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Illness Perception and Cardiovascular Risk Awareness

in Adults with Type 2 Diabetes Mellitus

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Illness Perception and Cardiovascular Risk Awareness in Adults with Type 2 Diabetes Mellitus

by

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Dedication

First and foremost, I thank my Heavenly Father, as

"I can do all things through Christ who strengthens me." Philippians 4:13 (KJV).

This is dedicated to the individuals who live with T2DM daily.

To my parents and family for their encouragement and understanding.

To my son for the unending support and competitiveness.

To my husband for his unconditional love, extreme patience, and belief in me.

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Illness Perception and Cardiovascular Risk Awareness

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Abstract

Two out of 3 people with T2DM, over the age of 64, will die of cardiovascular disease (CVD). Currently, there is a global push to broaden the awareness of the risk for CVD in the DM population and this study is no exception. Illness perception (IP) has been shown to affect positive healthcare behaviors in people with T2DM however the relationship between IP and CVD risk awareness (CVD-RA) has never been evaluated. The purpose of this study was to determine if there is a relationship between IP and CVD-RA in people with T2DM. This descriptive, cross-sectional study recruited a purposive sample of 200 men and women, between the ages of 45 and 75 from a local health clinic. Data was collected by survey method using a demographic questionnaire, and 2 verified instruments, one to measure IP and the other to measure 4 sub-groups of CVD-RA. Data was analyzed by descriptive statistics, Pearson Correlation, multiple regression and Cronbach's Alpha. Inversely, 71% of participants were aware of their CVD-RA however,

they reported a low susceptibility to developing CVD and only a moderate level of intention to change behavior. While the study did find a correlation between IP and Perceived Risk for CVD, there were no significant associations between IP and Knowledge of CVD Risk, Perceived Benefits and Health Eating. The findings of this study can be used to develop interventions for both HCPs and people with T2DM to help improve health behaviors.

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List of Abbreviations

ABCD-RQ	ABCD Risk Questionnaire
A1c	Hemoglobin A1c
ADA	American Diabetes Association
AACE	American Association of Clinical Endocrinologist
AHA	American Heart Association
ANCOVA	Analysis of Covariance
B-IPQ	Brief Illness Perception Questionnaire
BP	Blood Pressure
CDC	Centers for Disease Control
CVD	Cardiovascular Disease
CVD-RA	Cardiovascular Disease Risk Awareness
DCCT	Diabetes Complications and Control Trial
DM	Diabetes Mellitus
HBM	Health Belief Model
HCP	Health Care Professional
HPM	Health Promotion Model
IDF	International Diabetes Federation
IP	Illness Perception
IRB	Institutional Review Board
PASS	Power Analysis and Sample Size
RA	Risk Awareness
SD	Standard Deviation

SPSS	Statistical Package for the Social Sciences
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
UKDPS	United Kingdom Diabetes Prospective Studies
US	United States
UTMB	University of Texas Medical Branch
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

INTRODUCTION

Chapter One introduces this quantitative study, which explores the association between illness perception (IP) and cardiovascular disease risk awareness (CVD-RA) in adults with type 2 diabetes mellitus (T2DM). Chapter One begins with a statement of the study problem. The chapter then provides the background and significance of the issue at hand, statement of purpose and goals, research questions and aims, theoretical framework, study variables, and definition of terms. Finally, Chapter One offers an overview of research methodology, data collection and analysis, and a brief overview of study findings.

STATEMENT OF THE PROBLEM

Cardiovascular disease (CVD) and diabetes mellitus (DM) pose a significant healthcare crisis in the world. According to the American Heart Association (AHA) (2018), CVD leads the United States in all-cause mortality at approximately 30%. However, in people with T2DM, the AHA (2019) states CVD, will claim the lives of 2 out of 3 adults with T2DM. Therefore, the relative risk for heart disease, stroke and/or death, is 2 to 6 times higher in people with DM than those without the disease, establishing that DM is an independent risk factor for CVD (Bertolucci & Rocha, 2017; Einarson, Acs, Ludwig & Panton, 2018; Mancussi, Dicembrini, Lauria & Pozzilli, 2013; Ohkuma, Komorita, Peters, & Woodward, 2019; Pagidipati et al., 2017; & Vazquez-Benitez et al., 2015). To further delineate, approximately 70-80% of people with DM, older than 65 years of age, die from CVD (Wang, Hess, Hiatt, & Goldfine, 2016). Despite being the leading cause of mortality, studies suggest between 50-80% of CVD deaths can be

prevented (Center for Disease Control [CDC], 2017; Jacobs, Burke, Rouse, Sarma & Zaric, 2016; Patel, Winkel, Ali, Narayan, & Mehta, 2015; & World Health Organization [WHO], 2017). This is accomplished through lifestyle changes and pharmacologic therapies, however, only 20% - 40% of Americans reach the guidelines for exercise, weight, blood pressure, lipid control and smoking cessation (Pagidipati, 2017).

Knowledge of the risk factors for CVD is low among patients with DM, leading to inadequate self-management of the disease and additional risk factors for CVD (Jacobs et al., 2016; Kilkenny et al., 2017; & Kugbey, Asante & Adulai, 2017). In addition, how a person perceives his or her illness has been shown, in numerous studies, to directly affect health behaviors either positively or negatively (Nie, Han, Xu, Huang, & Mao, 2017; Nur, 2018; & Webster & Healy, 2010). Although there are several factors that contribute to health behaviors, one major precursor to preventing CVD is the awareness of one's individual risk (International Diabetes Federation [IDF], 2018; Petricek et al., 2009). Separately, illness perception (IP) and risk awareness (RA) of CVD has been shown to impact self-care behaviors in chronic conditions (Broadbent, Donkin & Stroh, 2011; Nur, 2018; & Woringer, et al., 2017). However, no studies have explored the two concepts together in a diabetes population, utilizing a validated tool (Woringer et al., 2017).

BACKGROUND AND SIGNIFICANCE OF THE PROBLEM

Background.

Diabetes mellitus affects 30.3 million adults, in the Unites States, aged 18 years or older, of which 7.2 million were not aware of or did not report having DM (CDC, 2017). Type 2 diabetes (T2DM) accounts for roughly 95% of those diagnosed with the disease.

The CDC (2017) predicts that by the year 2050, up to 1 in 3 people in the United States could be suffering from T2DM, which is associated with a number of serious complications reducing life expectancy by as much as 10 -12 years (AHA, 2018; & Einarson et al., 2018). Diabetes related complications include acute myocardial infarction, stroke, amputation, end-stage renal disease, blindness and death.

According to Enserro, Vasan, & Xanthakis, (2018), the number of Americans with ideal heart health has steadily declined over the last two decades, mostly due to changes in lifestyles leading to unhealthy habits resulting in weight gain, higher blood pressure, lipid abnormalities and blood glucose levels. Diabetes and CVD can be controlled by addressing self-care behaviors, such as a healthy diet and weight, proper exercise, controlling blood pressure and lipid levels and stopping the use of tobacco. These modifiable risks should be addressed early in the disease process through education and medical management (Einarson et al., 2018; WHO, 2018). However, only 6.8% of newly diagnosed patients with T2DM attend diabetes education within the first year and only about 50% report ever attending diabetes education classes (CDC, 2014). A recent global study by the International Diabetes Federation (2018) reported only 1 in 4 people with DM had ever discussed CVD risk factors with a health care provider. Additionally, a study by Kilkenny et al, (2017) demonstrated that knowledge of risk factors for DM and CVD is low in those with identified risk factors, men and over the age of 55.

Diabetes is a disease that is managed primarily by the individual, despite the imperative role of the health care professional. Ninety-five percent of health-related decisions, such as diet, smoking, and exercising, are made by the individual daily

(Anderson, 1995 & Petricek et al., 2009) making positive self-care behaviors a must. Kugbey et al. (2017) and Petricek et al. (2009) demonstrated that IP and diabetes knowledge significantly predict diabetes self-care practices. That is, if an individual has a positive view of their disease, they tend to adopt healthier self-management practices. To the same extent, CVD risk awareness, either of the disease or risk factor for the disease, can have positive or negative health outcomes. Jacobs et al., (2016) found a negative association between preventive health practices and poor CVD awareness.

Understanding how a person's perception of DM relates to knowing his or her individual risk for CVD is imperative for health care professionals (Petrie & Weinman, 2006). Currently, there are no studies evaluating the concept of IP and CVD awareness in T2DM together. Therefore, the purpose of this study is to address this gap in the literature in three ways. First, I sought to identify if adults with T2DM are aware of their CVD risk. Second, I aimed to determine the relationship between IP and CVD risk awareness (CVD-RA) in the same population and finally, to evaluate the reliability of the ABCD Risk Questionnaire (ABCD-RQ) in adults with T2DM.

Significance.

The significance of this study is understanding the association between IP and CVD-RA, in those diagnosed with T2DM, which can shed a broad light on the actual need for and the amount and type of education required to reduce CVD in the coming years. This study may also lead to the development of interventions, by health care professionals (HCPs), to reduce the risk of CVD, as well as, increasing adherence and persistence to medications early in the disease progression. The information can also improve health behavior education and interventions to aid in the improvement of self-

care in those diagnosed with the disease. Further, this study will be the first of its kind to determine the level of CVD-RA in adults with T2DM and the relationship between IP and CVD-RA. The outcomes of this study may lead to the development of effective methods to modify negative IPs and increase CVD-RA.

STATEMENT OF PURPOSE AND GOALS

The *overall objective* of this study was to determine the relationship between IP and CVD-RA in adults with T2DM. The *short-term* goal of this study was to inform decision making around interventions to increase CVD knowledge and improve health outcomes in people with T2DM. The *long-term* goal is to identify the amount and type of education required to reduce the risk of CVD in adults with T2DM. Further, this study is the first of its kind to determine the level of CVD-RA in adults with T2DM and the relationship between IP and CVD-RA.

THE RESEARCH QUESTION AND AIMS

Research Questions.

The following research questions guided this research:

Central Research Question: What is the association between IP and CVD-RA in adults with T2DM?

Central Hypothesis: There is an association between illness perception and CVD-RA in adults with T2DM.

Specific Aims.

The following specific aims and research questions were addressed:

Specific Aim 1: Determine the level of awareness of CVD risk in adults with T2DM.

Research Question 1: What is the level of awareness of CVD risk in adults with T2DM?

Null Hypothesis 1: The majority of people with T2DM are not aware of the increased risk of CVD associated with DM.

Specific Aim 2: Determine the relationship between IP and CVD-RA in adults with T2DM.

Research Question 2: What is the relationship between IP and CVD-RA in adults with T2DM?

Null Hypothesis 2: There is no relationship between IP and CVD-RA in adults with T2DM.

Specific Aim 3: Verify the reliability of the ABCD Risk Questionnaire (ABCD-RQ) in adults with T2DM.

Research Question 3: What is the reliability of the ABCD-RQ in adults with T2DM?

Null Hypothesis 3: The reliability of the ABCD-RQ will not be verified in a population with T2DM.

STATEMENT OF THE THEORETICAL FRAMEWORK

The theoretical foundation of this study is supported by the Health Belief Model (HBM). According to the HBM, the beliefs held toward current and future health, and level of disease knowledge, are likely to modify the extent to which persons engage in disease self-management (Champion & Skinner, 2008). The association between health beliefs, disease self-management, and health outcomes were first delineated in the HBM in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels who were

working in the U.S. Public Health Services (Champion & Skinner, 2008). The model provides a conceptual framework for understanding why people do, or do not, engage in disease self-management.

Theoretical Propositions of the HBM

Engaging in health-related actions is predicted by the perceived value attached to an outcome and the perceived likelihood that these actions will lead to an outcome. The HBM suggests that people will take action to prevent illness:

- if they regard themselves as susceptible to a condition (perceived susceptibility),
- if they believe it would have potentially serious consequences (perceived severity),
- if they believe that a particular course of action available to them would reduce the susceptibility or severity or lead to other positive outcomes (perceived benefits), and
- if they perceive few negative attributes related to the health action (perceived barriers).

Self-efficacy, the belief that one can successfully complete the behavior of interest despite considered barriers, was added to the model in 1988 (Bandura, 1977). The HBM Model and T2DM has been successfully used in numerous studies (Shabibi et al., 2017; Vazini & Barati, (2015); & von Arx, Gydesen, & Skovlund, 2016).

Integration of the HBM

In this study, the HBM Model will be integrated in the following manner: (1) *perceived susceptibility* will be evaluated via the "perceived risk" section of the ABCD-

RQ; (2) *perceived severity* will be evaluated via the Brief Illness Perception Questionnaire (B-IPQ) scores, (3) *perceived benefits* will be evaluated via the "perceived benefits and intentions to change" section of the ABCD-RQ, and (4) *perceived barriers* will be evaluated via the Brief Illness Perception Questionnaire (B-IPQ) scores,

THE STUDY VARIABLES

For the purposes of this study, the following terms were conceptually and operationally defined: illness perception and risk awareness.

Illness perception

Illness Perception (IP) is conceptually defined as the beliefs held by patients about their health problems (Broadbent, Petrie, Main, & Weinman, 2006). When an adult is diagnosed with an illness or disease, emotional and cognitive beliefs are formed about the diagnosis, that will determine how the adult will ultimately handle or cope with the condition (Petrie et al., 2006). These perceptions are fluid and can vary as the illness changes. Illness perceptions that are negative tend to be associated with poor outcomes and increased healthcare costs whereas positive IPs are closely linked to improved health outcomes (Nur, 2018; Petrie & Weinman, 2006; & Broadbent et al., 2006). This variable is operationally defined by Broadbent et al.'s (2006) Brief Illness Perception Questionnaire (B-IPQ).

Risk Awareness

Risk Awareness (RA) is conceptually defined as the accurate recognition of personal risks associated with a chronic disease (Woringer et al., 2017). The term "risk awareness" is fairly new to the healthcare world but has been used in the business and finance industries for decades. According to Woodward (2011), RA, in the healthcare

environment, is the recognition of inherent risks or hazards that can result in patient harm. Woodward (2011) further explains that an individual's awareness of a risk(s) can potentially prevent future impairment by altering plans or behaviors. Risk perception has been the term of choice, used in previous studies, to identify a person's level of personal control, worry, optimism, personal disease risk and environmental disease risk (Nie et al., 2017). Risk awareness is operationally defined by the "ABCD Risk Questionnaire" (ABCD-RQ), a 26-item survey developed to assess awareness of a person's risk of CVD (Woringer, et al, 2017).

OVERVIEW OF RESEARCH METHODOLOGY

Quantitative Methodology.

This study followed a descriptive, cross-sectional design. A descriptive study allows translation of the characteristics of the population, while a cross-sectional design provides for data collection at one point in time (Polit & Beck, 2014). Convenience sampling was used to recruit adults with T2DM between the ages of 45-75, from the outpatient UTMB health systems clinics. Data was collected by two anonymous Likert-scale survey questionnaires, one to evaluate IP and the other CVD-RA.

OVERVIEW OF DESIGN: DATA COLLECTION AND DATA ANALYSIS

Data Collection.

The data collection was conducted in the lobby, and in a side room, of the University of Texas Medical Branch (UTMB) Health Primary and Specialty Care Clinic in Texas City, Texas. Interested participants were provided informed consent via a fast fact sheet highlighting the purpose and participant responsibilities of the research project. The researcher questioned interested participants to ensure the inclusion criteria was met. The

participant was informed that by participating in the interview process and completing the surveys, consent to participate in the study was implied and that consent and participation could be withdrawn at any time. The surveys were then handed to the participant, by the researcher, and completed.

Data Gathered

The data for this research study consisted of demographic information and two Likert-scale surveys on IP and CVD-RA. Completion of the questionnaires took approximately 15 minutes.

Data Analysis.

All data was analyzed using the version 25 of the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics consisting of mean, standard deviation, frequency, percentage, range, and minimum and maximum values was used to present the demographic data and health information of the study participants. Pearson Correlation analysis was used to determine the relationship among IP and CVD-RA, in each section of the ABCD-RQ: knowledge, perceived risk, perceived benefits and healthy eating. Cronbach's Alpha and Factor Analysis was used to verify the reliability of the ABCD-RQ in a T2DM population.

OVERVIEW OF STUDY FINDINGS

This study explored the association between IP and CVD-RA in adults with T2DM, between the ages of 45-75. Study findings revealed that of the four sub-groups within the ABCD-RQ, only Perceived Risk was significantly associated with IP, meaning those who perceive a higher level of risk of CVD tend to also perceive a higher level of IP. In addition, participants who reported one or more diabetes related complications and

those with a longer duration of diagnosed DM, had a significantly higher IP score than those that did not report complications or had recently been diagnosed. Of note, contrary to recent reports, 71% of participants were aware of their increased risk for CVD however, they only reported a moderate level of intention to change health behaviors, to decrease the risk for developing CVD.

SUMMARY OF CHAPTER ONE

Chapter One introduced this quantitative study, which explored the association between IP and CVD-RA in adults with type 2 diabetes mellitus. Chapter One began with a statement of the study problem. The chapter then provided the background and significance of the problem, statement of purpose and goals, research questions and aims, theoretical framework, study variables, and definition of terms. Finally, Chapter One offered an overview of research methodology, data collection and analysis, and a brief overview of study findings.

PLAN FOR REMAINING CHAPTERS

This dissertation is divided into five chapters. Chapter One represented the introduction, problem statement, purpose, objective of the study, specific aims, research questions, significance of the study, conceptual framework, and definition of relevant terms. Chapter Two will provide a detailed review of literature, including an overview of DM and CVD and in-depth review of each variable in the context of IP and CVD-RA. Chapter Three will discuss the application of the descriptive, cross-sectional research design, sample, setting of the study, data collection procedure, and data analyses used to address research questions, and instruments. Chapter Four presents the results from the

data analysis. Finally, Chapter Five will present the conclusions, discussion, and recommendations relative to the study findings.

CHAPTER 2: REVIEW OF LITERATURE

INTRODUCTION

Type 2 diabetes mellitus (T2DM) has been a major health concern globally for several decades. Even though effective healthcare interventions have been developed to manage the disease, the illness has persisted, particularly in the United States, where the number of people diagnosed with T2DM is steadily increasing. Half of new onset CV events occur in men before age 65 and in one-third of women, prior to the same age (Sniderman, Thanassoulis, Williams & Pencina, 2016). To improve the management of T2DM, this Review of Literature (Review) will explore how illness perception (IP) and CVD risk awareness (CVD-RA) might influence the health behaviors of individuals with T2DM, and whether there are possible relationships between these two concepts. Specifically, this Review focuses on research studies that have been conducted regarding DM and CVD as comorbidities and explores the effects of such variables as IP and CVD-RA on T2DM. Finally, possible research gaps are identified regarding the relationship between DM and CVD and concludes with a summary of the Review.

HISTORICAL REVIEW OF THE LITERATURE

Diabetes Mellitus (DM) Trends

Diabetes Mellitus (DM) is a complex, chronic disorder affecting 30.3 million Americans, almost 10% of the United States population (Center for Disease Control [CDC], 2017). In the last decade the number of people diagnosed with DM has increased almost 50% and the CDC (2017) predicts that by the year 2050, up to 1 in 3 Americans could be suffering from disease. This trend demonstrates that DM has become one of the most devastating diseases, in the US, and is expected to cause even more financial and

health burdens if adequate health care interventions are not developed. According to Chaudhury et al. (2017), prediabetes, gestational diabetes, Type 1 diabetes mellitus (T1DM), and Type 2 diabetes mellitus (T2DM) are the four types of DM that exist, affecting over 100 million Americans.

Prediabetes

Prediabetes, also referred to as impaired fasting glucose or impaired glucose tolerance, occurs when the blood glucose levels are higher than the normal range but not high enough to be diagnostic of T2DM. In 2015, the CDC (2017) estimated that nearly 40% of the U.S. adults aged 18 and older and almost 50% of adults over the age of 65 had prediabetes. If left untreated, prediabetes is likely to develop into T2DM. Fortunately, making healthy lifestyle choices can help restore normal blood glucose levels and prevent or delay the onset of T2DM.

