot examinations than Caucasians. However, this same study found that, when taken as a whole, African Americans were less likely to perform multiple self-care behaviors than their Caucasian counterparts. The majority of the patients in the GAD-7/SDSCA dataset were African American

(75%). The SDSCA measure of foot care comprises five questions: (1) On how many of the last seven days did you wash your feet?, (2) On how many of the last seven days did you soak your feet?, (3) On how many of the last seven days did you dry between your toes after washing?, (4) On how many of the last seven days did you check your feet?, and (5) On how many of the last seven days did you inspect the inside of your shoes? Therefore, these results are in agreement as the SDSCA score requires engagement in multiple self-care activities.

Similar to foot care, a correlation was identified between exercise and ethnicity; the regression analysis predicted that Caucasians are more likely to improve exercise scores than minorities (OR=3.27). The results from this study are in agreement with others that found African Americans are less likely to engage in physical activity (Egede & Poston, 2004; Nwasuruba, Khan, & Egede, 2007).

### *Gender*

Clear associations have been made between fruit and vegetable consumption and gender. There is overwhelming evidence to suggest that females consume more fruits and vegetables (Baker & Wardle, 2003; Granner et al., 2004), and men are apt to eat more meat (Daniel, Cross, Koebnick, & Sinha, 2011). The current study found that males were more likely to improve fruit and vegetable consumption (OR=4.40) than females. It is possible that this result is due to the way this is measured. The SDSCA asks “On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?” (Toobert, Hampson & Glasgow, 2000). It is possible that since the instrument measures specific intake (servings and days) males in the study had more opportunity to improve from baseline.

## **Implications for Future Research**

Although data limitations prohibit the author from determining causal relationships, the use of a pre- post-test design offers the ability to identify how individuals change over time and if these changes are correlated. Specifically, this design presents information that identifies if different types of variables influence improvement in self-care in the population. The original hypothesis was that mood would be a predictor of self-care behaviors. Even though this hypothesis was rejected for all self-care variables except general diet scores, an understanding of the role of other variables was acquired.

Results of the Friedman's test indicate that patients involved in the integrated health program experience a positive change in both mood and self-care behaviors. Future studies that explore differences in patients receiving diabetes self-management education (DSME) provided by a social worker versus patients receiving care as usual or DSME provided by medical personnel could help identify how the intervention itself influences patient behavior and mood. There have been studies that evaluated the efficacy of DSME (Chrvala, Sherr, & Lipman, 2015; Norris et al., 2001), but there are currently no published studies that explore the role of social workers as the primary providers of diabetic care management. Data from this study supports the benefit of engaging social workers in diabetic care.

Future research can add to the current study by exploring how the severity of anxiety and depression impacts self-care behaviors. Also, patients with anxiety vs. depression and comorbid anxiety and depression at different levels (mild, moderate, and severe) should be compared to determine if differences exist based on type and severity of the disorder. The patient data analyzed for this study contained individuals with lower levels of anxiety and depression. Since it is expected that higher levels of anxiety and depression will have a more significant impact on

daily functioning, it is likely that patients with higher levels of anxiety and depression who experience an improvement in mood will experience greater improvement in self-care behaviors. A reduction in functioning would also be expected to also occur in patients with comorbid anxiety and depression.

Interestingly, results indicated the impact of marital status on medication adherence scores in both the Anxiety group and the Depression group. Previous research (Chyun et al., 2006) has suggested that social persuasion can have an impact on behavior, especially in a marital relationship. This connection should be further investigated to determine if additional involvement by a life partner in supporting self-care activities could have a positive impact on patients with T2DM. Since living arrangement failed to show any significant correlation, it would be useful to investigate how support differs between a marital relationship and other social supports gained from just living with others. Future research should also investigate how age and sleep impact self-care. More in-depth investigations that combine qualitative interviews and detailed data collection will help determine if and how these variables are connected.

