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Formative Evaluation Of The Health Belief Model As A Valid Theoretical Framework For "the Diabetes Garage"

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PFORMATIVE EVALUATION OF THE HEALTH BELIEF MODEL AS A VALID THEORETICAL FRAMEWORK FOR "THE DIABETES GARAGE"

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FORMATIVE EVALUATION OF THE HEALTH BELIEF MODEL AS A VALID THEORETICAL FRAMEWORK FOR "THE DIABETES GARAGE"

by

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Abstract

Background & Significance. Recent studies estimate the prevalence of diabetes among Hispanics/Latinos (H/L) to be 16.9% and 18.7% among H/L men specifically. To address this disparity, the Diabetes Garage (DG), a culturally tailored Diabetes Self-Management Education and Support (DSME/S) program, was designed to engage H/L men in diabetes self-management. Because seriousness of diabetes best predicts men's engagement in self-care, the Health Belief Model (HBM) was chosen as the central theoretical framework. The HBM hypothesizes that the cue to action (i.e. DG) increases men's perceived diabetes risk/severity/threat, self-efficacy in self-care, and health outcomes. **Aims & Objectives.** This research was aimed to investigate the use of the HBM as a viable theoretical framework for changing men's behaviors towards diabetes through their participation in the DG program. Specifically, this research sought to 1) determine if participating in the DG increases men's diabetes knowledge, awareness of diabetes risk and severity, vulnerability, benefits and barriers, and self-efficacy and 2) examine the relationship between those variables. **Methods.** A mixed methods design was used. Quantitative descriptive non-parametric statistical analysis was conducted to examine pre- and post-survey data to determine if participation in the DG increases men's diabetes knowledge, awareness of diabetes risk and severity, vulnerability, perceived benefits and barriers to treatment, and self-efficacy and to determine if there is a relationship between those variables. Second, qualitative analysis including coding focus group narratives for themes related to the HBM and to identify themes related to the quantitative findings. **Results.** Eleven men participated in both DG pilot classes and seven completed the program. Results are presented only for men who completed pre- and post-assessments. Quantitative findings showed an increase in diabetes knowledge (pre-mean=3.50 SD=0.55; post-mean=3.83, SD=0.75), risk knowledge (pre-mean=3.29 SD=1.70; post-

mean=3.86, SD=1.35), and risk perception (pre-mean=1.53 SD=0.21; post-mean=1.15, SD=0.19). There were also improvements in weight (pre-mean=217.58 SD=40.58; post-mean=212.67, SD=34.01), systolic (pre-mean=145.40 SD=20.31; post-mean=129.60, SD=19.78) and diastolic (pre-mean=74.40 SD=9.45; post-mean=67.40, SD=10.67) blood pressure, and glycosylated hemoglobin A1c (HbA1c: pre-mean=7.62 SD=1.70; post-mean=7.34, SD=1.29). These findings were supported by the qualitative data, which shows men's perceptions are in alignment with the HBM pathway for behavior change. For example, men stated: "a lot of this information…helped me out a lot" (diabetes knowledge); "diabetes can be more dangerous for individuals like myself with cardio problems" (risk knowledge); "…it can really happen to you down the road…" (risk perception); "…I lost 14lbs just changing what I eat." (weight). **Conclusions.** Results of the DG pilot study show that participation increased general diabetes knowledge and knowledge of the risk associated with the disease. In turn, participants' risk perception decreased after participating in the program. Physical health markers and some self-care behaviors showed improvement after participation in the DG pilot. Although the sample size was small, the findings suggest that the HBM may be an appropriate theoretical framework to engage H/L men in diabetes self-management. These results also indicate that participation in the DG pilot had positive effects on the participants' knowledge, behaviors, and physical health. **Recommendations.** Because of the nature of this study and the small sample size, paired sample analysis was limited, and pathway analysis could not be analyzed on the data to observe the relationship between the variables in relation to the pathway of the HBM. Recommendations include a larger sample size to further investigate the applicability of the HBM as a framework for engaging H/L men.