Type 1 Diabetes Mellitus (T1DM)

Type 1 diabetes mellitus, affecting 5-10% of people diagnosed with the disease, occurs due to insufficient insulin in the blood and may be caused by the destruction of the autoimmune beta cells in the pancreas. T1DM requires a lifetime of daily insulin.

Type 2 Diabetes Mellitus (T2DM)

On the other hand, T2DM is the most common form affecting between 90% and 95% of those who are diagnosed with DM (CDC 2017). In T2DM, the body does produce insulin, but it is either not enough, or the body is not efficiently using the insulin produced (insulin resistance). T2DM can be treated with healthy lifestyle choices, medication and/or insulin.

DM and Risk for Cardiovascular Disease (CVD)

The presence of diabetes mellitus (DM), irrespective of its type, poses a major risk for the development of Cardiovascular Disease (CVD). CVD is the leading cause of death and disability in those diagnosed with DM, killing 2 out of 3 people with the disease (Wang, Hess, Hiatt, & Goldfine, 2016). Fortunately, recent advances in medical care, as well as adequate prevention of cardiovascular risk factors, have led to a reduction of deaths attributed to CVD events. However, the increased prevalence of DM and higher longevity rates, have offset improvements in CVD incidence in those with DM (Vazquez-Benitez et al., 2015). Improvements in CVD-RA among adults living with T2DM may empower public awareness, and therefore, contribute to reversing the current trend.

Self-Management of DM

Proper self-management and adherence to treatment is one of the most effective methods of managing DM and may help prevent complications. Lifestyle changes that include weight loss, healthy eating, as well as increased physical activities may radically reduce the rate of progression of T2DM. Lifestyle changes are also essential for self-management of CVD risk factors such as blood pressure, elevated blood glucose, and cholesterol (American Heart Association [AHA], 2019; International Diabetes Federation [IDF], 2018).

Self-management techniques may be achieved by embracing diabetes or disease self-care practices that follow the American Diabetes Association's (ADA) Standards of Diabetes Care (ADA, 2019). A study carried out by the CDC (2014) found that the diagnoses of DM may present profound challenges to new patients who may experience

emotions such as intense fear, confusion, and misunderstanding, as well as denial. Thus, it is important to understand how people with T2DM are influenced by IP, emotions, as well as, knowledge of the disease process.

REVIEW OF LITERATURE RELATED TO CARDIOVASCULAR DISEASE

CVD Statistics

Cardiovascular disease (CVD) is the leading cause of death in people with DM (AHA, 2018) with 70% of patients older than 65 dying from CVD (Wang, Hess, Hiatt, & Goldfine, 2016). Patients with T2DM have a 2 to 4-fold increased risk for CVD morbidity and mortality (Bertoluci & Rocha, 2017; Einarson et al., 2018). CVD, for the purposes of this study, is operationally defined as diagnosed coronary artery disease, peripheral vascular disease and cerebrovascular disease. CVD kills nearly three-quarters of a million Americans every year (Einarson, Acs, Ludwig & Panton, 2018). The comorbidity of DM and CVD is even higher, killing 2 out of every 3 persons diagnosed with DM (AHA, 2019; IDF, 2018). Yet, half of CVD deaths can be prevented by controlling modifiable risk factors (CDC, 2017; Pagidipati et al., 2017).

Risk Factors Associated with CVD

With these statistics in mind, Fan et al., (2019) utilized the Diabetes Collaborative Registry (DCR) to evaluate over 74,000 people with DM, to determine how many adults attained the targeted levels for glycated hemoglobin (HbA1c), LDL cholesterol, blood pressure (BP), and nonsmoking. The registry contains real world data from both primary care and specialty practices from across the globe. Fan et al., (2019) determined that only 1 in 5 adults with DM have control over risk factor targets for CVD, highlighting the need for comprehensive lifestyle changes and multidisciplinary diabetes care. Important

limiting factors of the study included the fact that the DCR; (1) underrepresents minority groups in the U.S.; and (2) includes mostly cardiology practices, who care for fewer of those diagnosed with DM compared to primary care practices or endocrinology practices.

A longitudinal study that focused on risk factors associated with CVD, revealed that proper self-management of preventable factors such as glucose levels, BP, smoking behaviors, and cholesterol, leads to a significant reduction in the number of deaths, from CVD, among people living with DM (Vazquez-Benitez et al., 2015). Risk factors are considered detrimental and are believed to be the reason CVD is the number one cause of death globally (World Health Organization [WHO], 2018). The 6-year study, by Vazquez-Benitez et al., (2015), utilized 859,617 adults diagnosed with DM. The researchers further revealed that the overall rates of CV events are nearly 5 times higher in patients with CVD than in those without the disease. The findings go on to highlight that 1 in 3 major CV events are attributable to uncontrolled risk factors in those without CVD. However, the investigation was limited by the following; (1) numerous cases of missing data, and (2) and the differentiation of T1DM and T2DM was not available. Reliance on incomplete data may have impeded data analysis, and thus, make it difficult to generalize the findings.

Efficacy of Secondary Prevention in CVD

Utilizing a double-blind, randomized, placebo-controlled trial, Pagidipati et al., (2017) explored the efficacy of secondary prevention interventions in patients with T2DM. The researchers evaluated 13, 616 people, over 3 years, to determine the attainment level of five (5) prevention parameters; non-smoking status, aspirin use, lipid control, BP control, and the use of an angiotensin-converting enzyme inhibitors or

angiotensin receptor blockers. Results demonstrated: (1) only 29.9% of patients with T2DM and CVD achieved all five parameters, and (2) only 58% achieved BP control. The outcomes lead researchers to conclude that substantial opportunities exist to increase the attainment of secondary prevention goals necessary for reducing the risk of CV events. However, the researchers admit that a large amount of missing lipid data may bias the analyses. Further, LDL-C monitoring may not be the most appropriate measurement of lipid control in people with DM, as these levels can be skewed.

The Relationship Between DM and CVD

Ohkuma, Komorita, Peters & Woodward (2019) pulled data from 47 cohorts including 12,142,998 individuals with DM from January 1966 to November 2018. The goal of the systematic review and meta-analysis was to evaluate whether diabetes confers a risk for heart failure and if there are relative risk differences between men and women. The researchers concluded that DM is a risk factor for heart failure and is associated with a 47% greater risk in women with T1DM and 9% greater risk in women with T2DM, versus men. The significant sex differences, associated with T2DM and heart failure, was shown to be consistent across a variety of prespecified subgroups.

Mannucci, Dicembrini, Lauria and Pozzilli (2013) evaluated whether good glycemic control can prevent CVD. The writers reviewed several of the large, long-term diabetes clinical trials, dating back to the 1980's, to see if there is a relationship between diabetes and CVD. Mannucci et al., 2013 concluded that the tighter glycemic control appears to be associated with a lower incidence of major cardiovascular events. Mannucci et al. (2013) recommended proper glycemic control as well as the need to prevent hyper and hypoglycemia when controlling diabetes and preventing CVD. At the

same time, they also highlight the important need to control lipid levels as higher levels are associated with higher CV events.

In the same light, the American College of Cardiology states that there is vast evidence to show that glycemic control, defined by an A1c < 7% in patients with CVD ages 40-79, greatly improves health outcomes. However, there is little evidence in the elderly population, over age 80. The ADA recommends that in patients with multiple comorbidities, a more relaxed A1c target of 7.5 - 8% be obtained, if life expectancy is less than 10 years, or a goal of 8 - 8.5% in those with multiple complex medical problems (ADA, 2019; & Wilcox, Blaum, & Newman, 2018). Therefore, it is evident that an individualized, sex-specific approach would be the most effective method for managing both CVD and DM.

Impact of Delay in CVD Treatment Intensification

This concept was echoed by Paul, Klein, Thorsted, Wolden & Khunti, (2015) who wanted to evaluate whether a delay in treatment intensification, in newly diagnosed T2DM, had an impact on CV events. Using retrospective data over a maximum of 23 years, the researchers evaluated 105,477 people from the United Kingdom Clinical Practice Research Datalink. The researchers discovered: (1) an average HbA1c of 8.1% (< 7% recommended by the ADA, 2019); and (2) regardless of glycemic control, failure to add or increase anti-hyperglycemic medications within the first two years of diagnosis, was significantly linked to a 42% increase in CV events in those with CVD (HR CI: 1.21, 1.66), and a 48% increase in those without the disease (HR CI: 1.36, 1.61). This study validates the beneficial effect of following current recommended treatment targets and guidelines on long-term cardiovascular risks. This study was limited by: (1) missing

data, (2) failure to control for the patient's socio-economic status, and (3) adherence to medication, diet and exercise.

REVIEW OF RELEVANT THEORETICAL LITERATURE

The Health Belief Model

Researchers have been using the Health Belief Model (HBM or Model), for decades, to evaluate IP and behavior influence in the T2DM population. This Model, derived from psychological and behavioral theory, tends to view behavior in a descriptive manner. The HBM suggests that a personal belief or a perception precedes a behavior, it does not explain why the behaviors occur.

Primary Perceptive Dimensions of the HBM

The HBM focuses on six (6) primary perceptive dimensions but only the following four (4) were evaluated in this study; susceptibility, severity, perceived benefits, and barriers (Janz & Becker, 1984).

Actions to Prevent Illness Within the HBM

The HBM suggests that people will take action to prevent illness if they perceive:

- themselves as susceptible to a condition (perceived susceptibility),
- the illness would have potentially serious consequences (perceived severity),
- that a particular course of action available to them would reduce the susceptibility or severity or lead to other positive outcomes (perceived benefits), and
- few negative attributes related to the health action (perceived barriers) (Janz & Becker, 1984).

Predictors of Self-Management Behaviors

Vazini & Barati, (2015) used the HBM to investigate predictors of self-management behaviors in people with T2DM. Three hundred ninety (390) participants in a cross-sectional study completed surveys involving self-care behaviors and constructs from the HBM. The researchers determined that the majority of self-care behaviors were predicted by the following three (3) HBM constructs; susceptibility, severity and perceived barriers, (p <0.05), (Vazini & Barati, 2015). Additionally, and in accordance with the Model, perceived severity was positively related to perceived benefit and self-efficacy in that if a threat is perceived, action is taken by the individual to decrease that threat.

Based upon these results the researchers suggested that HCPs should provide educational material tailored specifically to T2DM that emphasize self-efficacy and the promotion of self-management behaviors. The study was limited by the following two factors: (1) a cross-sectional design; and (2) participants that did not have complications from DM, which excluded over half the subjects diagnosed with the disease (CDC, 2017).

Understanding the Importance of Preventive Measures

In another study that utilized the HBM, Woringer et al. (2017) noted that based on the theory, subjects with adequate knowledge concerning cardiovascular disease, as well as, possible exposure to consequences of the illness, may have increased understanding of the importance of preventive measures. Further, such individuals have greater chances of making appropriate lifestyle choices that are essential for disease prevention, especially during the early stages of DM. In addition, Shabibi et al. (2017), who evaluated self-

management behaviors of patient's diagnosed with T2DM, pointed out that the HBM is a compelling Model to use in a DM population because it centers on disease prevention or control through the adoption of healthy behaviors.

CRITICAL EVALUATIVE REVIEW OF RELEVANT RESEARCH

Review of Literature Related to Diabetes Mellitus

Ninety-five percent of decisions about self-care are made by the patient, on a daily basis, despite the fundamental role of health care providers (HCPs) (Petricek et al., 2009). Yet, according to Enserro et al. (2018), the number of Americans with ideal heart health, has steadily declined over the last two decades. The AHA (2018) measures ideal heart health with a scoring system of zero to three, containing 7 lifestyle factors; body mass index, activity level, BP, fasting blood glucose levels, diet, smoking status, and cholesterol values. The decline is mostly due to lifestyle changes that have led to unhealthy habits resulting in weight gain, higher blood pressure, cholesterol and blood glucose levels. These preventable determinants decrease the life expectancy of up to ten years and at least doubles the risk of mortality, in those with DM (Einarson et al., 2018).

Determinants of Health Outcomes in T2DM

In research that sought to establish health behaviors, treatment beliefs, and a link with health outcomes in T2DM, Von-Arx, Gydesen & Skovlund, (2016) found that people with the disease usually undergo regular psychological challenges caused by several factors or determinants. Specifically, such determinants include frequent monitoring of blood glucose levels, medication adherence, lifestyle adjustments, disease prevention, as well as, the management of prolonged complications. These challenges

indicate that individuals who suffer from DM need to determine appropriate coping mechanisms that would help self-manage health outcomes.

In this large-scale, cross-sectional study, respondents, who were all using insulin, completed a 27-question survey concerning health beliefs and health behaviors. Study outcomes indicated that health behaviors are stronger predictors for health outcomes than health beliefs. Adherence to regimens and blood glucose monitoring was significantly linked to meeting A1c, BP and cholesterol targets, ($p = < 0.001$). Study outcomes also highlighted the need for more attention and commitment to appropriate diabetes care to improve CVD risk. Unfortunately, the following factors limited the application of the study findings: (1) the cross-sectional survey did not allow for a causal relationship to be established; (2) the data collected only represented one-third of the respondents who were identified for the study, and (3) the population was elderly, average age 67, so generalizability outside of this age group could not be established.

Lifelong Self-Management Behaviors

Shabibi et al. (2017) undertook a study that centered on self-management behaviors of patients with established T2DM. The researchers adopted a quasi-experimental research method through which they used a multi-stage random sampling technique to collect quantitative data. Findings reveal that those who had been exposed to educational classes demonstrated substantial improvement in diabetes self-management practices, ($p<0.001$). In accordance with similar studies, (Von-Arx et al., 2016; American Heart Association, 2018), the researchers found that the need for lifelong self-management practices is paramount for those who have DM. Additionally, the study showed that an increased degree of awareness among people with DM is crucial for the

self-management of the condition, a point that has also been supported by the ADA (2019) and the IDF (2018).

Primary Determinants of Self-Care

Appropriate health care is a critical matter especially among people living with T2DM. Kugbey, Asante, and Adulai (2017) analyzed IP, knowledge management, and self-care behaviors among individuals living with type-2 diabetes. The researchers discovered that both cognitive as well as emotional understandings of the complications of DM, are fundamental factors acting as the primary determinants of the patients' self-care practices. The study found that there is a significant relationship between IP and diabetes knowledge, ($p < 0.001$), and the two together determined diabetes self-care behaviors, ($R^2 = .26$, $F = 27.05$, $p < 0.001$). The findings also suggest that IP and diabetes knowledge predict positive dietary habits, ($R^2 = .32$, $F = 37.26$, $p < 0.001$). Blood glucose monitoring was significantly predicted only by diabetes knowledge, not IP, ($R^2 = .19$, $F = 18.12$, $p < 0.001$). As Shabibi et al.'s (2017) study supported the significance of IP and how the concept is critical for self-care among people with DM, this cross-sectional survey also confirmed the importance of patients' familiarity with their disease.

Kugbey et al., (2017) further asserts that it is essential for healthcare workers to adopt psychosocial interventions that may assist in improving patients' adherence to evidence-based self-care practices. However, the findings of this study were limited by the following; (1) the cross-sectional design; (2) self-reported outcome data which may have led to biased results; and (3) a disproportionate sample with 115 females and only 45 males.

DEFINITION OF VARIABLES

Illness Perception

Illness perception (IP) is conceptually defined as the views and beliefs that one will develop when diagnosed with a disease or health threat. These beliefs are fluid and can be affected by a patient's knowledge base, experiences, causal beliefs and consequences the person links to the illness (Petrie & Weinman, 2006). Illness perception may promote patient control of illness. Adherence to treatment processes and perceptions of health conditions may enhance coping mechanisms and facilitate the realization that healthy behaviors improve medication adherence and health outcomes (Broadbent, Donkin & Stroh, (2011); Nie, Han, Xu, Huang & Mao, (2018); Nur, 2018; Petrie & Weinman, 2006).

Brief Illness Perception Questionnaire (B-IPQ)

Numerous studies regarding illness perception (IP) exist in the literature regarding multiple disease states, including DM. To evaluate and operationally define the level of IP among people living with diseases, including DM and CVD, researchers have successfully used the Brief Illness Perception Questionnaire (B-IPQ), a 9-question likert-scale survey, with Cronbach's alpha's ranging from 0.76 to 0.92 (Broadbent et al., 2011; Kugbey et al., 2017; Nur, 2018; Petricek et al., 2009)

IP and Adherence

Broadbent et al. (2011) used the B-IPQ to evaluate the perceptions of DM and medication as well as the relationship to adherence and blood glucose control. In the cross-sectional study involving 157 subjects with DM, the researchers concluded that adherence was related to low perceived consequences and higher personal control of the

disease. Medication adherence was significantly more important than diet or exercise in controlling diabetes, (p = < 0.001). Eighty-six of the study participants reported lower negative outcomes of DM and higher IP scores in personal control, when adherent to prescribed treatment, ($p < 0.05$). Only 22% of the participants reported adhering to their dietary regimen, which was associated with lower IP scores, ($r = -0.22$, $p < 0.01$). Therefore, the researchers recommend enacting interventions that will increase a patients IP in order to improve medication and dietary adherence and positive health outcomes. The study was limited by the cross-sectional design.

IP and Self-Care

Many researchers support the assertion that IP has a significant influence on patients' self-care behaviors (Broadbent et al., 2011; Kugbey et al., 2017; Petricek et al., 2009; Webster & Heeley, 2011). Using a descriptive cross-sectional design, Nie et al. (2018), explored the relationship between IP, perceived risk of developing diabetes complications, and self-management behaviors. After surveying 304 subjects, the researchers identified a significant relationship between IP, risk perception, and self-management. Subjects with higher IP and risk perception scores had healthier self-management behaviors. As with many studies in the review, the cross-sectional design excluded interpretation of causal relationships. Further, the use of non-random sampling limits the generalizability of the conclusions of this study.

Nur (2018) utilized the B-IPQ to study the level of IP, CV health behavior and the relationship between the two variables in 235 subjects with CVD. The researcher found comparable results to Nie et al. (2018); subjects with a higher level of IP had better CV health behaviors, ($r = 0.38$, $p < 0.01$). The researcher recommended heightened

awareness regarding the development of interventions by HCP's to promote IP and healthy behaviors in those with CVD. Nur (2018) further recognizes that perception is essential to patients and can be acquired through prolonged interaction between patients and physicians as well as with family members.

Greco et al. (2015) used the B-IPQ and 2 additional instruments to investigate the impact IP and self-efficacy has on illness severity and health satisfaction. Seventy-five participants, with CVD, completed a self-reported questionnaire, as part of a prospective study. The researchers found that IP negatively affected health satisfaction, in other words, IP affects health outcomes more than the severity of the disease, (r = -0.32, p < 0.05). The researchers recommend incorporating IP and self-efficacy into a health care regimen to assist patients, with CVD, to better cope with and adhere to treatment. This study is limited by the small number of participants, the inclusion of multiple types of CVD without differentiation, and the lack of demographic variables to distinguish different characteristics of the participants.

IP and Glycemic Control

Voigt et al. (2015) evaluated IP scores of 242 Chileans with T2DM, average age of 66, using the B-IPQ. The aim of the cross-sectional study was to determine whether IP was associated with glycemic control. The results showed IP scores were significantly higher in participants with poor glycemic control, A1c ≥ 7%, versus those considered to be controlled with A1c values < 7%, (p < 0.01). When demographic characteristics were considered, only age (OR = 2; IC = 2 – 3.3; p = < 0.020) and years since diagnosis (OR = 2.53; IC = 1.15 – 3.3; p = < 0.009) showed significant differences. Controlled participants were older and had been diagnosed with DM for a shorter duration of time.