Future research should build upon this study by interviewing individuals with T2DM and mood disturbances. Understanding how treatment is experienced by patients would help identify differences among minorities as it relates to the intervention and their relationship to providers. Obtaining the perspectives of these individuals could provide further clarification about the impacts of mood and other potential confounders on their ability to perform specific self-care behaviors. Interviews should also be conducted with medical providers and social workers providing integrated health services to this population to identify additional variables that influence mood and self-care.

Lastly, information from this study should be presented to the National Institute of Diabetes and Digestive and Kidney Diseases, the American Diabetes Association and other professional organizations that develop best practice models for individuals with diabetes. These findings could be used to develop more comprehensive, multisite studies to determine how to improve current treatment models in various settings.

### **Implications for Social Work Practice**

Social workers are actively involved in the healthcare industry through home health, hospital, nursing homes, and primary care, providing education, psychosocial support, referral services, and counseling (Bureau of Labor Statistics, 2017). With the prevalence of T2DM, it is inevitable that these patients will encounter a social worker. To better assist these patients, social workers can advise healthcare teams on psychosocial issues impacting the individual; provide interventions to address emotional issues and improve coping skills; serve as a care coordinator or medical case manager (Claiborne & Vandeburgh, 2001; Wardian & Fei Sun, 2015); and address environmental influences that hinder treatment adherence (DeCoster & Cummings, 2005). This unique set of skills supports a role for the social worker as an essential part of a diabetic care team. Findings from the current study can inform the provision of social work services in these settings.

Specifically, findings from this study support the role of age, ethnicity, gender, and marital status in diet and foot care among individuals with diabetes. Knowledge of these associations can be used to help social workers develop targeted interventions that support improvements in adherence with medical treatment plans. Creating effective interventions is particularly important for the diabetic population since adherence to diet and foot care recommendations are essential in overall patient outcomes.

This study identified gender, marital status, and age as impacting adherence to dietary treatment plans. The importance of nutrition in the management of type 2 diabetes is clear. Following nutritional recommendations can significantly improve blood glucose levels, help with weight loss, and may lead to the reduction or elimination of diabetic medication (Feinman et al., 2015). Social workers providing services to males, older individuals, and single patients should spend more time addressing barriers to dietary compliance with these groups.

Result from this investigation identified ethnicity as influencing foot care. Peripheral neuropathy and peripheral vascular disease are common in the diabetic patient (Al-Maskari & El-Sadig, 2007) and can lead to foot ulcers and amputations (Marso & Hiatt, 2006). The problem of vascular disease is worse for African Americans (Kullo, Bailey, Kardia, Mosley, Boerwinkle, & Turner, 2003) who are more likely to experience amputation (Lefebvre & Lavery, 2011). Preventative foot care behaviors have the potential to reduce the severity of foot problems and may even eliminate the need for amputation. The connections between foot care, disease burden, and ethnicity in this study suggest the need for social workers to develop targeted interventions to encourage diabetic foot care in minority communities.

Support for increasing self-care behaviors with interventions targeting minorities can be found in the literature. A 2002 study (Keyserling et al.) evaluated the effectiveness of a program designed to increase physical activity in a random sample of 200 African American women. The program provided individual counseling, group sessions, and telephone contact. After one year, participants showed a statistically significant improvement in their physical activity ( $p=0.014$ ). A 2008 study (Utz et al.) evaluated the effectiveness of a program designed specifically for rural African Americans with diabetes. A total of twenty-two participants took part in either a group or an individual DSME program. Group activities included culturally appropriate story-telling,

hands-on activities, and problem-solving exercises. Individual sessions concentrated on goal-setting and problem-solving. Participants in both group and individual DSME showed improvement at the three month follow-up.

The current analysis failed to provide an explicit model of how mood and other factors influence the ability of individuals with T2DM to perform required self-care activities. The results show that various factors impact treatment adherence. The information gained through this study should be used by social workers to emphasize the importance of maintaining a holistic perspective when working with individuals and supporting the emphasis placed on the Person in Environment perspective by the profession.