Table of Contents

List of Tables

List of Figures

Introduction

Diabetes and Hispanic/Latino men

Prevalence. In 2015, it was estimated that 30.3 million people (9.4%) in the United States had diabetes (Centers for Disease Control and Prevention, 2017a). In the National Diabetes Statistics Report published by the Centers for Disease Control and Prevention (CDC), it is also estimated that 7.2 million people in the United States (23.8%) have diabetes but are undiagnosed (Centers for Disease Control and Prevention, 2017a). Of those who are affected, 9.4% of men and 9.2% of women are diagnosed, while 3.4% of men and 2.5% of women are undiagnosed (Centers for Disease Control and Prevention, 2017a). More striking is the prevalence of prediabetes in the U.S. There are an estimated 84.1 million adults (33.69%) in the United States who have prediabetes. Of those with prediabetes, 36.9% are men and 31.1% are women, with approximately 9.4% and 14.1% unaware of their prediabetic status, respectively (Centers for Disease Control and Prevention, 2017a). In Texas, data from 2017 shows the prevalence of diabetes to be 11.4% and the rates of prediabetes are 7.5% (Texas Department of State Health Services, 2017). In El Paso, TX the prevalence of diabetes in 2016 among adults was 15.1 (Healthy Paso del Norte, 2016). The age adjusted mortality rate due to diabetes in El Paso is 32.0%, with men having a higher mortality rate than women, 39.0% and 26.7%, respectively (Healthy Paso del Norte, 2018a).

The groups most impacted by diabetes include ethnic/racial minority populations including American Indian/Alaska Natives with the highest prevalence of diabetes (15.1%), followed by non-Hispanic blacks (12.7%), Hispanics (12.1%), Asian Americans (8.0%), and non-Hispanic whites (7.4%) (Centers for Disease Control and Prevention, 2017a). Among Hispanic adults in the United States, the largest ethnic minority in the United States, those of Mexican background

have the highest prevalence (13.8%), followed by Puerto Ricans (12.0%), Cubans (9.0%), and Central/South Americans (8.5%) (Centers for Disease Control and Prevention, 2017a).

What is diabetes? Diabetes occurs when there is a prolonged, or chronic, excess of blood glucose in the body, also known as hyperglycemia, that is caused by insulin resistance where the body's cells lose sensitivity to insulin (Alam, Asghar, Azmi, & Malik, 2014). Blood glucose is regulated by insulin, a hormone produced by the beta-cells of the pancreas, which promotes the absorption of glucose into the cells to be used for energy (Ndisang, Rastogi, & Vannacci, 2014). The sensitizing factor limits the body's ability to effectively and efficiently use insulin to regulate blood glucose (Himsworth, 2013). These sensitizing factors, such as autoimmune destruction or apoptosis (cell death) caused by cellular stress, lead to the destruction of the structure or functional aspects of beta-cells of the pancreas and the target tissues of insulin, also known as glucotoxicity (Ndisang et al., 2014). When the body does not create enough or fails to create any insulin because of glucotoxicity, the glucose in the blood does not reach the cells that need it and instead is left in the blood stream causing hyperglycemia and diabetes (Ndisang et al., 2014).

Types. There are three main types of diabetes: type 1, type 2, and gestational diabetes. The other less common types of diabetes include monogenic diabetes, and autoimmune related diabetes. Among all individuals with diabetes, 95% are identified to have type 2 diabetes and 5% are identified to type 1 diabetes (Centers for Disease Control and Prevention, 2017a).

Type 1 diabetes occurs when the body does not produce insulin. This can occur because of genetics or when the body's immune system attacks the cells in the pancreas that synthesize insulin (Alam et al., 2014). This type of diabetes is usually diagnosed in children and young adults but can appear at any age. People with type 1 diabetes require regular doses of insulin throughout the day to maintain optimal use of blood glucose and healthy lifestyle (Alam et al., 2014). Type 2

diabetes occurs when the insulin that is created by the pancreas is not used or used ineffectively. This type of diabetes can occur at any age but is seen most often in people who are middle-aged or older (Alam et al., 2014). Treatment of type 2 diabetes involves lifestyle modifications and medications use to help regulate blood glucose. Insulin injections can also be used as an additional treatment (Alam et al., 2014). Unlike type 1 and 2 diabetes, gestational diabetes only occurs in women. Gestational diabetes specifically develops in pregnant women and often goes away after delivery (Alam et al., 2014). Women who develop gestational diabetes are at higher risk of developing type 2 diabetes later in life (Alam et al., 2014).