An almost identical study was done by Malaysian researchers (Lee, The, Malar, Ong & James, 2018), using a sample size of 200, to determine the association between IP and metabolic control, specifically A1c values. The results were consistent with Voigt et al. (2015); the higher the IP score, the lower the glycemic control ($p = < 0.082$). A significant relationship between the BIP-Q domain of identity and A1c was also found ($p = < 0.002$) indicating participants who experienced more symptoms of T2DM had a higher possibility of poor metabolic control. According to the researchers the findings of this study demonstrates how IP can be a predictor for metabolic control. Both studies were limited by the cross-sectional design and both carried out in a single medical clinic.

IP and Control of CVD Risk Factors

Petricek et al. (2009) utilized the B-IPQ, in a cross-sectional study, to evaluate IP and its relationship with the degree of control over CVD risk factors in T2DM. The researchers found that IP is moderately associated with the patients feeling of control over CVD risk factor.

The researchers point out that appropriate awareness of T2DM enables patients to interpret symptoms accurately, report precise signs of DM, and acquire the relevant disease self-management behaviors. The researchers discovered that people with DM have the ability to: (1) make most of the decisions that affect their health; (2) discern appropriate health conditions that may assist patients to enhance communication practices with healthcare providers; and (3) embrace specific treatment regimes. Desirable behaviors among those with T2DM, as noted by Petricek et al. (2009), include adequate physical exercises, glucose level regulation, and adherence to healthy practices. The results emphasized the role of the HCP in addressing patient's illness perceptions in order

to adopt interventions to improve self-management techniques and health outcomes. These findings were limited due to the use of a cross-sectional design, which did not explain a causal relationship between the concepts of IP and CVD risk factors. Nevertheless, this research corresponds with other studies in highlighting the importance of DM self-management skills to improve health outcomes (Shabibi et al., 2017; Von-Arx et al., 2016).

Based on the findings of this review, it is evident that IP plays a critical role in the lives of patients with T2DM as these individuals may become highly concerned regarding their illnesses, consequences of the illness, financial challenges, and the ensuing burden to their households. Accordingly, IP may significantly influence self-care management among people with DM.

Risk Awareness

Risk awareness (RA) is conceptually defined as a fundamental factor that may help healthcare providers identify vulnerable patients and offer appropriate healthcare interventions regarding CVD. According to Woodward (2011), RA, in the healthcare environment, is the recognition of inherent risks or hazards that can result in patient harm. Woodward (2011) further explains that an individual's awareness of a risk(s) can potentially prevent future impairment by altering plans or behaviors. Risk perception has been conceptually defined in previous studies, to identify a person's level of personal control, worry, optimism, personal disease risk and environmental disease risk (Nie et al., 2017; Walker et al., 2007). Woringer et al. (2017) stated that the general populations must be aware of current health risks to enable the adoption of healthy lifestyle behaviors, such as proper diet, adequate physical exercise, alcohol consumption, and smoking behaviors.

CVD Risk Awareness

Risk factors for cardiovascular disease risk awareness (CVD-RA) were evaluated by Jacobs, Burke, Rouse, Sarma & Zaric (2016) using self-reported outcome behaviors and measurements of weight, blood pressure and cholesterol. In the cross-sectional study, researchers used data from the Sun Life-Ivey Workplace Wellness Return on Investment Study to question 820 participants in Canada. In all, only 31.5% of the respondents were aware of all three risk factors while 39.5% were not aware of at least one the CVD risks. Results from this study are in line with others (Petricek, 2009; Woodard, 2011; & Woringer, 2017) that suggest HCPs talk to their patients about specific CVD risks which in turn may aid in the adoption of preventive health behaviors. This study used a cross-sectional design which did not allow for a causal relationship to be established. The researchers relied on self-reported outcome data which may have led to biased results. Importantly, the researchers did not report reliability data in the questionnaires, which can lead to doubt whether the surveys are accurately measuring the construct.

Unlike other studies that reported a direct relationship between individuals who have experienced DM or CVD and their awareness of relevant risk factors, Kilkenny et al. (2017) determined that a subject's prior encounter with CVD does not result in adequate knowledge regarding the diseases. This Australian study utilized questionnaires and direct interviews to measure the degree of RA among subjects based on risk status. Grounded in data from 4,647 participants, researchers found that those with CVD (OR: 0.66; 95% CI:0.55, 0.80; $p = < 0.001$), or who were at risk for CVD (OR: 0.65; 95% CI: 0.57, 0.73; $p = < 0.001$), often had less knowledge of risk factors for CVD than those who were risk free. Overall, the study identified men over 55 years of age as likely to

lack the proper awareness for complications of DM (OR: 0.59; 95% CI: 0.52, 0.66; $p = <$ 0.001). The discoveries confirmed the need to prioritize health education among high risk groups to help reduce the prevalence of DM and CVD globally. The study is limited by: (1) convenience sampling that may not be representative of the general population; (2) closed ended questions were used evaluated levels of knowledge; and (3) the use of a large database of subjects participating in a national program to increase public awareness of stroke and CVD.

Operational Definition of CVD-RA

A valid operational definition or measurement of CVD-RA was not established until 2017 by Woringer et al. After modification, validity testing and reliability scoring, Woringer et al. (2017) developed a 26-question tool called the ABDC Risk Questionnaire (ABCD-RQ), designed to evaluate the awareness of CVD risk. This is the first tool to evaluate CVD-RA specifically, as other tools simply evaluated heart disease or risk factors for heart disease. The validity and reliability of the ABCD-RQ was initially demonstrated in August 2017, using a sample of 110 subjects with at least one or more CVD risk factors. Content validity was verified with a score of ≥ 0.80 and reliability was demonstrated with Cronbach's alpha scores of 0.56, 0.70, 0.82 & 0.85, respectively. The questionnaire has four (4) content areas;

- Knowledge of CVD Risk and Prevention (8 items),
- Perceived Risk of Heart Attack and Stroke (7 items),
- Perceived Benefits and Intentions to Change (7 items), and
- Healthy Eating Intentions (3 items).

Higher sum scores represent higher perception of risk. To this date, the instrument has not been evaluated in a population with DM.

GAPS IN THE LITERATURE

A heightened awareness exists in the medical community around CVD in T2DM, focused on interventions that can decrease the rates of morbidity and mortality in this population. At this time, no studies have identified the level of CVD-RA in adults with T2DM, which is a fundamental task in developing interventions centered around CVD prevention. Secondly, the relationship between IP and CVD-RA in T2DM has not been evaluated. In particular, understanding how these relationships affect people with T2DM may help HCPs develop communication skills and or interventions to improve self-management skills and health behavior outcomes. Finally, CVD-RA, has not been studied in subjects with DM, utilizing the ABCD-RQ. Consequently, this study seeks to be the first to verify the reliability of the Questionnaire in adult subjects with T2DM.

SUMMARY

The incidence of Type 2 DM continues to rise. This chronic disease is closely linked to CVD, bringing with it a 2 to 4 times increased risk for developing CVD, and a 2 out 3 risk of dying from the disease. Finding effective interventions to reverse these trends are crucial. Literature reveals that many people with DM and/or CVD are not aware of the risk factors for disease. IP can lead to effective self-management behavior; therefore, HCPs should include IP techniques in clinical practice. Another intervention in the management DM requires appropriate consideration of how IP and CVD-RA are associated and how these concepts may inspire health behaviors in people with T2DM. Per this Review, many studies have evaluated IP and awareness of risk factors for CVD,

however, no studies have assessed the level of CVD-RA, nor IP and CVD-RA, in T2DM, using a verified tool. Lack of such knowledge does not allow HCPs to fully understand how these two variables relate and identify appropriate interventions for managing CVD in T2DM. Therefore, the current research explored this gap in knowledge and furthered the understanding of IP and CVDRA in the T2DM population.

CHAPTER 3: RESEARCH DESIGN

INTRODUCTION

Chapter Three presents the research design. The Chapter begins by identifying the research question, and the research methodology (i.e. design and rationale) for exploring the aims. This Chapter describes the application of the cross-sectional design, principles in the study, including participant population, setting, and sampling methods; and data collection, data analysis, and data management strategies. Chapter Three, also, provides a discussion of ethical considerations and techniques utilized to protect the rights and confidentiality of study participants.

CENTRAL RESEARCH QUESTION, HYPOTHESIS AND RATIONALE

The central research question was: What is the association between IP and CVD risk awareness (CVD-RA) in adults with T2DM? The central hypothesis was that there is an association between IP and CVD-RA in adults with T2DM. The rationale underlying this study was that the link between IP and CVD would inform decision making around interventions to increase CVD knowledge and improve health outcomes in people with T2DM.

RESEARCH METHODOLOGY

The Design and Rationale

A descriptive, cross-sectional design was conducted to determine the association between IP and CVD-RA in adults with T2DM. A cross-sectional design allows for the collection of data at one point in time. A descriptive research methodology was used to identify and describe the characteristics of the adult participants with T2DM.

POPULATION AND SETTING

Two hundred men and women, with a self-diagnosis of Type 2 DM, were recruited from the University of Texas Medical Branch (UTMB) Health Primary and Specialty Care Clinic in Texas City, Texas. The site was used to post the study flyer (Appendix A) and a table was set up, in an area of the lobby, to recruit participants. A private room was provided for the participant to complete the survey. The sample size was determined based on a power analysis and the desired effect size based on existant literature from the B-IPQ.

SAMPLING METHOD AND ACCESS

Inclusion and Exclusion Criteria

Eligible participants were between the ages of 45 and 75, had a self-reported diagnosis of T2DM, were English speaking and able to participate in the study. According to the Centers for Disease Control (2017), the typical age group diagnosed with T2DM are adults between the ages of 45 and 65. Each year, 809,000 new cases are diagnosed in this age range, compared to approximately 360,000 in other age groups. The risk of new onset CV events increases at about 45 years of age and grows steadily for each decade of life (Sniderman et al., 2016). Additionally, participants up to 75 years of age are included based on the higher risk of mortality due to CVD. Only English-speaking participants were included due to the limitations of the researcher.

Patients were excluded if diagnosed with T1DM, were pregnant, or were non-English speaking.

ETHICAL CONSIDERATIONS

The following ethical considerations for human subjects in research were utilized

in this study:

- Informed Consent. - Participants were provided a “fast fact” sheet that offered an overview of the research study (Appendix B).
- Anonymity. - Prior to starting the survey, a statement was presented highlighting the anonymity, of the study and that voluntary participation constituted consent.
- Withdrawal. - The participants were also informed that withdrawal from the study could be done at any time, without affecting the care they received at UTMB.
- Confidentiality. - To protect the participants identity, names and any identifying information were not obtained nor appeared on any of the study documents.

MEASUREMENT METHODS

Three instruments were used in the study: (a) a Demographic Data Questionnaire; (b) The Brief Illness Perception Questionnaire (B-IPQ); and (c) the ABCD Risk Awareness Questionnaire (ABCD-RQ).

Demographic Data Questionnaire

The demographic survey (Appendix C) included the participant’s age, race, and education level. It also included questions related to the participants’ diagnosis of T2DM, such as the length of time since diagnosis, educational class attendance, last A1c value, and whether or not the participant was currently taking medication for blood pressure, cholesterol and/or diabetes. These demographic variables were used to describe the characteristics of the sample and explore relationships between other study variables.

The Brief Illness Perception Questionnaire (B-IP-Q)

Illness perception (IP) was assessed using the Brief Illness Perception Questionnaire (B-IPQ) (Broadbent et al., 2006) (Appendix D). The instrument is designed to assess the various cognitive and emotional components of IP. The B-IPQ has nine (9) items: eight (8) illness representation items and a causal perception scale. All the items except for the causal question are rated using an 11-point end-defined response scale, with the higher score indicating strong beliefs about the negative aspects and outcomes of T2DM. Five (5) of the eight (8) items assess cognitive illness representations: "consequences" (Q1) "timeline" (Q 2), "the degree of personal control over the disease" (Q 3), "treatment control" (Q 4), and "identity" (Q 5). Two (2) of the eight (8) questions assess emotional representations: "concern" (Q 6) and "emotional response" (Q 7), while one (1) question assesses "illness understanding" (Q 8). Question nine (9) is open ended, asking for the top three (3) reasons, they believe, caused their T2DM. Previous research demonstrates that the B-IPQ has proven reliability measures from multiple studies including people with T2DM, with alpha coefficients ranging from 0.71 to 0.88 (Broadbent, Donkin, & Stroh, 2011; Nie et al, 2017).

ABCD Risk Questionnaire

The ABCD-RQ (Appendix E) is a 26-item survey developed to assess awareness of a person's risk of cardiovascular disease (Woringer, et al, 2017). This is a new instrument, the first to specifically evaluate CV risk awareness. The reliability and validity of this tool was initially demonstrated in August 2017, through content validity, face validity and a Cronbach's alpha of 0.56 - 0.85, in a population with at least one or more CVD risk factors. The questionnaire has four (4) content areas; Knowledge of CVD Risk

and Prevention [eight (8) items], Perceived Risk of Heart Attack and Stroke [seven (7) items], Perceived Benefits and Intentions to Change [seven (7) items], and Healthy Eating Intentions [three (3) items]. Higher sum scores represent higher perception of risk. This tool has not previously been studied in a diabetes population; therefore, this study was the first to assess the reliability of the ABCD-RQ in those diagnosed with T2DM.

DATA COLLECTION PROCESS

After obtaining approval from the Institutional Review Board (IRB) of the University of Texas Medical Branch at Galveston, Texas, a survey link for this study was created in Survey Analytics. In order for the participants to answer questions via an i-Pad, the following three (3) questionnaires were uploaded: a Demographic Data Questionnaire, the Brief Illness Perception Questionnaire (B-IPQ), and the ABCD Risk Questionnaire (ABCD-RQ). After approval from the clinic manager, a table was set up in the lobby of the UTMB Specialty clinic, in Texas City, Texas and flyers (Appendix A) were posted on each of the entrance doors, to aid in the recruitment of participants.

Data collection began on April 1, 2019 and concluded on August 2, 2019. As prospective participants approached the table, a "fast fact" sheet (Appendix B) was provided as an overview of the research study. If interested, the researcher verified inclusion criteria and the i-Pad was handed to the participant to complete the survey. Seventy-eight (78) of the participants were not comfortable using an i-Pad, so a handout including the "fast fact" sheet, the demographic questionnaire and the two surveys, was provided. Once the survey was completed, a $10 gift card was provided to the participant

LIMITATIONS AND ASSUMPTIONS

Assumptions

The following assumptions have been identified for this study:

- The ability to complete the survey questionnaires will be assumed to be an indication of capacity to participate as a subject in this study.
- All subjects have not been exposed to CVD health information.
- All subjects will have different levels of reading comprehension.

Limitations

The following limitations have been identified for this study:

- The cross-sectional design does not allow for the determination of causality.
- Some subjects have previously been exposed to CVD health information in primary care or other clinics.
- Diabetes experts may not agree on the content validity of individual questions in the survey questionnaires.
- Information used in individual questions in each survey questionnaire may generate false negative or false positive responses.
- Terminology used in individual questions may be misleading and result in inaccurate responses.
- False negative or false positive responses to individual survey questions may affect the scoring and thus the generalizability of the study outcomes.
- Individual questions on each survey questionnaire may not have been written at the education and/or comprehension level of all the subjects.

DATA ANALYSIS PROCEDURES

Data were analyzed using the Statistical Package for Social Sciences (SPSS) software (Version 25). Significance was calculated at ∂ =.05. All data were examined for normality and homogeneity. Descriptive statistics consisting of mean, standard deviation, frequency, percentage, range, and minimum and maximum values will be used to present the demographic data and health information of the study participants.

The statistical analyses are described by the specific aims, research questions, and analysis below.

Specific Aim 1

The *first aim* was to determine the level of awareness of CVD risk in adults with T2DM.

Research Question 1:

What is the level of awareness of CVD risk in adults with T2DM?

Data Analysis 1: Descriptive Statistics were used to evaluate results from two questions on the ABCD-RQ.

Specific Aim 2

The *second aim* was to determine the relationship between IP and CVD-RA in adults with T2DM.

Research Question 2:

What is the relationship between illness perception and CVD-RA in adults with T2DM?

Data Analysis 2: Analysis included Pearson correlation to determine the relationship among the illness perception and CVD risk awareness, including each section of the questionnaire: knowledge, perceived risk, perceived benefits and healthy eating. Multivariate linear regression was performed to evaluate the association between IP and CVD-RA, after adjusting for covariates.

Specific Aim 3

The *third aim* was to verify the reliability of the ABCD-RQ in adults with T2DM.

Research Question 3:

What is the reliability of the ABCD-RQ in adults with T2DM?

Data Analysis 3: The data was analyzed using Cronbach's Alpha was used to verify the reliability of the ABCD-RQ in a T2DM population

SUMMARY OF CHAPTER

Chapter Three presented the research design. The Chapter began by identifying the research question, and the research methodology (i.e. design and rationale) for exploring the aims. The Chapter described the application of [methodology] principles in the study, including participant population, setting, and sampling methods; and data collection, data analysis, and data management strategies. The Chapter also provided a discussion of ethical considerations and techniques utilized to protect the rights and confidentiality of study participants.

CHAPTER 4: FINDINGS

INTRODUCTION

Chapter 4 presents the results of the study. The analyses examined the association between illness perception (IP) and cardiovascular risk awareness (CVD-RA) in adults between the ages of 45 and 75 with T2DM. The Specific Aims of the study were to determine the level of awareness of CVD risk in adults with T2DM, the relationship between IP and CVD-RA in adults with T2DM, and to verify the reliability of the ABCD-RQ. This chapter is organized in the following manner: Descriptions of the demographic characteristics of the sample, followed by the psychometric properties of the instruments used in this study, as well as, the findings for each research question.

SAMPLE CHARACTERISTICS

Descriptive Statistics for Demographic Variables.

Among the 200 study participants, there were 76 (38%) males and 124 (62%) females. The average (and standard deviation) age was 62.6 (8.2) and the range was 45 to 75. The racial distribution was 96 (48%) Caucasian, 41 (21.5%) Hispanic, 56 (28%) Black, 4 (2.0%) Latino, and 1 (0.5%) Other. The distribution of highest education level achieved was 15 (7.5%) did not complete high school; 116 (58%) high school or GED; 30 (15%) Associates degree; 30 (15%) Bachelor's degree, and; 9 (4.5%) Master's degree. The average length of time a participant has been diagnosed with DM was 10.64 (8.5) years with a mean, most recent self-reported, A1c of 7.6% (1.37). Only 72 (36%) have ever attended diabetes education classes. Most of the participants, 160 (80%), stated a primary care doctor manages their disease and usually sees the physician every 4-6 months, 103 (51.5%) or every 1-3 months, 75 (37.5%). The vast majority of the

participants were prescribed medication to treat diabetes, only 9 (4.5%) were not receiving treatment. Of the 95.5% of participants taking medication, 126 (63%) were on pills only, 38 (19%) were on both pills and insulin, and 20 (10%) were only prescribed insulin. A total of 67 (33.5%) of study participants reported the presence of one or more DM comorbidities, e.g. nephropathy, neuropathy, and/or retinopathy. See Appendix F, Table 1, Descriptive Statistics for Participants Demographic Data.

PSYCHOMETRIC ESTIMATES FOR THE SAMPLE

Sample Size Justification

The correlation between IP and adherence, self-care, or CVD risk factor from literature reviews were in the range of 0.2 to 0.3 (Chapter 2). A sample size of 193 will reach a power of 80% to detect a correlation coefficient of 0.2 at a 0.05, 2-sided significant level. In addition, a sample size of 201 on a measurement with 26 items produces a two-sided confidence interval of Cronbach's Alpha between 0.70 and 0.80. Therefore, a final sample size of 200 was chosen. All of the above calculations were made using the power software, Power Analysis and Sample Size (PASS 2019).