It is clear from the repeated measures analysis that patients who received services through the integrated health program improved in both mood and self-care behaviors over time, some of which were significant. This result indicates the benefits of social workers providing diabetic interventions in primary care and is in direct opposition to older research showing little benefit (Wagner, 2000). An integrated model led by social workers could offer an option to healthcare systems struggling to address the needs of the diabetic patient and stem the epidemic of the disease currently occurring in the U.S.

Finally, this study was limited by the quality of the dataset. Practitioners were more focused on completing sessions and meeting treatment benchmarks than ensuring data collection protocols were met. While patient treatment is arguably the most important aspect of service provision, research should carry substantial weight as well. Social work curricula requires students to pass research courses in order to obtain their degrees at both the undergraduate and graduate levels. However, the practitioner is less likely to engage in research initiatives in practice. After a time, the importance of this aspect of practice can be lost. Continuing education

should emphasize the importance of research and data collection to improve practice for both the individual practitioner and the programs that employ them.

### **Implications for Social Work Policy**

In 2017, approximately 9% (29 million) of the U.S. population was without healthcare (National Center for Health Statistics, 2018) and access to preventative services. For those with insurance, there are no federal mandates that require healthcare providers to address the psychological and social needs of their patients. Despite efforts to expand insurance coverage to more individuals and promote integrated health models, services are limited, and reimbursements vary from state to state. Even with the current insurance requirements, psychosocial and medical issues continue to be treated separately in many sites, leaving patients with chronic diseases struggling to manage their health.

While The Patient Protection and Affordable Care Act (ACA) is still in force, its future is uncertain. Congress is still struggling to decide whether the ACA will remain, be eliminated, or modified. Passed in 2010, the ACA established certain minimum essential coverage (MEC) requirements for all medical insurance providers and offered incentives for states to expand Medicaid. The minimum coverage requirements include preventative services and chronic disease management (“What Marketplace health insurance plans cover”, n.d.) such as DSME and DSMS programs. Also under this legislation, thirty-seven states and the District of Columbia chose to expand Medicaid. As an insurance provider, Medicaid meets the minimum essential coverage requirements, extending access to prevention services for many who were previously uninsured.

To support the continuation of the ACA or a comparable policy, the current study initially sought to clarify the link between mood and self-care. The author hoped to build a case

for the requirement that medical providers implement services that include both mental and physical health as an integrated model. Although the level of significance of the correlations in this study were not as expected, the results of the Friedman's test did show a positive impact of holistic services on both mood and self-care behaviors.

Additionally, the results of the Friedman's test can be used to provide a basis for supporting health care policies that create funding for programs that address the needs of individuals with T2DM. Further support for this can be found in results from a 2000 study by Patout, Birke, Horswell, Williams, and Cerise. This study evaluated the effectiveness of a comprehensive foot care program in a predominantly low-income African-American community. After a single year of the program, subjects experienced a reduction in days with a foot-related ulcer, hospitalizations, days in the hospital, emergency room visits, number of antibiotic prescriptions, foot operations, foot amputations, and missed days at work. The program (Patout, Birke, Horswell, Williams, & Cerise, 2000) offered education, early treatment of foot issues and access to proper footwear to individuals with a history of limited or no access to health care. While this study focused on foot care, its positive results offer a solid argument for the benefit of expanding medical coverage to previously ineligible individuals.

In addition to health benefits, providing services to uninsured patients with T2DM can decrease healthcare expenditures. The lifetime incidence of developing a foot ulcer for the diabetic patient is estimated to be between 19% and 34% (Armstrong, Boulton, & Bus, 2017). Among Medicare recipients, approximately \$33,000 per patient per year is expended for medical services related to diabetic foot care. When an amputation occurs, the cost rises to approximately \$52,000 per year (Margolis et al., 2011). Based on this data, treating ulcerations and preventing

amputations could save up to \$19,000 per year. A 2013 study found controlling T2DM complications could result in as much as a 10% cost savings (Fitch, Pyenson, & Iwasaki).