PSYCHOMETRIC PROPERTIES OF THE INSTRUMENTS

The Dependent Variable

First, reliability of each instrument, utilized in this study sample, was calculated using Cronbach's alpha coefficients and are depicted in Table 4.1, Instrument Reliability. The *dependent variable*, perceived illness severity was measured by the "The Brief Illness Perception Questionnaire" (B-IPQ). This instrument has been used extensively in research and the validity and reliability have been well established with Cronbach's alpha's ranging from 0.76 to 0.92 (Broadbent et al., 2011; Kugbey et al., 2017; Nie et al.,

2018; & Nur, 2018). Question 9, of this instrument, is open ended, asking for the top three (3) reasons the participants believe, caused their T2DM. Answers to this question were not utilized in the analysis due to the extreme variety of answers. For purposes of this study, Cronbach's alpha was calculated for the overall total score based on eight (8) survey questions measured on a 0 to 10-point scale. Cronbach's alpha was found to be 0.690. While a common rule-of-thumb is that 0.70 or greater is considered acceptable reliability, the 0.690 value was considered close enough to meet the acceptable reliability criteria.

The Independent Variable

The *independent variable,* cardiovascular disease risk awareness, was evaluated using the "ABCD Risk Questionnaire (ABCD-RQ). Cronbach's alpha reliability for the instrument was 0.702. Four (4) dimensions of this instrument were evaluated to provide reliability outcomes. Each will be explained, in detail, in a following section. A commonly accepted rule of thumb for what constitutes acceptable reliability is 0.70 or greater, indicating acceptable reliability of this instrument.

Table 4.1. Instrument Reliability Results

Instrument	α	Number of items
B-IPQ	.690	8
ABCD-RQ	.702	26

INTRODUCTION TO MAJOR FINDINGS AND CONCLUSIONS

Specific Aim One

Specific Aim 1: Determine the level of awareness of CVD risk in adults with T2DM.

RQ1.1 What is the level of awareness of CVD risk in adults with T2DM?

Null Hypothesis 1: The majority of people with T2DM are not aware of the increased risk of CVD associated with DM.

Based on the ABCD-RQ, people with T2DM have a Perceived risk of CVD associated with DM of zero (0). A sample *t*-test was used to test this hypothesis. The null hypothesis was rejected because the average Perceived Risk of CVD associated with DM (12.9) was statistically significantly greater than 0; $t\ (129) = 26.0$, $p < 0.001$.

ABCD-RQ Sub-Groups.

To answer this research question, descriptive statistics (Table 4.2. Descriptive Statistics for ABCD-RQ) were used to analyze the four (4) subgroups and one (1) particular question, contained in the ABCD-RQ: (1) Knowledge of Cardiovascular Risk, (2) Perceived Risk of CVD, (3) Perceived Benefits of CVD and Intentions to Change Behaviors, (4) Healthy Eating Intentions for CVD Prevention, and (5) a True/False question, "*People who have diabetes are at a higher risk of having a heart attack or stroke."*

Knowledge of Cardiovascular Risk Score.

The average (and standard deviation) Knowledge of Cardiovascular Risk Score was 6.35 (1.52) and the range was 2.0 to 8.0. Considering this score could take on values between 0 and 8, the average was relatively high, considering the midpoint of the range was 4.0. This indicates that on average, the study participants had a relatively high level of Knowledge of their risk of CVD.

Perceived Risk of CVD.

The average (and standard deviation) Perceived Risk of CVD was 12.9 (5.7) and the range was 1.0 to 28.0. Considering this score could take on values between 0 and 32, the average was relatively low, considering the midpoint of the range was 16. This indicates that on average, the study participants had a relatively low level of Perceived Risk of CVD.

Perceived Benefits of CVD Prevention Behaviors.

The average (and standard deviation) Perceived Benefits of CVD Prevention Behaviors was 14.3 (2.7) and the range was 8.0 to 22.0. Considering this score could take on values between 0 and 28, the average was very near the midpoint of the range (14). This indicates that on average, the study participants had a relatively moderate level of Perceived Benefits of CVD and Intentions to Change Behavior.

Perceived Benefits of Healthy Eating Intentions.

The average (and standard deviation) Perceived Benefits of Healthy Eating Intentions was 6.7 (1.7) and the range was 1.0 to 10.0. Considering this score could take on values between 0 and 12, the average was very near the midpoint of the range (6). This indicates that on average, the study participants had a relatively moderate level of Perceived Benefits of Healthy Eating for CVD Prevention.

Table 4.2. Descriptive Statistics for ABCD-RQ

ABCD-RQ Subgroups	N			Std.			
	Valid	Missing	Mean	Deviation	Min	Max	Values
Knowledge of Cardiovascular Risk Score	200	0	6.350	1.5196	2.0	8.0	0 to 8

Perceived Risk of CVD Score	200	0	12.870	5.6996	1.0	28.0	0 to 32
Perceived Benefit and Intention to Change Behavior Score	200	0	14.345	2.7134	8.0	22.0	0 to 28
Perceived Benefits of Healthy Eating for CVD Prevention Score	200	0	6.670	1.6868	1.0	10.0	0 to 12

True/False Risk Question.

When the participants were asked if, "People with diabetes are at a higher risk of having a heart attack or stroke, 143 (71.5%), considering values between 0 and 100, were aware that having DM puts them at a higher risk for CVD (Table 4.3. Descriptive Statistics for "At Risk" Question).

Table 4.3. Descriptive Statistics for "At Risk" Question

People who have diabetes are at a higher risk of having a heart attack or stroke.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	57	28.5	28.5	28.5
	True	143	71.5	71.5	100.0
	Total	200	100.0	100.0	

In this study, the vast majority of participants were aware of their risk for CVD. Although the Knowledge of CVD risk score was high, the participants had a relatively low perception of their risk of actually developing CVD.

Specific Aim 2

Specific Aim 2: Determine the relationship between IP and CVD-RA in adults with T2DM.

RQ 2.1 What is the relationship between IP and CVD-RA in adults with T2DM?

Null Hypothesis 2: There is no relationship between IP and CVD-RA in adults with T2DM.

The null hypothesis was rejected because the Pearson Correlation statistic was statistically significant, $r(128) = 0.22$, $p = 0.013$. It was concluded that those who perceive a higher level of risk of CVD tend to also perceive a higher level of their IP.

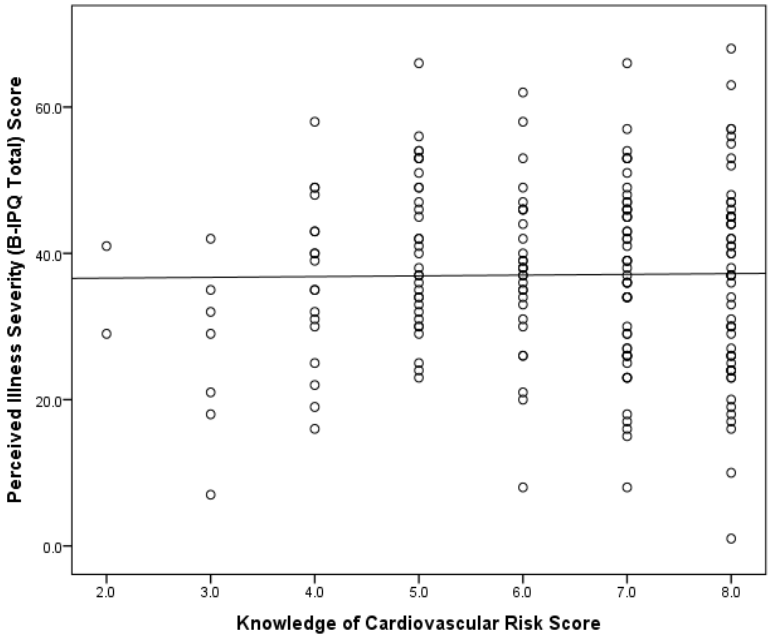
ABCD-RQ Sub-Groups.

To evaluate this research question, Pearson's Correlation was used to determine if there is a relationship between the IP and the four (4) subgroups contained within the ABCD-RQ: (1) Knowledge of CV risk, (2) Perceived Risk, (3) Perceived Benefit and Intentions to Change Behavior, and (4) Healthy Eating Intentions.

Knowledge of CV Risk.

Figure 4.1, Scatter Plot of IP and Knowledge of Cardiovascular Risk, is a scatter plot which graphically depicts the relationship between the IP and Knowledge of CV risk scores among adults between the ages of 45 and 75 with T2DM. The figure shows little or no evidence of a correlation between the two variables. The Pearson's correlation analysis showed the correlation was not statistically significant, $r(198) = 0.013$; $p = 0.86$, small effect size = 0.013. The null hypothesis was not rejected, and it was concluded there is no correlation between IP and knowledge of cardiovascular risk among adults between the ages of 45 and 75 with Type II DM.

Figure 4.1. Scatter Plot of IP and Knowledge of Cardiovascular Risk

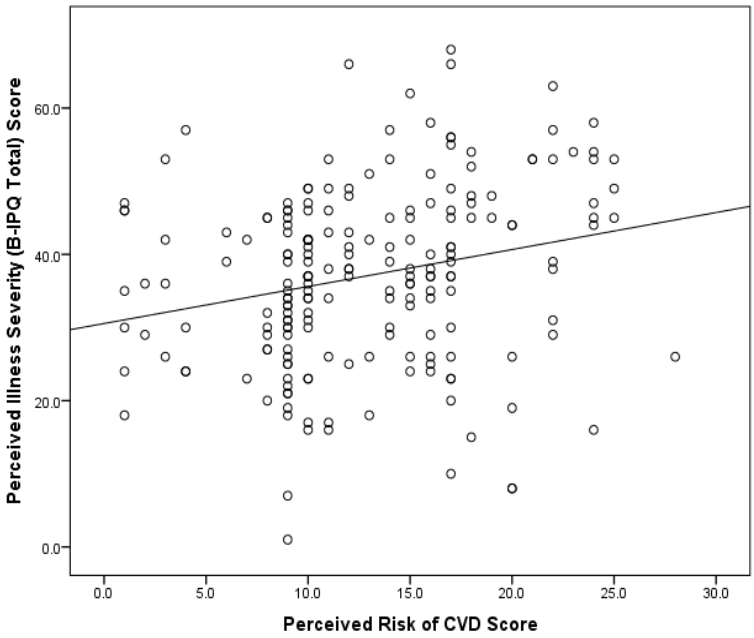


Pearson's correlation: r(198) = 0.013; p = 0.86, small effect size = 0.013

Perceived Risk of CVD.

Figure 4.2, Scatter Plot of IP and Perceived Risk of CVD, is a scatter plot which graphically depicts the relationship between IP and Perceived risk of CVD scores among adults between the ages of 45 and 75 with T2DM. The figure shows some evidence of a positive correlation between the two variables. The Pearson's correlation analysis showed the correlation was statistically significant, $r(198)$ = 0.24; p = 0.001, small to medium effect size = 0.24. The null hypothesis was rejected, and it was concluded that those who perceive a higher level of risk of CVD tend to also perceive a higher level of their IP among adults between the ages of 45 and 75 with T2DM.

Figure 4.2. Scatter Plot of IP and Perceived Risk of CVD

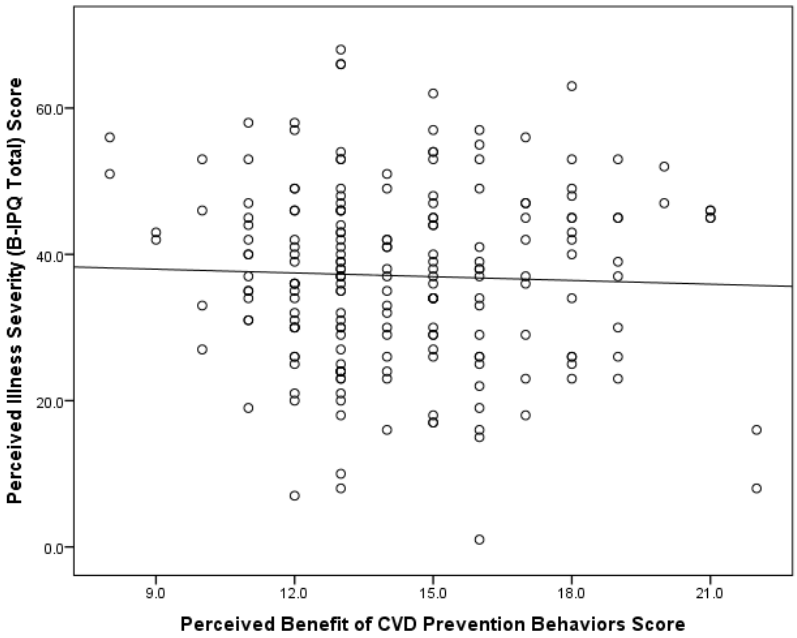


Pearson's correlation $r(198) = 0.24$; $p = 0.001$, small to medium effect size = 0.24

Perceived Benefits of CVD Prevention Behaviors.

Figure 4.3. Scatter Plot of IP and Perceived Benefits of CVD Prevention Behaviors, is a scatter plot, which graphically depicts the relationship between IP and perceived benefits of CVD prevention behaviors scores among adults between the ages of 45 and 75 with T2DM. The figure shows some evidence of a negative correlation between the two variables. However, the Pearson's correlation analysis showed the correlation was not statistically significant, $r(198) = -0.038$; $p = 0.60$, small effect size = 0.038. The null hypothesis was not rejected, and it was concluded there is no correlation between perceived illness severity and perceived benefits of cardiovascular disease prevention behaviors among adults between the ages of 45 and 75 with T2DM.

Figure 4.3. Scatter Plot of IP and Perceived Benefits of CVD Prevention Behaviors

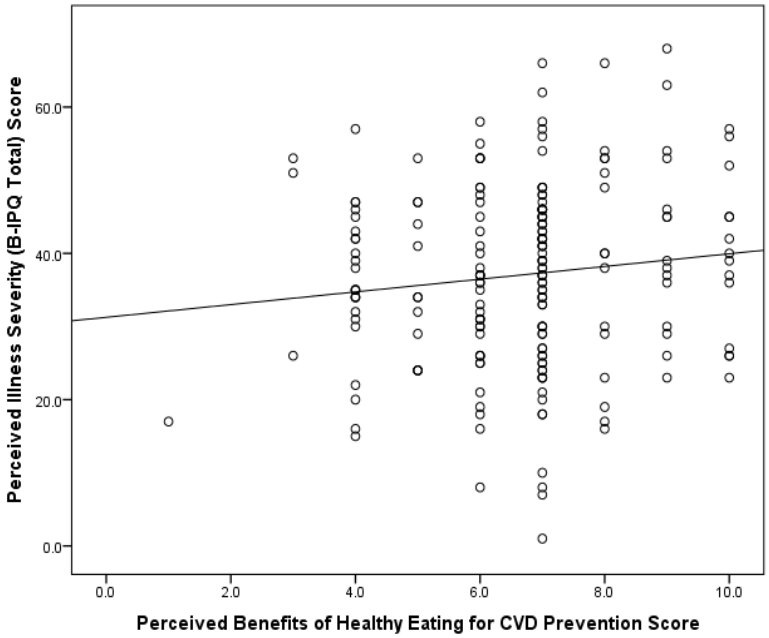


Pearson's correlation: $r(198) = -0.038$; $p = 0.60$, small effect size = 0.038

Perceived Benefits of Healthy Eating Intentions.

Figure 4.4. Healthy Eating Intentions for CVD Prevention, is a scatter plot which graphically depicts the relationship between the IP and healthy eating intentions for CVD prevention among adults between the ages of 45 and 75 with T2DM. The figure shows some evidence of a positive correlation between the two variables. The Pearson's correlation analysis showed the correlation was not statistically significant, $r(198) = 0.12$; $p = 0.091$, small effect size = 0.12. The null hypothesis was not rejected, and it was concluded there is no correlation between perceived illness severity and healthy eating intentions for cardiovascular disease prevention among adults between the ages of 45 and 75 with T2DM.

Figure 4.4. Scatter Plot of IP and Healthy Eating Intentions for CVD Prevention



Pearson's correlation: $r(198) = 0.12$; $p = 0.091$, small effect size = 0.12

Additional Exploratory Analysis of Illness Perception

Subsequent to the primary analyses, it was of interest to investigate the possibility that other variables may have been related to the dependent variable IP. Specifically, the other variables that were investigated were A1c (≤ 7% versus >7%), age, comorbidities, duration of diabetes, and the attendance of diabetes education programs.

Illness Perception Score Based on A1c.

The *first analysis* was an independent samples t-test to determine if there was a difference in the average IP Score between those with an A1c ≤ 7% versus those with an A1c > 7%. The results of the analysis showed there was not a statistically significant difference between the two groups, $t(192) = -1.01$; $p=0.31$; effect size $d = 0.15$. Additionally, the mean and standard deviation scores were calculated, based on the categorical variable, and presented in Table 4.4, Illness Perception (B-IPQ) Score Based

on A1c. In conclusion, there was insufficient evidence to suggest IP has any relationship to whether the patient's A1c score was ≤ 7% or greater than 7%.

Table 4.4. Illness Perception (B-IPQ) Total Score Based on A1c

What was your last A1c result?	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				
A1c ≤ 7	74	0	36.041	11.0917	8.0	66.0
A1c > 7	120	0	37.850	12.6807	1.0	68.0

Illness Perception Score Based on Age.

The *second analysis* was a correlation analysis of the relationship between the IP and age among adults between the ages of 45 and 75 with T2DM. The Pearson's correlation analysis showed the correlation was not statistically significant, $r(198) = 0.003$; $p = 0.96$, small effect size $d = 0.003$. It was concluded there is no correlation between IP and age among adults between the ages of 45 and 75 with T2DM.

Illness Perception Score Based on Complications.

The *third analysis* was an independent samples t-test to determine if there was a difference in the average IP score between those with a comorbid condition compared to those without a comorbid condition. Three conditions were considered comorbid: (1) Retinopathy, (2) Nephropathy, and (3) Neuropathy. Consequently, 133 (66.5%) study participants reported they had none of the three (3) complications of DM and 67 (33.5%) reported having at least one of the three (3) comorbid conditions. The results of the analysis show there was a statistically significant difference between the two groups, $t(198) = -3.18$; p=0.002; effect size $d = 0.48$. Additionally, mean and standard deviation statistics were calculated based on the categorical variable of having a complication or not (Table 4.5. Illness Perception (B-IPQ Total) Score Based on Complications). In

conclusion, there is statistically significant evidence to suggest those with one or more diabetes related complications, on average had a higher IP score compared to those who reported no diabetes related complications of the eye, kidney or nerves.

Table 4.5. Illness Perception (B-IPQ) Total Score Based on Complications

Any comorbidities of the eye, kidney or nerves?	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				
No	133	0	35.150	13.2742	1.0	68.0
Yes	67	0	40.851	8.7961	19.0	58.0

Illness Perception Score and Duration of Diabetes.

The *fourth* analysis was a correlation analysis of the relationship between IP and duration of diabetes (i.e. How many years have you been diagnosed with diabetes?) among adults between the ages of 45 and 75 with T2DM. The Pearson's correlation analysis showed the correlation was statistically significant, $r(198) = 0.18$; $p = 0.011$, small effect size $d = 0.18$. It was concluded that among adults between the ages of 45 and 75 with T2DM, the longer they have had diabetes, tends to be associated with a greater IP.

Illness Perception Score and Diabetes Education.

For the *fifth* and final exploratory analysis, an independent samples t-test, was conducted to determine if there was a difference in the average Perceived Illness Severity (B-IPQ) Total Score between those who did versus those who did not ever attend diabetes education classes. Table 4.6, Perceived Illness Severity based on Diabetes Education, shows descriptive statistics for Perceived Illness Severity, separately for the two groups. The results of the independent samples t-test showed there was not a statistically

significant difference between the two groups, $t(198) = 1.29$; $p=0.20$; effect size $d = 0.19$. In conclusion, there was insufficient evidence to suggest the B-IPQ score had any relationship to whether the patient did or did not attend diabetes education classes.

Table 4.6. Illness Perception (B-IPQ Total) Score Based on Diabetes Education

Have you ever attended diabetes education classes?	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				
Yes	72	0	38.542	10.7663	16.0	68.0
No	128	0	36.227	12.9616	1.0	66.0

Additional Exploratory Analysis of CVD Risk Awareness

Subsequent to the primary analyses, it was also of interest to investigate the possibility that other variables may have been related to the independent variable Cardiovascular Disease Risk Awareness. Specifically, the other variables that were investigated were A1c (≤ 7% versus > 7%), age, comorbidities, duration of diabetes and the attendance of diabetes education programs.

Cardiovascular Disease Risk Awareness Score Based on A1c.

The *first analysis* was an independent samples t-test to determine if there was a difference in the average CVD-RA between those with an A1c ≤ 7% versus those with an A1c > 7%. Table 4.7, CVD-RA Score Based on A1c, shows descriptive statistics for CVD-RA, separately for the two groups. The results of the independent samples t-test showed there was not a statistically significant difference between the two groups, $t(198) = 1.29$; $p = 0.20$; effect size $d = 0.19$. In conclusion, there was insufficient evidence to suggest there is a difference in the average CVD-RA between those with an A1c ≤ 7% versus those with an A1c > 7%.

Table 4.7. CVD-RA Total Score based on A1c

What was your last A1c result?	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				
A1c ≤ 7	74	0	13.068	4.8011	1.0	28.0
A1c > 7	120	0	12.717	6.1305	1.0	25.0

Cardiovascular Disease Risk Awareness Score Based on Age.

The *second analysis* was a correlation analysis of the relationship between the CVD-RA and age among adults between the ages of 45 and 75 with T2DM. There is little or no evidence of a correlation between the two variables. The Pearson's correlation analysis showed the correlation was not statistically significant, $r(198) = 0.089$; $p = 0.21$, small effect size 0.089.

Cardiovascular Disease Risk Awareness Score Based on Complications.

The *third analysis* was an independent samples t-test to determine if there was a difference in the average CVD-RA score between those with versus those without a comorbid condition of the eye, kidney, or nerves. Table 4.8, CVD-RA Score Based on Complications, shows descriptive statistics for CVD-RA, separately for the two groups. The results of the independent samples t-test showed there was not a statistically significant difference between the two group, $t(198) = 0.27$; $p = 0.79$; effect size $d = 0.040$. In conclusion, there was insufficient evidence to suggest CVD-RA has any relationship to whether the patient does or does not have a comorbid condition of the eye, kidney, or nerves.

Table 4.8. CVD-RA Total Score Based on Complications

Any comorbidities of the eye, kidney or nerves?	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				

No	133	0	12.947	5.4081	1.0	25.0
Yes	67	0	12.716	6.2784	1.0	28.0

Cardiovascular Disease Risk Awareness Score and Duration of Diabetes.

The *fourth* analysis was a correlation analysis of the relationship between CVD-RA and the number of years since being diagnosed with diabetes, among adults between the ages of 45 and 75 with T2DM. The Pearson's correlation analysis showed the correlation was statistically significant, $r(198) = 0.19$; $p = 0.006$, small effect size = 0.19. It was concluded there is a weak positive correlation between CVD-RA and number of years since being diagnosed with diabetes among adults between the ages of 45 and 75 with T2DM. For example, there is a tendency for people diagnosed with DM between the ages of 45 and 75, with a longer duration since the time of diagnosis with diabetes, to have a greater Perceived Risk of CVD.

Cardiovascular Disease Risk Awareness Score and Attendance of Diabetes Education.

The *fifth* and final analysis, an independent samples t-test, was conducted to determine if there was a difference in the average CVD-RA score between those who did versus those who did not attend diabetes education classes. Table 4.9, CVD-RA Score Based on Diabetes Education, shows descriptive statistics for CVD-RA, separately for the two groups. The results of the independent samples t-test showed there was not a statistically significant difference between the two group, $t(198) = 0.58$; $p = 0.56$; effect size $d = 0.086$. In conclusion, there was insufficient evidence to suggest Perceived Risk of CVD has any relationship to whether the patient attends or does not attend diabetes education classes.

Table 4.9. CVD-RA Total Score Based on Diabetes Education

Have you ever attended diabetes education classes?	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				
Yes	72	0	12.556	5.4898	1.0	25.0
No	128	0	13.047	5.8281	1.0	28.0

Evaluation of Variable Distribution

The Pearson correlation statistic has been shown to be robust to violations of the normality assumption with large sample sizes (e.g. greater than 30). The sample size for this study was n = 200, making it very robust to violations of the normality assumption. To be thorough, histograms were produced for the independent and dependent variables. All histograms were roughly normally distributed. The normality assumption was considered satisfied for all hypothesis tests. Appendix F, Table 4, "Variable Distributions" shows the histograms for each of the four (4) sub-groups of the ABCD-RQ. A Spearman's Rho Correlation was run to determine if distribution was different, however outcomes between the two analysis were similar.

IP and CVD-RA Association

To evaluate the association between IP and CVD-RA, after adjusting for covariates, multivariate linear regression was performed. Tables 4.10. ANOVA and 4.11. Model Summary demonstrate two models:

- *Model 1* contains only the four covariates: 1) How many years have you be diagnosed with diabetes; 2)What was your last A1c result (≤ 7 vs > 7); 3) Any comorbidities of the eye, kidney or nerves (yes vs no), and; 4) age. The Model was statistically significant, $F(4, 189) = 4.81$; $p = 0.001$; $R^2 = 0.092$; effect size $f^2 = 0.10$ (small effect size).

- *Model 2* demonstrates the effect of adding Perceived Risk of CVD to Model 1. Model 2 was statistically significant, $F(5,188) = 6.76$; $p < 0.001$; $R^2 = 0.15$.

Thus, when controlling for the four covariates, Perceived Risk of CVD explained a statistically significant amount of the variation in IP variance ($R^2 = 0.060$). The effect size for Perceived Risk of CVD after controlling for the four covariates was small, effect size $f^2 = 0.064$ (small effect size).

Table 4.10. IP and CVD-RA ANOVA Summary

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2612.548	4	653.137	4.812	0.001[b]
	Residual	25653.499	189	135.733		
	Total	28266.046	193			
2	Regression	4307.419	5	861.484	6.760	<0.001[c]
	Residual	23958.627	188	127.440		
	Total	28266.046	193			

a. Dependent Variable: IP (B-IPQ Total) Score

b. Predictors: (Constant), How many years have you been diagnosed with diabetes?, What was your last A1c result?, Any comorbidities of the eye, kidney or nerves?, Age

c. Predictors: (Constant), How many years have you been diagnosed with diabetes?, What was your last A1c result?, Any comorbidities of the eye, kidney or nerves?, Age, Perceived Risk of CVD Score

Table 4.11. IP and CVD-RA Regression Model Summary

					Change Statistics
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change
1	0.304[a]	0.092	0.073	11.6504	0.092
2	0.390[b]	0.152	0.130	11.2889	0.060

a. Predictors: (Constant), How many years have you been diagnosed with diabetes?, What was your last A1c result?, Any comorbidities of the eye, kidney or nerves?, Age

b. Predictors: (Constant), How many years have you been diagnosed with diabetes?, What was your last A1c result?, Any comorbidities of the eye, kidney or nerves?, Age, Perceived Risk of CVD Score

c. Dependent Variable: IP (B-IPQ Total) Score

Table 4.12. Regression Coefficients for Multivariable Models

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	*p*-value
1	(Constant)	39.897	6.730		5.928	0.000
	What was your last A1C result?	2.185	1.731	0.088	1.262	0.208
	Any comorbidities of the eye, kidney or nerves?	4.998	1.849	0.195	2.702	0.008
	Age	-0.142	0.111	-0.097	-1.281	0.202
	How many years have you been diagnosed with diabetes?	0.296	0.114	0.202	2.599	0.010
2	(Constant)	34.583	6.682		5.176	0.000
	What was your last A1C result?	2.260	1.678	0.091	1.347	0.180
	Any comorbidities of the eye, kidney or nerves?	5.384	1.795	0.211	2.999	0.003
	Age	-0.160	0.108	-0.109	-1.483	0.140
	How many years have you been diagnosed with diabetes?	0.238	0.112	0.162	2.133	0.034
	Perceived Risk of CVD Score	0.533	0.146	0.249	3.647	<0.001

a. Dependent Variable: Perceived Illness Severity (B-IPQ Total) Score

IP and CVD-RA Variable Dependence

To evaluate whether the relationship between IP and CVD-RA is dependent on certain covariates, multivariate linear regression was performed. Tables 4.13. ANVOA and 4.14. Model Summary, show two models:

- Model 1 contains only the four covariates: How many years have you been diagnosed with diabetes; What was your last A1c result (≤ 7 vs > 7); Any comorbidities of the eye, kidney or nerves (yes vs no), and; age. The model was statistically significant, $F(4, 189) = 4.81$; $p = 0.001$; $R^2 = 0.092$; effect size $f^2 = 0.10$ (small effect size).
- Model 2 shows the effect of adding the four interactions between Perceived Risk of CVD and each of the four covariates to model 1. Model 2 was statistically significant, $F(8,185) = 4.70$; $p < 0.001$; $R^2 = 0.17$; $f^2 = 0.20$. This means the four interactions contributed only 0.076 to the R^2 for the total model. Table 4.13 shows which interactions contributed statistical significance to the model. In particular, only the interaction between Perceived Risk of CVD and A1c was statistically significant, $p = 0.039$.

Table 4.13. IP and CVD-RA Variable Dependence ANOVA Summary

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4557.391	6	759.565	5.991	0.000[b]
	Residual	23708.655	187	126.784		
	Total	28266.046	193			
2	Regression	5067.034	11	460.639	3.614	0.000[c]
	Residual	23199.013	182	127.467		
	Total	28266.046	193			

a. Dependent Variable: Perceived Illness Severity (B-IPQ Total) Score
b. Predictors: (Constant), Have you ever attended diabetes education classes?, Any comorbidities of the eye, kidney or nerves?, Perceived Risk of CVD Score, What was your last A1C result?, Age, How many years have you been diagnosed with diabetes?

c. Predictors: (Constant), Have you ever attended diabetes education classes?, Any comorbidities of the eye, kidney or nerves?, Perceived Risk of CVD Score, What was your last A1C result?, Age, How many years have you been diagnosed with diabetes? , Interaction between Perceived Risk of CVD and whether or not a comorbidity was present (eye, kidney or nerves), Interaction between Perceived Risk of CVD and years since diagnosed with diabetes, Interaction between Perceived Risk of CVD and A1C (0 = <=7, 1 = > 7), Interaction between Perceived Risk of CVD and Diabetes Education (1=yes, 2=no), Interaction between Perceived Risk of CVD and age

Table 4.14. IP and CVD Variable Dependence Regression Model Summary

					Change Statistics
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change
1	0.402[a]	0.161	0.134	11.2599	0.161
2	0.423[b]	0.179	0.130	11.2901	0.018

a. Predictors: (Constant), Have you ever attended diabetes education classes?, Any comorbidities of the eye, kidney or nerves?, Perceived Risk of CVD Score, What was your last A1C result?, Age, How many years have you been diagnosed with diabetes?

b. Predictors: (Constant), Have you ever attended diabetes education classes?, Any comorbidities of the eye, kidney or nerves?, Perceived Risk of CVD Score, What was your last A1C result?, Age, How many years have you been diagnosed with diabetes? , Interaction between Perceived Risk of CVD and whether or not a comorbidity was present (eye, kidney or nerves), Interaction between Perceived Risk of CVD and years since diagnosed with diabetes, Interaction between Perceived Risk of CVD and A1C (0 = <=7, 1 = > 7), Interaction between Perceived Risk of CVD and Diabetes Education (1=yes, 2=no), Interaction between Perceived Risk of CVD and age

c. Dependent Variable: Perceived Illness Severity (B-IPQ Total) Score

Table 4.15. Regression Coefficients for Multivariable Models

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	*p*-value
1	(Constant)	30.157	18.606		1.621	0.107

Perceived Risk of CVD Score	1.004	1.305	0.469	0.770	0.442
What was your last A1C result?	-3.863	4.819	-0.155	-0.802	0.424
Any comorbidities of the eye, kidney or nerves?	8.635	4.377	0.338	1.973	0.050
Age	0.099	0.281	0.068	0.353	0.724
How many years have you been diagnosed with diabetes?	-0.040	0.306	-0.027	-0.131	0.896
Have you ever attended diabetes education classes?	-3.492	4.605	-0.140	-0.758	0.449
Interaction between Perceived Risk of CVD and A1C (0 = <=7, 1 = > 7)	0.489	0.338	0.317	1.444	0.150
Interaction between Perceived Risk of CVD and whether or not a comorbidity was present (eye, kidney or nerves)	-0.238	0.314	-0.138	-0.756	0.451
Interaction between Perceived Risk of CVD and age	-0.018	0.019	-0.557	-0.950	0.343

Interaction between Perceived Risk of CVD and years since diagnosed with diabetes	0.017	0.020	0.200	0.841	0.402
Interaction between Perceived Risk of CVD and Diabetes Education (1=yes, 2=no)	0.126	0.323	0.122	0.391	0.696

a. Dependent Variable: Perceived Illness Severity (B-IPQ Total) Score

Specific Aim 3

Specific Aim 3: Verify the reliability of the ABCD Risk Questionnaire (ABCD-RQ) in adults with T2DM.

RQ 3.1 What is the reliability of the ABCD-RQ in adults with T2DM?

Null Hypothesis 3: The reliability of the ABCD-RQ will not be verified in a population with T2DM.

The null hypothesis was rejected because the mean Cronbach's alpha was 0.70 which establishes acceptable reliability.

ABCD-RQ Sub-Groups.

Cronbach's alpha reliability for the four (4) dimensions to the ABCD-RQ instrument were: (1) Perceived Risk, 0.92; (2) Perceived Benefit, 0.73; (3) Healthy Eating, 0.61; and (4) Knowledge, 0.55 (Table 4.16). The average Cronbach's alpha score was 0.70. A commonly accepted rule of thumb for what constitutes acceptable reliability is 0.70 or greater. The observed Cronbach's alpha statistics for the risk and benefits

scores were above 0.70, indicating acceptable reliability. The knowledge score had a particularly low reliability and is a limitation of this study with respect to further analyses of the knowledge score. The healthy eating score had a Cronbach's alpha score only slightly less than 0.70 and that was not considered to be a major threat to the reliability of subsequent analyses of that variable.

Table 4.16. Cronbach's Alpha Results, displays the Cronbach's alpha scores for this study and the primary publication. Results in this study were similar to initial reliability scores for each subsection of the ABCD-RQ instrument; (1) Perceived risk, 0.85; (2) Perceived benefit 0.82; (3) Healthy eating, 0.56; and (4) Knowledge, 0.72. Even though the Healthy Eating score was well below the minimum threshold of 0.70, it is acceptable for a multiple group scale (Woringer et al., 2017). The Healthy Eating section bears re-evaluation in future studies due to low Cronbach's alpha in both studies.

Table 4.16. Cronbach's Alpha Results

Sub-group	α	α in Primary Study
Perceived Risk	.92	.85
Perceived Benefit	.73	.82
Healthy Eating	.61	.56
Knowledge	.55	.72
Average α	.70	.74

Reliability Based on Patient Characteristics

Due to the low Cronbach's alpha internal consistency reliability statistic for the "Knowledge" score, it became of interest to determine if this low reliability was consistent across various demographic groups such as education level, race/ethnicity, years diagnosed with DM and previous diabetes education. Based on the information

provided by the participants, education was dichotomized into High School or GED versus Associates, Bachelors, Masters; the "Did not complete high school" (n=15) group was eliminated from this analysis because there was no logical group to combine them with. Table 4.17, Education Groups, depicts similar outcomes between the two groups.

Table 4.17. Education Groups

What is the highest level of education you have completed?			N	%	Cronbach's Alpha
High School or GED	Cases	Valid	116	100.0	
		Excluded[a]	0	0.0	
		Total	116	100.0	0.552
Associates, Bachelors, or Masters	Cases	Valid	69	100.0	
		Excluded[a]	0	0.0	
		Total	69	100.0	0.525

a. Listwise deletion based on all variables in the procedure.

Race/Ethnicity was dichotomized into Caucasian (n = 96; 48%) versus Other, Hispanic, Black, Latino, Other (n = 104, 52%). Table 4.18, Race/Ethnicity, shows similar outcomes between the two groups.

Table 4.18. Race/Ethnicity

What is your race?			N	%	Cronbach's Alpha
Other	Cases	Valid	104	100.0	
		Excluded[a]	0	0.0	
		Total	104	100.0	0.521
Caucasian	Cases	Valid	96	100.0	
		Excluded[a]	0	0.0	
		Total	96	100.0	0.508

a. Listwise deletion based on all variables in the procedure.

In this study, participants had an average "Years since diagnosed with diabetes" of 10.64 years. Based on this mean, those with less than or equal to 10.64 years (n = 121;

61%) were coded as 0 (less time with diabetes) while those with more than 10.64 years (n = 79; 39%) were coded as 1 (more time with diabetes). Even though there was a slight numerical difference in the Cronbach's Alpha, Table 4.19, Years with Diabetes, shows the results were similar.

Table 4.19. Years with Diabetes

How many years have you been diagnosed with diabetes?			N	%	Cronbach's Alpha
Less than 10.64 years	Cases	Valid	121	100.0	
		Excluded[a]	0	0.0	
		Total	121	100.0	0.580
More than 10.64 years	Cases	Valid	79	100.0	
		Excluded[a]	0	0.0	
		Total	79	100.0	0.488

a. Listwise deletion based on all variables in the procedure.

Diabetes education was another demographic group that was evaluated for this analysis. Participants were asked if they "have ever attended diabetes education classes" and n = 72 (36%) responded with a "yes" and n = 128 (64%) stated "no". Table 4.20, Diabetes Education, shows, as with the other demographic variables, the results were similar.

Table 4.20. Diabetes Education

Have you ever attended diabetes education classes?			N	%	Cronbach's Alpha
Yes	Cases	Valid	72	100.0	
		Excluded[a]	0	0.0	
		Total	72	100.0	0.578
No	Cases	Valid	128	100.0	
		Excluded[a]	0	0.0	
		Total	128	100.0	0.509

a. Listwise deletion based on all variables in the procedure.

Based on this analysis, the lower reliability statistic for the "Knowledge" score, was not a function of these demographic groups.

SUMMARY OF CHAPTER

Demographic Data

Analyses exploring the association between illness perception (IP) and cardiovascular risk awareness (CVD-RA) in 200 adults between the ages of 45 and 75 with T2DM showed a significance only in the area of Perceived risk of CVD. The study sample, mostly female (62%) and Caucasian (48%) had an average age of 62.64 and had been diagnosed with DM for a mean of 10.64 years. Fifty-one percent (51%) of the participants only had a high school education and 80% said a primary care physician manages their DM. The average A1c was 7.6% with 64% of the participants reporting they had never taken a diabetes education course. Only 33.5% documented having a diagnosis of retinopathy, neuropathy, or nephropathy.

Instrumentation

Two standardized instruments with acceptable reliability were used in this study: The Brief Illness Perception Questionnaire ($\alpha = .690$) and the ABCD Risk Questionnaire ($\alpha = .702$). While both reliability scores measure $\alpha = 0.7$, this measurement is considered to be adequate when measuring internal consistency (Polit & Beck, 2014).

Specific Aim One

Aim One examined the level of awareness of CVD risk in adults with T2DM. Despite the higher A1c and the lack of diabetes education, 71.4% of the participants were aware that being diagnosed with DM increases their risk of having a heart attack or stroke. In contrast, subjects had a relatively low Perceived risk score at 12.9, on a scale of 0 and 28, meaning their perception of the risk for actually developing CVD is low.

Based on this statistic the null hypothesis was rejected. Descriptive statistics were used to show a higher level of Knowledge of CV risk, at 6.35 on a scale between 0 and 8. Perceived Benefits of CVD Prevention Behaviors was average, 14.3, on a scale of 0 to 28 and finally, Healthy Eating scores were also relatively average, 6.7, on a scale of 0 to 12.