## **Strengths and Limitations**

### **Merits of the Current Study**

Few studies have examined the impacts of mood on self-care in the diabetic population. The majority of research has focused on the impacts of depression on diabetes (Adam & Folds, 2014; Devarajooch & Chinna, 2017; Egede & Osborn, 2010; Gaitonde & Shaya, 2016; Kav, Yilmaz, Bulut, & Dogan, 2017; Mut-Vitcu, Timar, Timar, Oancea, & Citu, 2016) or only considered it as a comorbid construct with depression (Bener, OAA Al-Hamaq, & Dafeeah, 2011; Deschênes, Burns, & Schmitz, 2015; Helgadóttir, Forsell, & Ekblom, 2015; Khuwaja et al., 2010; Lloyd, Dyer, & Barnett, 2000; Rajput, Gehlan, Gehlawat, Gupta, & Rajput, 2016; Whitworth et al., 2016; Wu et al., 2011; Wu et al., 2013). One study (Browne, Nefs, Pouwer, & Speight, 2014) did explore the links between anxiety, depression, and self-care, but it only included cross-sectional survey data and focused on 19-39 year-olds. The studies that do exist have either reported self-care as a single construct (Hudson et al., 2016; Shin et al., 2017) or only used cross-sectional data. The use of cross-sectional data eliminates the ability to determine predictive relationships based on changes in the independent variables of interest.

In light of the existent body of research, the current study contributed to the literature in several ways. This author used a longitudinal design to determine correlations and predictors. There are no studies currently published that explore both changes in mood and specific self-care behaviors over time. In addition, the study investigated if there were correlations between improvements in specific self-care behaviors, demographic variables, sleep difficulty, and the presence of pain. The current study makes a meaningful contribution to the literature by

examining the influences that these variables have on improvements in specific self-care behaviors, and not viewing them as a single construct helps build knowledge about individual behaviors.

Furthermore, the current study provided foundational research into the benefits of using social workers to provide diabetes education in primary care. There is support for the use of medical personnel in the provision of diabetes education, but there are no currently published investigations that explore the efficacy of social work with the population. This study was able to show that patients enrolled in the social-work-led integrated health program had statistically significant improvements in depression, general diet scores, specific diet scores, medication adherence, glucose testing, exercise, and foot care. The current study supports previous assertions that social workers have an important role in improving patient outcomes with the population in primary care.

### **Limitations**

Several limitations were noted in the current study. These include inconsistent method of data collection; the reliability of self-report instruments; differences in behavioral health treatment provided; and sample selection. Each of these will be discussed in further detail below.

The design of the integrated health program is flexible. Social workers and their interns adjust assessments and the presentation of information and interventions to meet the needs of the patient. While flexibility may assist the patient, it means that the time between initial assessment and follow-ups can vary by as much as six months. The variation in time limits internal validity due to possible changes in treatment plans that affect the self-care regimen. For instance, if a

physician adjusts the patient's diet plan to accommodate a weight change, the patient may have seen a decrease in the scores recorded on the specific diet subscale of the SDSCA.

The data analyzed for this study was extracted from a clinical database. Variables and coding were based on clinical service needs, not for the purposes of research. Consequently, tight controls on when and how assessment instruments are collected did not exist, resulting in a smaller sample size and requiring the dataset to be split into four different datasets. The lack of control over assessment administration prevented statistical analysis exploring the role of comorbid anxiety and depression in self-care behaviors. Further limiting analysis, the resulting dataset contained variables that were not normally distributed, eliminating the ability to use parametric tests to determine significance.

Other limitations concern constructs that are missing from the dataset. The data was collected served as an addendum to the medical electronic health record. The dataset omits medical information that could impact self-care activities, confounding the results. For example, there is no indication in the available data if the patient had a physical disability that limited their capacity to perform required behaviors. Also missing are narratives that could explain if there are cognitive or economic barriers that exist for the patient. Although patients were evaluated for alcohol disorders and smoking behaviors, these data were not included in the dataset. This limits the ability to determine how these factors may influence other variables.