Specific Aim Two

Aim Two examined the relationship between IP and CVD-RA. Four (4) analyses were conducted based on the different subscales within the ABCD-RQ; (1) Knowledge of CV risk, (2) Perceived Risk, (3) Perceived Benefit and Intentions to Change Behavior, and (4) Healthy Eating Intentions. Pearson's correlation revealed no association between IP and Knowledge of CV risk. The only significant correlation was between IP and Perceived risk of CVD ($p = 0.001$), meaning the participants who perceived a higher level of risk of CVD tend to also perceive a higher level or IP. This statistic, therefore, allowed for the rejection of the null hypothesis for *Aim Two*. There was some evidence to suggest a negative correlation between IP and Perceived benefit of CVD prevention behaviors, however, it was not statistically significant. Pearson's correlation was also used to evaluate the relationship between IP and Perceived benefits of healthy eating for CVD prevention. The analysis proved no correlation between the two (2) variables.

An exploratory analysis was conducted evaluating the relationship between IP and five (5) characteristics of the participants; (1) A1c $\leq$ 7% vs > 7%, (2) age, (3) presence or absence of comorbidities, (4) duration of diabetes, and 5) attendance of diabetes education. There was no correlation found between A1c values or age. However, Pearson's correlation analyses showed statistically significant values in those with one or more related diabetes complications vs those without any complications. There was also

a significant correlation between IP and the duration of diabetes, meaning the longer a participant is diagnosed with DM, the greater the IP.

Additionally, an exploratory analysis was conducted evaluating the relationship between CVD-RA and the same five (5) participant characteristics mentioned in the previous paragraph. The only statistically significant correlation was between CVD-RA and the duration of diabetes. As with IP, the longer the participant has been diagnosed with DM, the greater the Perceived Risk of CVD.

When evaluating the association between IP and CVD-RA controlling for four covariates, Perceived Risk of CVD explained a statically significant amount of the variation in IP. To evaluate the relationship between IP and CVD-RA depending on certain covariates, only the interactions between Perceived Risk of CVD and A1c were statistically significant.

Specific Aim Three

Aim Three sought to verify the reliability of the ABCD Risk Questionnaire (ABCD-RQ) in adults with T2DM, a tool that had not previously been utilized in this population. The overall Cronbach's alpha statistic was 0.702, which constitutes acceptable reliability. Reliability for each subscale using Cronbach's alphas, ranged from 0.55 to 0.92. The Knowledge subscale had a low reliability score of 0.55, which bears further analysis in future studies. Therefore, the null hypothesis for *Aim Three* was rejected.

CHAPTER 5:

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

INTRODUCTION

Chapter 5 brings the presentation of this study to closure by further discussing the findings. This chapter offers an association of the results to existent literature and the framework, insights into the strengths and weaknesses of the study, the nursing implications, and provides thoughts about future research opportunities to further explore CVD-RA in DM.

INTERPRETATION OF MAJOR FINDINGS

Sample

Participants in this study were mostly Caucasian (48%), had a least a high school education (85.5%), see a primary care physician a minimum of every four to six months (89%) and most have some form of health insurance. Due to the site of recruitment, this sample had access to preventive services that other populations may not. Despite access to health care services, the average A1c was 7.6%, which is above the ADA goal of 7% and 64% had never attended diabetes education classes. This finding is higher than the 50%, reported by the CDC (2014), as never attending diabetes education.

IP Scores & CVD-RA

The *overall objective* of the present study was to determine the association of IP to CVD-RA in adults with T2DM. Analysis of the data revealed participants in this study had an IP total score of 37, just below the mean of 40. This score suggests the participants did not have a strong positive or negative perception of their disease. When correlated with the four (4) sub-groups of the ABCD-RQ instrument, the only statistically

significant result was in those subjects who perceived a higher level of IP (negative outcomes), in turn, had a higher perception of CVD-RA. These findings are in line with Steca, Pozzi, Monzani Malfatto & Parati (2015) who found an association between IP and CVD severity. The analysis of the additional three (3) sub-groups of the ABCD-RQ, found no correlation between IP and Knowledge of CV Risk nor IP and Healthy Eating. Although there was some evidence of a negative correlation between IP and perceived benefits of CVD prevention, it was not significant.

Additional exploratory analysis was conducted evaluating the association between IP and CVD-RA with the covariates of A1c, age, comorbidities, duration of diabetes and the attendance of a diabetes education program. Significantly higher IP scores were found in those subjects with diabetes related complications. This is an expected finding, as negative outcomes of the disease are typically associated with poor health outcomes and complications (Nie, 2017; Nur, 2018; & Petricek et al. 2009). Of interest, in both variables, IP and CVD-RA, only the duration of diabetes was statistically significant, highlighting that the longer a person has been diagnosed with diabetes the more the awareness of negative consequences of the diabetes such as CVD.

In many cases, the development of diabetes complications, such as CVD, retinopathy or severe neuropathy will lead to a feeling of helplessness and depression. The rate of depression in DM is extremely high and will often exacerbate the complications, increasing the risk of mortality. Results of this study highlight the need for diabetes education and positive behavior interventions in patients with longstanding T2DM and in those subjects who have a diabetes related complication. Early interventions such as diabetes education at the time of diagnoses, focusing on IP, may

directly influence the negative IP scores related to CVD risk awareness and improve health outcomes.

Multivariate linear regression was done to examine the association between IP and CVD-RA, after controlling for the covariates of A1c, age, comorbidities and duration of diabetes. The results showed that Perceived Risk of CVD explained a statistically significant amount of the variance.

Multiple linear regression was used to determine if the association between IP and CVD-RA was dependent on the covariates of A1c, age, comorbidities and the duration of diabetes. The four covariates only account for 7% of the variance and Perceived Risk for CVD and A1c was the only interaction that was statistically significant.

Reliability of the ABCD-RQ

Study findings do support the reliability of the first tool developed for evaluating CVD-RA, the ABCD-RQ (Woringer, et al. 2017). Results were similar to the initial reliability scores of the ABCD-RQ instrument, respectively; Cronbach's alpha score was 0.70 compared to 0.74. This is now, the second study, using this verified tool, which has expanded upon the knowledge gained by the previous researchers, with the use in a diabetes population and a larger sample size.

COMPARISON TO EXTANT LITERATURE

IP and Risk Awareness

Although there are no previous studies specifically evaluating IP and CVD-RA, general references can be made with each variable and overall conclusions. Evaluating the first subgroup of knowledge of CVD, 71% of participants in this study were aware diabetes increases their risk of developing CVD. This is a surprising finding since some

literature has commented that, although they do not have a number, most people with T2DM are unaware of their risk (Einarson, 2018; Kilkenny et al., 2017; & Tovar & Clark, 2015). To that same point, the AHA recently conducted an online poll and found that only about half of the respondents recognized their risk for a heart attack or stroke (AHA, 2019). The higher rate of CVD-RA, in this study, may be due to the national campaign to increase CVD risk awareness, including television commercials, that began airing earlier this year. Additionally, 2019 national guidelines for diabetes management were released in late 2018 that reflect the new guidance to HCPs to directly ask each patient about their history and risk for CVD (ADA 2019).

Kugbey et al. (2017) and Petricek et al. (2009) demonstrated that IP and diabetes knowledge significantly predict diabetes self-care practices such as diet exercise and glucose monitoring. That is, if an individual has a positive view of their disease, they tend to adopt healthier self-management practices. To the same extent, CVD risk awareness, either of the disease or risk factors of the disease, can have positive or negative health outcomes. Jacobs et al., (2016) found a negative association between preventive health practices and poor CVD awareness. Although self-care outcome behaviors were not evaluated, this study did not find a correlation between IP and Knowledge of CVD-RA. A correlation between IP and Perceived benefits of CVD prevention nor IP and Healthy Eating was found, which is unlike other studies that have evaluated IP and similar variables. For example, Kugbey et.al. (2017) found a significant correlation between IP and dietary habits and Broadbent (2011) found a correlation between IP and medication adherence, exercise and healthy eating. The finding of this study can be reflected by the average IP score of 37, in this study. The B-IPQ can take on

values between 0-80 given the mean score to be 40. Other studies have reported scores much higher than this study (Nie, et al, 2017; Nur, 2018; & Voigt et al. 2015). The lower score in this study may be due to the characteristics of the participants, being recruited from a site that provides a stable environment and open access to primary care physicians.

The only significant result, found in this study, was the association between IP and CVD-RA. The results showed that the participants who perceived a higher level of IP in turn, had a higher perception of CVD-RA. These findings are in line with Greco, Steca, Pozzi, Monzani Malfatto & Parati (2015) who found an association between IP and CVD severity. Negative perceptions have been directly associated to the displeasure with or the severity of DM which was shown in current findings with higher IP scores in participants with one or more comorbidities.

When evaluating the association of IP with glycemic control, there were contrasting, and consistent results compared to existing literature. Lee et al. (2018); & Voigt et al. (2015), found that negative IPs are significantly associated with an A1c > 7%, whereas this study did not find an association. However, the longer duration of DM was associated with higher IP scores in all three studies. The differing results in the A1c may be due to higher mean participant values; 7.6% in the current study and a score of 8.15% reported by Lee et al., 2018.

Results from this study corroborate others (Petricek, 2009; Woodard, 2011; & Woringer, 2017) that suggest HCPs talk to their patients about specific CVD risks, which in turn may aid in the adoption of preventive health behaviors. One caveat to that is the

recommendation that a discussion about IP be added to the office visit. As this study shows, knowledge of risks may not be enough to avoid a CV event.

DISCUSSION OF FINDINGS WITHIN THE CONTEXT OF THE THEORETICAL FRAMEWORK

Health Belief Model

The Health Belief Model (HBM) was the theoretical framework for this study. The model provides a conceptual guideline for understanding the association between health perceptions or beliefs and actual behaviors. Findings of this study are in line with the Model's idea that engaging in health-related behavior is predicted by the perceived susceptibility and value attached to an outcome and the perceived likelihood that these actions will lead to an outcome. For the purposes of this study, four (4) concepts from the framework were examined; (1) *perceived susceptibility*, (2) *perceived severity*, (3) *perceived benefits*, and (4) *perceived barriers*.

Perceived Susceptibility.

First, *perceived susceptibility*, was evaluated using the "perceived risk" score of the ABCD Risk Questionnaire (ABCD-RQ). The average Perceived Risk score, in this study, was 12.9, on a scale of 0 to 32. This designates a relatively low score indicating most participants had a low level of Perceived Risk for CVD.

Perceived Severity and Barriers

Perceived severity and perceived barriers were evaluated using the outcome scores of the Brief Illness Perception Questionnaire (B-IPQ). The average (and standard deviation) score was 37.1 (12.2) and the range was 1.0 to 68.0. Considering this score could take on values between 0 and 80, the average was somewhat below the middle

score of 40, indicating on average the study participants perceived their illness to be of relatively low severity.

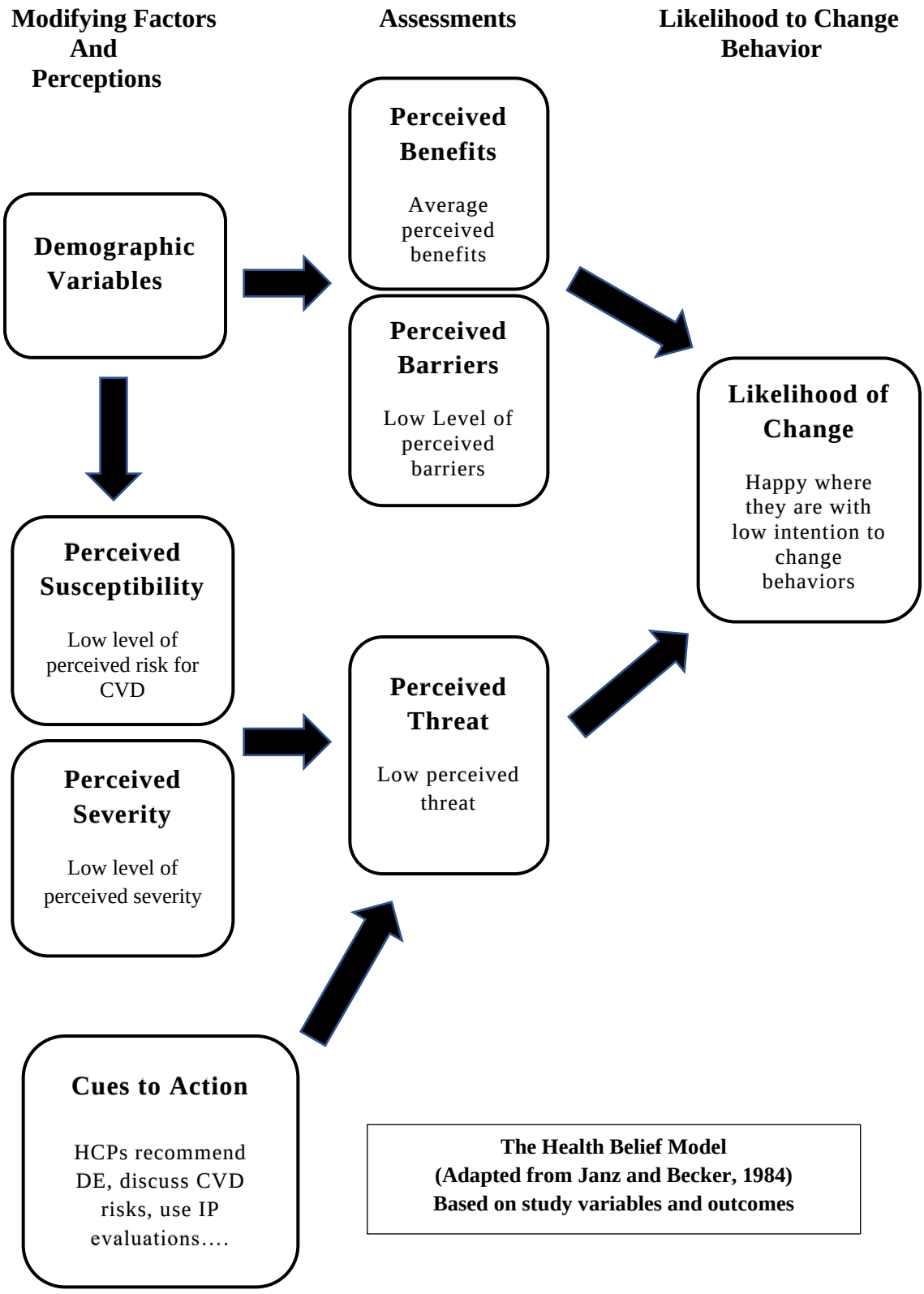
Perceived Benefits.

Finally, *perceived benefits* were evaluated using the "perceived benefits and intentions to change" score of the ABCD-RQ. The average (and standard deviation) score was 14.3 (2.7) and the range was 8.0 to 22.0. Considering this score could take on values between 0 and 28, the average was very near the midpoint of the range (14). This indicates that on average, the study participants had a relatively moderate level of Perceived Benefits and Intentions to Change.

Summary of Findings Within the Context of the Theoretical Framework

While previous research has shown perceived susceptibility, perceived severity and perceived barriers have a direct impact on improved health outcomes (Gatwood, 2016; Nur, 2018; Shabbibi et al. 2017; Woringer 2017; & Vazini & Barati, 2015), this study did, indirectly, demonstrate the same. The HBM suggests that a person's belief in a personal threat of an illness or disease together with a person's belief in the effectiveness of the recommended health behavior or action will predict the likelihood the person will adopt the behavior. The lower scores in *perceived susceptibility* and *perceived severity* show, overall, that participants may be unlikely to change a behavior which is, also, reflected in the moderate score of *perceived benefits and barriers*. To add to this discussion, the Perceived Benefits of Healthy Eating score, a sub-group of the ABCD-RQ, was average. This lends to the thought that regardless of the diagnosis of DM or the increased risk for the development of CVD, half of the study participants did not think there was a benefit to change their behaviors (Figure 5.1).

Figure 5.1 Health Belief Model with Study Findings



Although 71% of participants were aware that DM causes an increased risk for CVD and death, the majority did not perceive an individual susceptibility to developing, much less, dying from CVD. As a point of discussion, this could be related to that fact that 64% of the participants had never attended a diabetes education class and the average hemoglobin A1c was above the ADA goal of 7.0%, at 7.6%. Inversely, study findings suggest that those with higher scores in IP, who perceive negative outcomes, had higher rates of complications. Similar findings were also demonstrated by Greco et al., (2015) in patients with CVD.

To integrate theory with nursing clinical practice, the Health Promotion Model (HPM) has theoretical roots in the HBM and was developed for nursing to explore patient specific interventions to promote positive health behaviors. It is designed with a wholistic approach to predict individual factors for positive motivation and promotion.

The Model focuses on 3 concepts: (1) individual characteristics and experiences, (2) behavior-specific cognition and affect, and (3) behavioral outcomes (Pender, Murdaugh, & Parsons, 2006). Within these constructs, three behavior specific variables, including perceived benefits of action, perceived barriers to action and perceived self-efficacy are similar to those contained within the HBM. Previous studies based on the HBM and the HPM, identify perceived barriers and interpersonal influences (family, peers or providers) as two of the most important determinates of promoting positive self-care behaviors (Ho, Berggren & Lyckhage, 2010; Pender, 2006; Vanzine & Barati, 2014). In this study, participants had an average level of perceived benefits and a slightly low level of perceived barriers suggesting they are comfortable with their DM and self-care behaviors, at this time. The application of this model would suggest the evaluation of personal

factors and behaviors such as age, race, education, self-esteem, the individual perceptions and support mechanisms to determine a patient specific health plan to encourage health promoting behaviors.

STUDY IMPLICATIONS

Impact of the HCP on Self-Management

Previous studies have indicated that people with DM make up to 95% of their health-related decisions and behavior changes (Petricek et al., 2009). Therefore, it is imperative that HCPs take into consideration the patient's level of awareness of their disease, their beliefs and perceptions of the disease, as well as, their risks for complications. Today, many HCPs are in the field of nursing and have prescriptive authority as nurse practitioners or a doctorate in nursing practice. Nurse practitioners tend to spend more time with their patients, addressing specific behaviors and barriers to activity, therefore, have the ability to significantly impact self-care behaviors and positive health outcomes.

Based on the HPM and the findings of this study, the participants are often not aware of the benefit to a particular action, such as a healthy diet, physical activity or even the need for diabetes education classes. Nurses are in the prime position to educate and reinforce the advantages of that activity, in order to change the perception. The same holds true when it comes to patient perceived barriers or obstacles. Evaluating the patient's individual characteristics, past experiences, and influences, the nurse can encourage reflection, discuss the risks and risk factors, and develop a patient specific health plan that may increase the value of certain health behaviors, thereby promoting self-efficacy.

Impact of Perceptions versus Knowledge

This study highlights the important role that "perceptions" play in health behaviors versus knowledge alone. It also demonstrates the need for HCPs to not only ensure people with T2DM are aware of their CVD risk, but also question the likelihood of changing unhealthy behaviors. Many people living with diabetes are knowledgeable about the need to eat healthy foods and maintain certain portion sizes, however, most will admit that they are just not willing to make that change. Nurses can aid in the education and understanding of the disease and the benefits to improve health perceptions and behaviors. Additionally, understanding the role knowledge and health beliefs/perceptions play in day to day life, may help in designing an effective intervention program for those living with DM.

STUDY STRENGTHS

The overarching strength of this research is that it was the first study to evaluate if there is an association between a person's perception of DM and awareness of the risk for the development of CVD. The study is also very timely in that CVD risk awareness is a "hot topic" in the global diabetes community. Organizations like the ADA and AACE and IDF are introducing programs to increase CVD-RA in the diabetes population. This study can enhance the knowledge base in the development of interventions for patients with T2DM and national organizations.

STUDY LIMITATIONS

The limitations of this study include the following:

- Cross-Sectional Design: may not allow for the determination of causality. Some subjects have previously been exposed to CVD health information in primary care

or other clinics which may bias the degree of cardiovascular risk awareness the participant may have.

- False Negative or Positive Responses to Study Questions: individual study questions may generate false negative or false positive responses based on the participant's comprehension, education level, experience and or history. This, in turn, can affect the scoring and thus the generalizability of the study outcomes.
- Expert Disagreement on Content Validity: diabetes experts may not agree on the content validity of individual questions in the survey questionnaires.
- Inaccurate Demographic Data: the participants self-identified and self-reported age, diagnoses, and duration of diabetes, which is a limitation of this study.
- Convenience Sampling does not allow for generalizability of the population.
- Reliability of the ABCD-RQ: the lower than expected reliabilities on Healthy Eating (0.61) and Knowledge (0.55) subscales of the ABCD-RQ. This is only the second study to evaluate the reliability scores, and the first in a DM population, therefore, further studies in a DM population, using this instrument, could help clarify the reliability for these subscales.

RECOMMENDATIONS FOR FURTHER RESEARCH

Future research studies should involve a similar study with a larger sample size to evaluate not only association between IP and CVD-RA but also the outcomes of this study. This research was carried out in a single geographical area within Southeast Texas; therefore, it would be useful to see if similar results could be obtained in a different part of the country. Further research is also recommended to evaluate the reliability and validity of the Knowledge and Health Eating Intention sub-groups of the ABCD-RQ, due

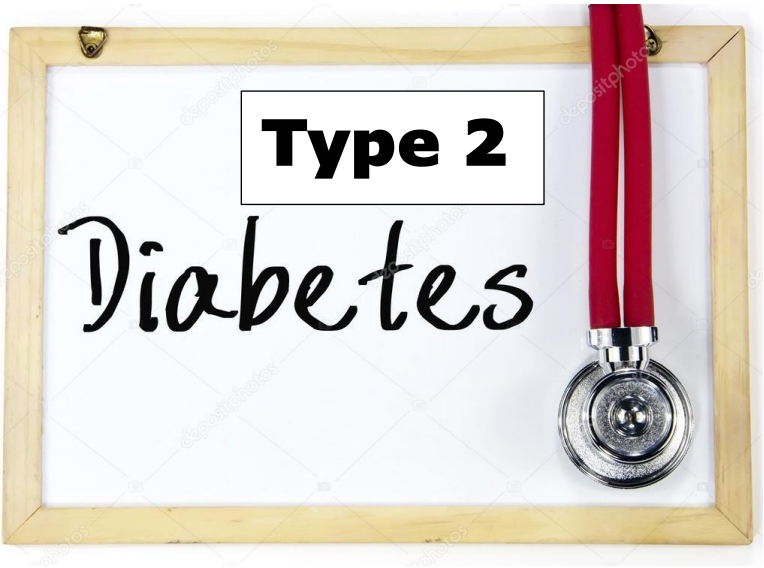
to the lower scores. A longitudinal study design may be of interest to evaluate the fluidity of IP over time, as well as, in those with T2DM, prior to and after having a CV event. Additionally, future studies may build off these findings evaluating the HPM as a framework for promoting interventions to increase self-efficacy in a diabetes population. In addition to this study, determining how participant characteristics such as age, A1c, duration of DM, previous diabetes education and comorbidities, are associated with CVD-RA would be of interest.

CONCLUSIONS

Illness perceptions are modifiable, and these findings suggest interventions should be designed to promote awareness and self-management behaviors of those beliefs. Positive perceptions in order to foster and empower patients to improve their health behaviors, especially around CVD are warranted especially in those with a longer duration of the disease or who have developed complications directly related to the diagnoses of DM.

Appendix A

Have you been diagnosed with



We are seeking volunteers between the ages of 45 and 75 to participate in a Research Study
Exploring Illness Perception and Cardiovascular Risk Awareness in Adults with Type 2 Diabetes

Participants will complete a demographic form and a 35-question survey regarding your perceptions of diabetes and associated risks

For more information or to volunteer, please contact
Lynnette Rodgers, RN, CDE, EMT at
mlrodger@utmb.edu or 409-504-1156.

All research participants will receive a $10 gift card once you have completed the survey

Appendix B

utmb Health

FAST FACT SHEET **IRB# 18-0324**

Study Name: Illness Perception and Cardiovascular Risk Awareness in Adults with Type 2 Diabetes Mellitus

Contact Information:

Principal Investigator:	Madeleine L. Rodgers	Cell: 409-504-1156	
Faculty Advisor:	Dr. Mary O'Keefe	Office: 409-772-6951	Cell: 713-553-7265

Purpose:
The purpose of this research project is to determine the level of awareness of cardiovascular disease (CVD) risk in adults with T2DM and to determine the relationship between illness perception and CVD risk awareness in the same population.
The researcher proposes to ascertain the actual need for, and the amount and type of education required to reduce CVD risk in the coming years. The information may also improve health behavior education and interventions to aid in the improvement of self-care in persons diagnosed with the disease.

Concise Summary:
Qualified participants will be asked to fill out 1 form and 2 surveys: a demographic form, a survey on illness perception in diabetes and the last on cardiovascular risk awareness.

Completion of the form and both surveys will occur in a room outside of the lobby area and should take about 15-20 minutes.

Risks/Benefits:
There is a possibility that participation in the study may raise your anxiety about your risk for cardiovascular disease. It is recommended you speak to your health care provider regarding your individual risks.

Your participation in this study is completely voluntary. You may refuse to participate or stop your participation in this research study at any time.

To protect your identity, your name and any identifying information will not appear on any of the study documents.

Subjects who complete the demographic and survey questions will receive a one-time $10.00 gift card.

Questions:
For questions about the study, contact Madeleine Rodgers or Dr. Mary O'Keefe at the numbers listed above.

Appendix C

Demographic Survey

Age: _____ Date: _____

Gender: □ Male □ Female

Marital Status: □ Single □ Married □ Widowed □ Divorced

Race: (all that apply) □ Caucasian □ Hispanic □ Black □ Asian
□ Latino □ Native American □ Other

Education Level: *What is the highest level of education you have completed?*

□ High School (or # of years completed_____) □ Bachelor's Degree
□ GED □ Master's Degree
□ Completed High School □ Doctoral Degree
□ Associates Degree □ PhD

The next questions refer to your diagnosis of Diabetes Mellitus

How many years have you been diagnosed with Diabetes? _____yrs.

Have you ever attended diabetes education classes? □ No □ Yes

If yes, how long ago was the last class? _____

Who helps manage your Diabetes?

□ Primary Care Doctor □ Internal Medicine Doctor □ Endocrinologist
□ Nurse Practitioner □ Physician Assistant

How often do you see your diabetes doctor? _____

What was your last Hemoglobin A1c result? _____

Date it was done: _____

Do you have a family history of Diabetes? □ No □ Yes Heart attack or stroke? □ No □ Yes

Have you had a heart attack or stroke? □ No □ Yes Date: _____

Do you routinely see a cardiologist? □ No □ Yes

Have you been diagnosed with diabetes complications of the Eye____ Kidney___or Nerves___?

Do you currently take medications for any of the following conditions?

Blood Pressure: □ No □ Yes Cholesterol: □ No □ Yes

Diabetes: □ No □ Yes

If you answered yes to diabetes medications, do you take: □ Diabetes Pills

□ Non-insulin injections for Diabetes □ Insulin injections □ I am not sure

Appendix D

The Brief Illness Perception Questionnaire

For the following questions, please circle the number that best corresponds to your views:

1. How much does your diabetes affect your life?

0	1	2	3	4	5	6	7	8	9	10
No affect at all										Severely affects my life

2. How long do you think your diabetes will continue?

0	1	2	3	4	5	6	7	8	9	10
A very short time										Forever

3. How much control do you feel you have over your diabetes?

0	1	2	3	4	5	6	7	8	9	10
Absolutely no control										Extreme amount of control

4. How much do you think your treatment can help your diabetes?

0	1	2	3	4	5	6	7	8	9	10
Not at all										Extremely helpful

5. How much do you experience symptoms from your diabetes?

0	1	2	3	4	5	6	7	8	9	10
No symptoms at all										Many severe symptoms

6. How concerned are you about your diabetes?

0	1	2	3	4	5	6	7	8	9	10
Not at all concerned										Extremely concerned

7. How well do you understand your diabetes?

0	1	2	3	4	5	6	7	8	9	10
Don't understand at all										Understand very clearly

8. How much does your diabetes affect you emotionally?
   (e.g. does it make you angry, scared, upset, or depressed?)

0	1	2	3	4	5	6	7	8	9	10
Not at all affected emotionally										Extremely affected emotionally

9. Please list in rank-order the three most important factors that you believe caused <u>your diabetes</u>. *The most important causes for me:*
   1. _____
   2. _____
   3. _____

Appendix E

The ABCD Risk Questionnaire

1.	One of the main causes of heart attack and stroke is stress.	□ True	□ False
2.	Walking and gardening are considered types of exercise that can lower the risk of having a heart attack or stroke.	□ True	□ False
3.	Moderately intense activity of 2 ½ hours a week will reduce your chances of having a heart attack or stroke.	□ True	□ False
4.	People who have diabetes are at higher risk of having a heart attack or stroke.	□ True	□ False
5.	Managing your stress levels will help you to manage your blood pressure.	□ True	□ False
6.	Drinking high levels of alcohol can increase your cholesterol and triglyceride levels.	□ True	□ False
7.	HDL refers to 'good' cholesterol, and LDL refers to 'bad' cholesterol.	□ True	□ False
8.	A family history of heart disease is not a risk factor for high blood pressure	□ True	□ False

9. I feel I will suffer from a heart attack or stroke sometime during my life.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

10. It is likely that I will suffer from a heart attack or stroke in the future.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

11. It is likely that I will have a heart attack or stroke some time during my life.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

12. There is a good chance I will experience a heart attack or stroke in the next 10 years.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

13. My chances of suffering from a heart attack or stroke in the next 10 years are great.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

14. It is likely I will have a heart attack or stroke because of my past and/or present behaviors.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

15. I am not worried that I might have a heart attack or stroke.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

16. I am concerned about the likelihood of having a heart attack or stroke in the near future.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

17. I am thinking about exercising at least 2 ½ hours a week.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

18. I intend or want to exercise at lease 2 ½ hours a week.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

19. When I exercise for at least 2 ½ hours a week I am doing something good for the health of my heart.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

20. I am confident that I can maintain a healthy weight by exercising at least 2 ½ hours a week within the next two months.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

21. I am not thinking about exercising for 2 ½ hours a week.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

22. When I eat at least five portions of fruit and vegetables a day I am doing something good for the health of my heart.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

23. Increasing my exercise to at least 2 ½ hours a week will decrease my chances of having a heart attack or stroke.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

24. I am confident that I can eat at least five portions of fruit and vegetables per day within the next two months.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

25. I am thinking about eating at least five portions of fruit and vegetables a day.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

26. I am not thinking about eating at least five portions of fruit and vegetables a day.

0	1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable

Appendix F
Supplementary Tables

Table F1. Descriptive Statistics for Participants Demographic Data

Characteristics	*n*	%
Age (Min-Max=45-75)	*M*=62.64	*SD*=8.197
Gender		
Male	76	38
Female	124	62
Marital Status		
Single	31	15.5
Married	110	55
Widowed	36	18
Divorced	23	11.5
Race		
Caucasian	96	48
Hispanic	43	21.5
Black	56	28
Latino	4	2
Other	1	0.5
Education Level		
High School	102	51
GED	14	7
Associates	30	15
Bachelors	30	15
Masters	9	4.5
Did not complete high school	15	7.5
Duration of DM	*M=10.64*	*SD=8.587*
Avg A1c	*M=7.621*	*SD=1.3744*
Attended Education Classes?		
Yes	72	36
No	128	64
Who Manages DM?		
Primary Care Doctor	160	80
Internal Medicine Doctor	6	3
Endocrinologist	27	13.5
Nurse Practitioner	6	3
Physician Assistant	1	0.5
Frequency of Doctor Visits		
1-3 Months	75	37.5
4-6 Months	103	51.5
7-9 Months	1	0.5
10-12 Months	20	10
16-18 Months	1	0.5

Last A1c Result		
A1c ≤ 7	74	37
A1c > 7	120	60
Missing	6	3
Family History of DM?		
Yes	165	82.5
No	35	17.5
Family History of Heart Attack or Stroke?		
Yes	109	54.5
No	91	45.5
Personal History of Heart Attack or Stroke?		
Yes	36	18
No	164	82
Routinely See a Cardiologist?		
Yes	52	26
No	148	74
Complications		
None	133	66.5
Neuropathy	51	25.5
Retinopathy	23	11.5
Nephropathy	14	7
Medications for BP?		
Yes	164	82
No	36	18
Medications for Cholesterol?		
Yes	159	79.5
No	41	20.5
Medications for DM?		
Yes	191	95.5
No	9	4.5
DM Medication		
Diabetes Pills	126	63
Non-insulin injections	2	1
Insulin injections	20	10
Pills and non-insulin injections	3	1.5
Pills and Insulin	38	19
Non-insulin injections and Insulin	1	0.5
Pills, Non-insulin injections, and Insulin	1	0.5
No medication	9	4.5

Table F2. Descriptive Statistics for B-IPQ Survey Questions

How much does diabetes affect your life?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	16	8.0	8.0	8.0
	1	8	4.0	4.0	12.0
	2	23	11.5	11.5	23.5
	3	29	14.5	14.5	38.0
	4	9	4.5	4.5	42.5
	5	34	17.0	17.0	59.5
	6	23	11.5	11.5	71.0
	7	16	8.0	8.0	79.0
	8	21	10.5	10.5	89.5
	9	14	7.0	7.0	96.5
	10	7	3.5	3.5	100.0
	Total	200	100.0	100.0	

How long do you think your diabetes will continue?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	2.5	2.5	2.5
	1	3	1.5	1.5	4.0
	2	6	3.0	3.0	7.0
	3	4	2.0	2.0	9.0
	4	5	2.5	2.5	11.5
	5	18	9.0	9.0	20.5
	6	6	3.0	3.0	23.5
	7	9	4.5	4.5	28.0
	8	18	9.0	9.0	37.0
	9	20	10.0	10.0	47.0
	10	106	53.0	53.0	100.0
	Total	200	100.0	100.0	

How much control do you feel you have over your diabetes?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	6	3.0	3.0	3.0
	1	6	3.0	3.0	6.0

	2	9	4.5	4.5	10.5
	3	8	4.0	4.0	14.5
	4	18	9.0	9.0	23.5
	5	38	19.0	19.0	42.5
	6	12	6.0	6.0	48.5
	7	24	12.0	12.0	60.5
	8	43	21.5	21.5	82.0
	9	17	8.5	8.5	90.5
	10	19	9.5	9.5	100.0
	Total	200	100.0	100.0	

How much do you think your treatment can help your diabetes?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	1.0	1.0	1.0
	2	4	2.0	2.0	3.0
	3	10	5.0	5.0	8.0
	4	8	4.0	4.0	12.0
	5	17	8.5	8.5	20.5
	6	17	8.5	8.5	29.0
	7	33	16.5	16.5	45.5
	8	43	21.5	21.5	67.0
	9	21	10.5	10.5	77.5
	10	45	22.5	22.5	100.0
	Total	200	100.0	100.0	

How much do you experience symptoms from your diabetes?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	28	14.0	14.0	14.0
	1	20	10.0	10.0	24.0
	2	25	12.5	12.5	36.5
	3	27	13.5	13.5	50.0
	4	12	6.0	6.0	56.0
	5	28	14.0	14.0	70.0
	6	15	7.5	7.5	77.5
	7	16	8.0	8.0	85.5

	8	13	6.5	6.5	92.0
	9	9	4.5	4.5	96.5
	10	7	3.5	3.5	100.0
	Total	200	100.0	100.0	

How concerned are you about your diabetes?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	2.5	2.5	2.5
	1	3	1.5	1.5	4.0
	2	11	5.5	5.5	9.5
	3	12	6.0	6.0	15.5
	4	4	2.0	2.0	17.5
	5	31	15.5	15.5	33.0
	6	14	7.0	7.0	40.0
	7	24	12.0	12.0	52.0
	8	18	9.0	9.0	61.0
	9	15	7.5	7.5	68.5
	10	63	31.5	31.5	100.0
	Total	200	100.0	100.0	

How well do you understand your diabetes?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	1.0	1.0	1.0
	1	4	2.0	2.0	3.0
	2	8	4.0	4.0	7.0
	3	11	5.5	5.5	12.5
	4	3	1.5	1.5	14.0
	5	19	9.5	9.5	23.5
	6	14	7.0	7.0	30.5
	7	25	12.5	12.5	43.0
	8	58	29.0	29.0	72.0
	9	21	10.5	10.5	82.5
	10	35	17.5	17.5	100.0
	Total	200	100.0	100.0	

How much does your diabetes affect you emotionally? (e.g. does it make you angry, scared, upset, or depressed?)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	29	14.5	14.5	14.5
	1	23	11.5	11.5	26.0
	2	31	15.5	15.5	41.5
	3	31	15.5	15.5	57.0
	4	15	7.5	7.5	64.5
	5	14	7.0	7.0	71.5
	6	7	3.5	3.5	75.0
	7	17	8.5	8.5	83.5
	8	9	4.5	4.5	88.0
	9	9	4.5	4.5	92.5
	10	15	7.5	7.5	100.0
	Total	200	100.0	100.0	

Table F 3. Descriptive Statistics for ABCD-RQ

One of the main causes of heart attack and stroke is stress.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	24	12.0	12.0	12.0
	True	176	88.0	88.0	100.0
	Total	200	100.0	100.0	

Walking and gardening are considered types of exercise that can lower the risk of having a heart attack or stroke.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	17	8.5	8.5	8.5
	True	183	91.5	91.5	100.0
	Total	200	100.0	100.0	

Moderately intense activity of 2 1/2 hours a week will reduce your chances of having a heart attack or stroke.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	22	11.0	11.0	11.0
	True	178	89.0	89.0	100.0
	Total	200	100.0	100.0	

People who have diabetes are at a higher risk of having a heart attack or stroke.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	57	28.5	28.5	28.5
	True	143	71.5	71.5	100.0
	Total	200	100.0	100.0	

Managing your stress levels will help you to manage your blood pressure.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	10	5.0	5.0	5.0
	True	190	95.0	95.0	100.0
	Total	200	100.0	100.0	

Drinking high levels of alcohol can increase your cholesterol.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	68	34.0	34.0	34.0
	True	132	66.0	66.0	100.0
	Total	200	100.0	100.0	

HDL refers to 'good' cholesterol, and LDL refers to 'bad' cholesterol.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	68	34.0	34.0	34.0
	True	132	66.0	66.0	100.0
	Total	200	100.0	100.0	

A family history of heart disease is not a risk factor for high blood pressure.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	False	136	68.0	68.0	68.0
	True	64	32.0	32.0	100.0
	Total	200	100.0	100.0	

I feel I will suffer from a heart attack or stroke sometime during my life.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	26	13.0	13.0	13.0
	Disagree	88	44.0	44.0	57.0
	Agree	53	26.5	26.5	83.5
	Strongly Agree	27	13.5	13.5	97.0
	Not applicable	6	3.0	3.0	100.0
	Total	200	100.0	100.0	

It is likely that I will suffer from a heart attack or stroke in the future.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	27	13.5	13.5	13.5
	Disagree	86	43.0	43.0	56.5
	Agree	64	32.0	32.0	88.5
	Strongly Agree	21	10.5	10.5	99.0
	Not applicable	2	1.0	1.0	100.0
	Total	200	100.0	100.0	

It is likely that I will have a heart attack or stroke some time during my life.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	19	9.5	9.5	9.5
	Disagree	81	40.5	40.5	50.0
	Agree	72	36.0	36.0	86.0
	Strongly Agree	25	12.5	12.5	98.5
	Not applicable	3	1.5	1.5	100.0
	Total	200	100.0	100.0	