Even though all of the instruments used to assess mood and level of self-care are both reliable and valid (Kroenke, Spitzer, & Williams, 2001; Spitzer, Kroenke, Williams, & Löwe, 2006; Toobert, Hampson, & Glasgow, 2000), they are all self-report measures. Each of these instruments asks the patient to recall activities or feelings that previously occurred. Some of the

items may be difficult to recall accurately. There is also the risk of participant bias. Patients may answer questions to avoid displeasing the social worker or the medical provider.

Treatment fidelity of the integrated health intervention represents the next threat to this study. The session plans are guidelines for the practitioner. The social worker providing the intervention may change, add, or subtract educational components based on the needs of the patient. Some patients may receive more or less information about self-care requirements and their impact on diabetes. Since the assessment of what material is to be provided is subjective, it is possible that some patients in need of more education were overlooked. Hence, intervention differences are inherent in the model and the level of education received may differ between patients. Since services were provided over multiple years in as many as eight separate locations, this author was unable to monitor the intensity of the education provided for each of the eight self-care behaviors measured by the SDSCA. Additionally, no records were kept that identified the intensity of the interventions provided.

The participants in this study were all located in the same geographic region and received care from a Community Health Center, resulting in a sample that is not reflective of the population of the United States. Specifically, Community Health Centers typically serve lower-income individuals who are uninsured or underinsured (L. Knight, personal communication, March 20, 2017) so this group of participants cannot be generalized to individuals who receive medical care from private providers or who are of higher socioeconomic status. In addition to the above, the social workers with the integrated health program only spoke English; this prevented the inclusion of Spanish speaking patients in the study as access to interpreters was limited.

## **Conclusion**

The current study sought to increase knowledge of the impact of mood on self-care behaviors in individuals with type 2 Diabetes Mellitus. This was accomplished by exploring improvements in anxiety, improvements in depression, and improvements in specific self-care behaviors. In addition, the study also attempted to determine if correlations existed between self-care behaviors, demographics, pain presence, and sleep difficulty. All of the above was accomplished through analysis of data collected from a social work led integrated health program provided in a primary care community health clinic.

Findings from this study suggest that self-care behaviors can be influenced by numerous factors: anxiety, age, ethnicity, gender, marital status, and sleep difficulty. However, findings were inconsistent. For this reason, the null hypothesis cannot be rejected. There was a correlation and predictive relationship between anxiety and general diet scores, but anxiety did not have a statistically significant impact on any other individual self-care behaviors.

Other factors were identified as predictive of self-care behaviors, but the results were not consistent between the two datasets. For example, ethnicity was a predictor of improvement in foot care in the GAD-7/SDSCA group. In contrast, it was a predictor of improvement in exercise in the PHQ-9/SDSCA group. Gender only appeared as a predictor for improvements in fruit and vegetable intake in the PHQ-9/SDSCA group. These results leave questions since both datasets share some patients.

Results from the current study should be interpreted with caution because of limitations to internal and external validity. Future research can build upon these findings by including qualitative information and implementing a research protocol designed to collect targeted data at

strict intervals. An experimental design to investigate specific variables could better reveal the strength of the relationships.

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## APPENDIX

### Appendix A: Generalized Anxiety Disorder 7-item (GAD-7) scale

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all sure	Several days	Over half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

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Total

Appendix B: Patient Health Questionnaire (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all sure	Several days	Over half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling/staying asleep, sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television.	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite; being so fidgety or restless that you have been moving around a lot more than usual.	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way.	0	1	2	3

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Total

## Appendix C: Summary of Diabetes Self-Care Activities

### Diet

1. How many of the last SEVEN DAYS have you followed a healthful eating plan?
2. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?
3. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?
4. On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products?
- \*\*\*5A. On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?