There is a good chance I will experience a heart attack or stroke in the next 10 years.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	20	10.0	10.0	10.0
	Disagree	97	48.5	48.5	58.5
	Agree	58	29.0	29.0	87.5
	Strongly Agree	20	10.0	10.0	97.5
	Not applicable	5	2.5	2.5	100.0
	Total	200	100.0	100.0	

My chances of suffering from a heart attack or stroke in the next 10 years are great.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	19	9.5	9.5	9.5
	Disagree	96	48.0	48.0	57.5
	Agree	60	30.0	30.0	87.5
	Strongly Agree	20	10.0	10.0	97.5
	Not applicable	5	2.5	2.5	100.0
	Total	200	100.0	100.0	

It is likely I will have a heart attack or stroke because of my past and/or present behaviors.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	19	9.5	9.5	9.5
	Disagree	93	46.5	46.5	56.0
	Agree	62	31.0	31.0	87.0
	Strongly Agree	20	10.0	10.0	97.0
	Not applicable	6	3.0	3.0	100.0
	Total	200	100.0	100.0	

I am not worried that I might have a heart attack or stroke.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	16	8.0	8.0	8.0
	Disagree	79	39.5	39.5	47.5

	Agree	74	37.0	37.0	84.5
	Strongly Agree	27	13.5	13.5	98.0
	Not applicable	4	2.0	2.0	100.0
	Total	200	100.0	100.0	

I am concerned about the likelihood of having a heart attack or stroke in the near future.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	19	9.5	9.5	9.5
	Disagree	77	38.5	38.5	48.0
	Agree	78	39.0	39.0	87.0
	Strongly Agree	25	12.5	12.5	99.5
	Not applicable	1	0.5	0.5	100.0
	Total	200	100.0	100.0	

I am thinking about exercising at least 2 1/2 hours a week.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	1.0	1.0	1.0
	Disagree	30	15.0	15.0	16.0
	Agree	118	59.0	59.0	75.0
	Strongly Agree	47	23.5	23.5	98.5
	Not applicable	3	1.5	1.5	100.0
	Total	200	100.0	100.0	

I intend or want to exercise at least 2 1/2 hours a week.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	1.5	1.5	1.5
	Disagree	19	9.5	9.5	11.0
	Agree	121	60.5	60.5	71.5
	Strongly Agree	55	27.5	27.5	99.0
	Not applicable	2	1.0	1.0	100.0
	Total	200	100.0	100.0	

When I exercise for at least 2 1/2 hours a week I am doing something good for the health of my heart.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	0.5	0.5	0.5
	Disagree	3	1.5	1.5	2.0
	Agree	107	53.5	53.5	55.5
	Strongly Agree	89	44.5	44.5	100.0
	Total	200	100.0	100.0	

I am confident that I can maintain a healthy weight by exercising at least 2 1/2 hours a week within the next 2 months.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	11	5.5	5.5	5.5
	Disagree	57	28.5	28.5	34.0
	Agree	87	43.5	43.5	77.5
	Strongly Agree	45	22.5	22.5	100.0
	Total	200	100.0	100.0	

I am not thinking about exercising for 2 1/2 hours a week.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	37	18.5	18.5	18.5
	Disagree	100	50.0	50.0	68.5
	Agree	46	23.0	23.0	91.5
	Strongly Agree	13	6.5	6.5	98.0
	Not applicable	4	2.0	2.0	100.0
	Total	200	100.0	100.0	

When I eat at least 5 portions of fruit and vegetables a day I am doing something good for the health of my heart.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	0.5	0.5	0.5
	Disagree	7	3.5	3.5	4.0
	Agree	113	56.5	56.5	60.5
	Strongly Agree	77	38.5	38.5	99.0

	Not applicable	2	1.0	1.0	100.0
	Total	200	100.0	100.0	

Increasing my exercise to at least 2 1/2 hours a week will decrease my chances of having a heart attack or stroke.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	3.0	3.0	3.0
	Disagree	10	5.0	5.0	8.0
	Agree	116	58.0	58.0	66.0
	Strongly Agree	67	33.5	33.5	99.5
	Not applicable	1	0.5	0.5	100.0
	Total	200	100.0	100.0	

I am confident that I can eat at least 5 portions of fruit and vegetables per day within the next 2 months.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	1.5	1.5	1.5
	Disagree	58	29.0	29.0	30.5
	Agree	98	49.0	49.0	79.5
	Strongly Agree	40	20.0	20.0	99.5
	Not applicable	1	0.5	0.5	100.0
	Total	200	100.0	100.0	

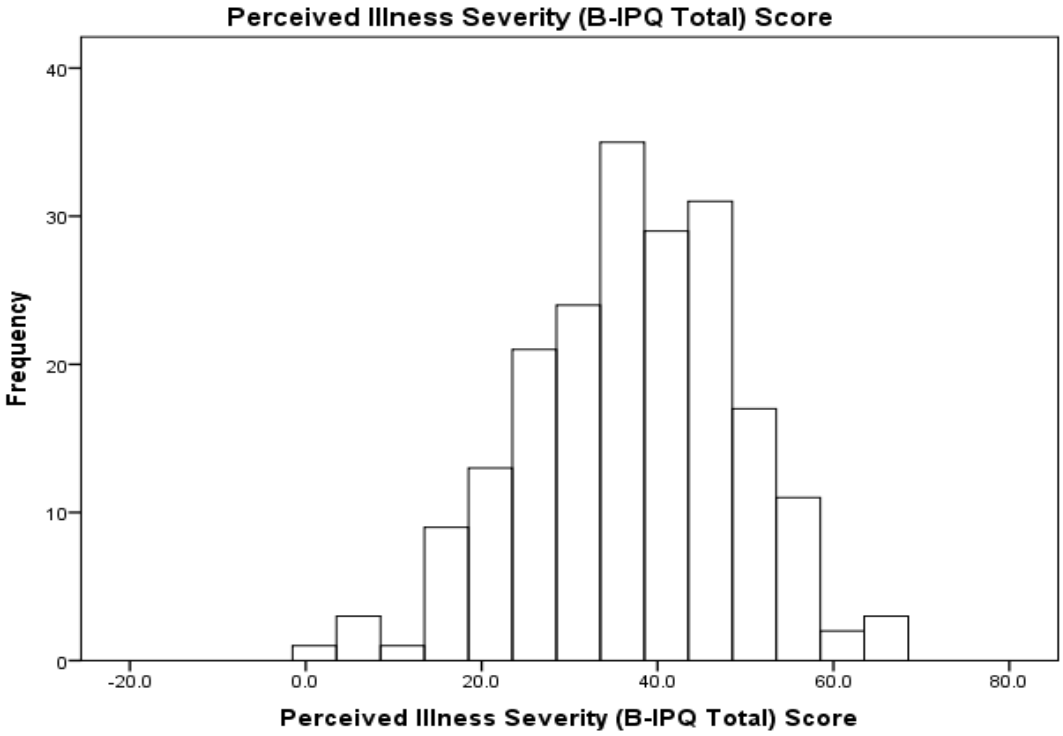
I am thinking about eating at least 5 portions of fruit and vegetables a day.

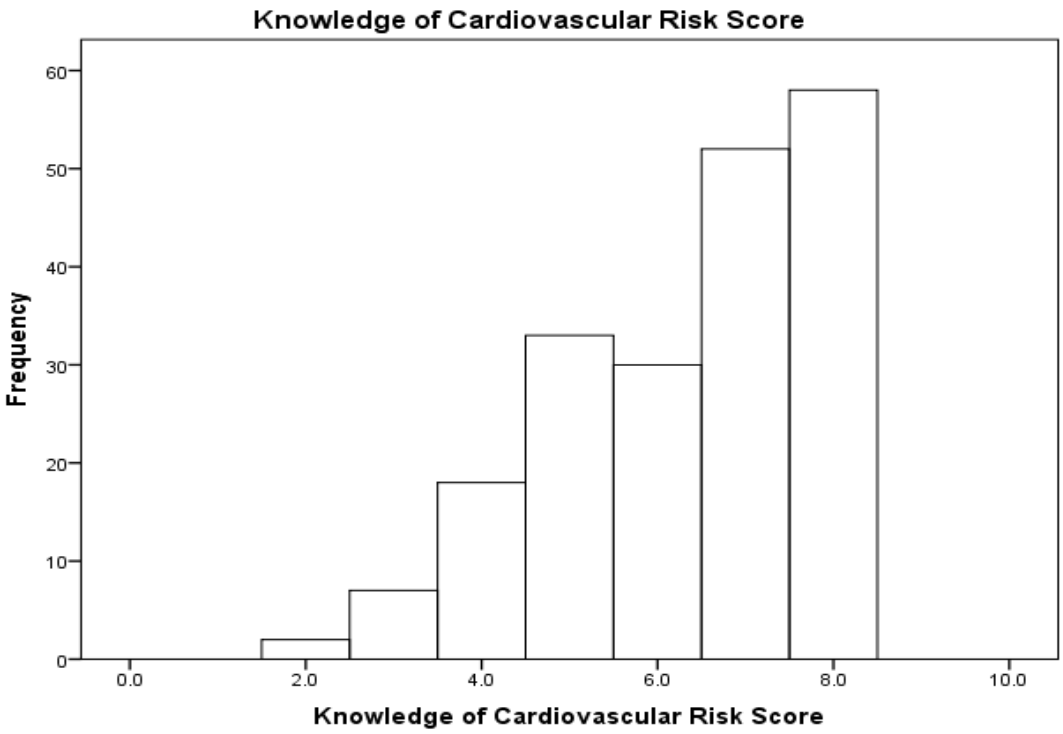
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	0.5	0.5	0.5
	Disagree	35	17.5	17.5	18.0
	Agree	120	60.0	60.0	78.0
	Strongly Agree	43	21.5	21.5	99.5
	Not applicable	1	0.5	0.5	100.0
	Total	200	100.0	100.0	

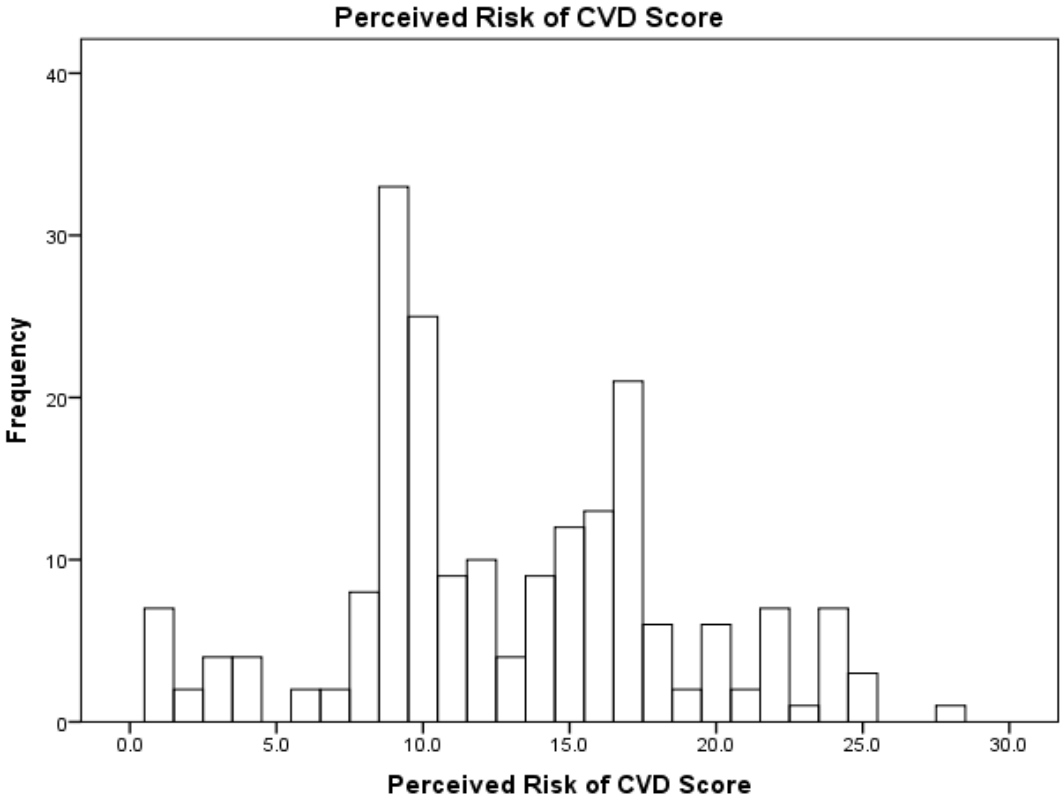
I am not thinking about eating at least 5 portions of fruit and vegetables a day.

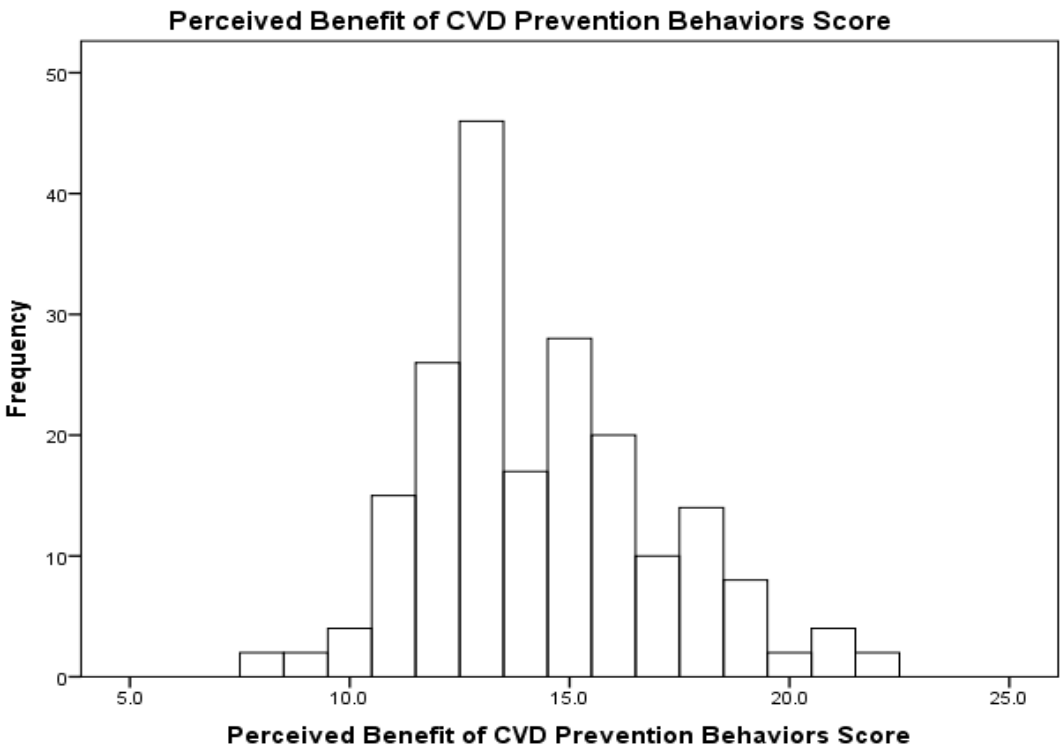
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	24	12.0	12.0	12.0
	Disagree	121	60.5	60.5	72.5
	Agree	38	19.0	19.0	91.5
	Strongly Agree	13	6.5	6.5	98.0
	Not applicable	4	2.0	2.0	100.0
	Total	200	100.0	100.0	

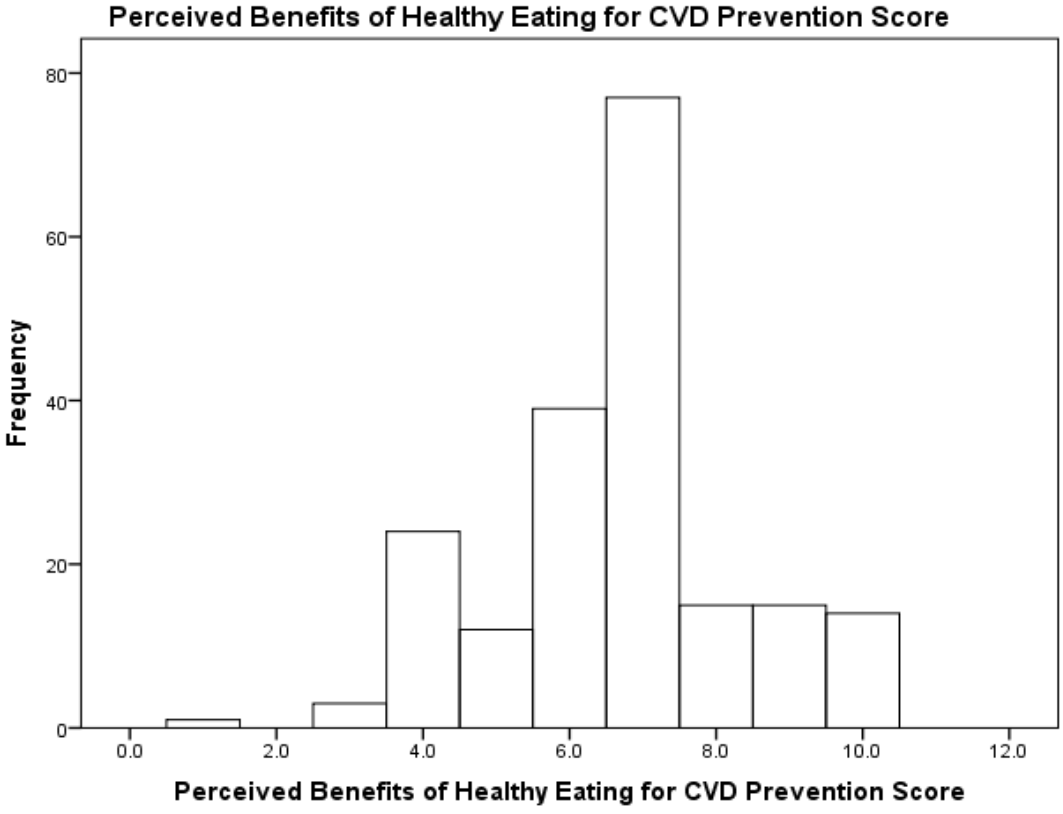
Table F 4. Variable Distributions




Knowledge of Cardiovascular Risk Score
Frequency
60
50
40
30
20
10
0
0.0
2.0
4.0
6.0
8.0
10.0
Knowledge of Cardiovascular Risk Score


Perceived Risk of CVD Score
Frequency
40
30
20
10
0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Perceived Risk of CVD Score


Perceived Benefit of CVD Prevention Behaviors Score
Frequency
50
40
30
20
10
0
5.0
10.0
15.0
20.0
25.0
Perceived Benefit of CVD Prevention Behaviors Score


Perceived Benefits of Healthy Eating for CVD Prevention Score
Frequency
80
60
40
20
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Perceived Benefits of Healthy Eating for CVD Prevention Score

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VITA

Madeleine Lynnette Rodgers was born in Beaumont, Texas in 1969 to Lynn and Madeleine Sanders. She has 2 sisters, Rana Glover and Jamie Cullen. She has been married to her husband, Shane Rodgers, since 1987 and they have one son, Marc Rodgers and a future daughter, Jessica Meyers. Lynnette first received her LVN certificate from Lamar University- Orange and went on to pursue an Associate Degree in Nursing from Lamar University- Port Arthur, in 1994. In 1996 she became a Certified Diabetes Educator (CDE) and has worked within this domain ever since. She worked as an RN/CDE for Beaumont, Medical and Surgical Hospital until 1999 when she began a career in the pharmaceutical industry. Lynnette started out training patients and HCPs how to use insulin pumps and how to titrate insulin to achieve blood glucose targets. Since 2009 she has been a medical liaison instructing HCPs and working with health care accounts on the proper management of and care for individuals with diabetes. In 2014 she completed a Bachelor of Science Degree in Nursing from Lamar University Beaumont.