### Medications

- \*\*\*6A. On how many of the last SEVEN DAYS, did you take your recommended diabetes medication?

OR

- \*\*\*7A. On how many of the last SEVEN DAYS did you take your recommended insulin injections?
- \*\*\*8A. On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?

### Exercise

5. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking).
6. 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?
7. Blood Sugar Testing On how many of the last SEVEN DAYS did you test your blood sugar?
8. On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?

## Foot Care

9. On how many of the last SEVEN DAYS did you check your feet?
10. On how many of the last SEVEN DAYS did you inspect the inside of your shoes?
- \*\*\*9A. On how many of the last SEVEN DAYS did you wash your feet?
- \*\*\*10A. On how many of the last SEVEN DAYS did you soak your feet?
- \*\*\*11A. On how many of the last SEVEN DAYS did you dry between your toes after washing?

## Smoking

- \*\*\* 12. Have you smoked a cigarette—even one puff—during the past SEVEN DAYS?  
Yes. If yes, how many cigarettes did you smoke on an average day?
- \*\*\* 12A. At your last doctor's visit, did anyone ask about your smoking status?  
0. No, Yes
- \*\*\* 13A. If you smoke, at your last doctor's visit, did anyone counsel you about stopping smoking or offer to refer you to a stop-smoking program?  
0. No, Yes
- \*\*\* 14A. When did you last smoke a cigarette?  
More than two years ago, or never smoked  
One to two years ago  
Four to twelve months ago  
One to three months ago  
Within the last month  
Today

## Questions not included in database used by program.

- \*\*\*1A. Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please check all that apply:
- a. Follow a low-fat eating plan
  - b. Follow a complex carbohydrate diet
  - c. Reduce the number of calories you eat to lose weight
  - d. Eat lots of food high in dietary fiber
  - e. Eat lots (at least 5 servings per day) of fruits and vegetables
  - f. Eat very few sweets (for example: desserts, non-diet sodas, candy bars)
  - g. Other (specify):

h. I have not been given any advice about my diet by my health care team.

\*\*\*2A. Which of the following has your health care team (doctor, nurse, dietitian or diabetes educator) advised you to do? Please check all that apply:

a. Get low level exercise (such as walking) on a daily basis.

b. Exercise continuously for a least 20 minutes at least 3 times a week.

c. Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk, etc.)

d. Engage in a specific amount, type, duration and level of exercise.

e. Other (specify):

f. I have not been given any advice about exercise by my health care team.

\*\*\*3A. Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please check all that apply:

a. Test your blood sugar using a drop of blood from your finger and a color chart.

b. Test your blood sugar using a machine to read the results.

c. Test your urine for sugar.

d. Other (specify):

e. I have not been given any advice either about testing my blood or urine sugar level by my health care team.

\*\*\*4A. Which of the following medications for your diabetes has your doctor prescribed?

Please check all that apply.

a. An insulin shot 1 or 2 times a day.

b. An insulin shot 3 or more times a day.

c. Diabetes pills to control my blood sugar level.

d. Other (specify):

e. I have not been prescribed either insulin or pills for my diabetes.

**\*\*\* Additional Items for the Expanded Version of the Summary of Diabetes Self-Care Activities.**

## Appendix D: IRB Approval Letter

October 17, 2018

B. Michelle Brazeal  
School of Social Work  
The University of Alabama  
Box 870314

Re: IRB # EX-18-CM-090: "Mood and Self Care in T2DM"

Dear Ms. Brazeal,

The University of Alabama Institutional Review Board has granted approval for your proposed research. Your application has been given exempt approval per 45 CFR part 46.101(b)(4) as outlined below:

*(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.*

**Your approval will expire on October 16, 2019.** If the study will continue beyond that date, please submit the Continuing Review Form within e-Protocol. If you need to modify the study, please submit an Amendment form. *Changes to this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants.* When the study closes, please submit the Final Report Form.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB approval number.

Good luck with your research.