While the most common types of diabetes (type 1 and type 2 diabetes) are related to a change or a defect in multiple genes (polygenic), there are some rare forms of diabetes that result from a mutation in a single gene (monogenic) (Alam et al., 2014). These single gene mutations are inherited from one or both parents or can even occur spontaneously. Monogenic diabetes reduced the body's ability to produce insulin. There are two main forms of monogenic diabetes, neonatal diabetes mellitus (NDM), which occurs in newborns and infants, and maturity-onset diabetes or the young (MODY), which occurs in adolescence or early adulthood (Alam et al., 2014).

There are also two types of autoimmune related diabetes, latent autoimmune diabetes in adults (LADA) and autoimmune-mediated diabetes. LADA is often misdiagnosed as type 2 diabetes, is usually diagnosed after the age of 35, and requires more immediate insulin therapy than type 2 diabetes (Alam et al., 2014). Autoimmune-mediated diabetes is more common with people who have neurological conditions where autoantibodies attack the cells in the pancreas that synthesize insulin (Alam et al., 2014).

Modifiable and non-Modifiable Risk factors. There are various modifiable and non-modifiable risk factors that can affect the chances of developing type 2 diabetes. Non-modifiable factors are those that cannot be changed, such as family history, ethnicity, and age. Modifiable factors include lifestyle modifications like changes in diet, physical activity, smoking, stress, and weight.

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) list the following as modifiable risk factors for developing type 2 diabetes: being overweight or obese; having high blood pressure; having low levels of HDL or high levels of triglycerides; not being physically active. Non-modifiable risk factors are: being 45 years or older; having a family history of diabetes; having an African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, Native Hawaiian, or Pacific Islander racial/ethnic background; having a history of gestational diabetes; history of heart disease or stroke; having depression; having polycystic ovary syndrome (PCOS); and having acanthosis nigricans (dark, thick, velvety skin around neck or armpits) ("Risk Factors for Type 2 Diabetes | NIDDK," 2016).

The emerging Hispanic/Latino population and their risk of diabetes. In the United States, approximately 18.1% of people are Hispanic/Latino (H/L) ("U.S. Census Bureau QuickFacts," 2010b). By 2050, it is expected that the H/L population will double, according to the US Census Bureau. In Texas, H/L make up 38.2% of the population and individuals of Mexican decent making up 88% of the H/L population ("Texas QuickFacts from the US Census Bureau," 2010). In El Paso, 82.8% of the population are H/L and if you include the surrounding counties in Texas and New Mexico, the H/L population is 66.5% (Healthy Paso del Norte, 2018b; "U.S. Census Bureau QuickFacts," 2010a). Because of the growing H/L population in the United States, and the large population of H/L residing in Texas and the El Paso/Ciudad Juarez border

region, the health of the majority populations in these areas will take a greater focus moving forward.

Diabetes among Hispanics/Latinos. In a study done by the CDC, it was estimated that H/L had a 133% higher prevalence rate for diabetes than non-Hispanic whites (Dominguez et al., 2015). The CDC reports that H/L all-cause mortality rate was 24% lower than non-Hispanic whites, including lower rates for cancer (-28%) and heart disease (-25%), but had higher death rates for diabetes (+51%); chronic liver disease and cirrhosis (+48%); and hypertension and hypertensive renal disease (+8%) (Dominguez et al., 2015). Hispanic/Latinos have generally been found to have better health outcomes compared to non-Hispanic whites despite having lower income and education (Padilla, Hamilton, & Hummer, 2009). This epidemiological paradox, often referred to as the Hispanic Health Paradox, has been cited in the literature as early as the 1960s (Karno & Edgerton, 1969) and studied more extensively in the 1970s and 1980s (Adamchak, 1979; Antonovsky & Bernstein, 1977; Markides & Coreil, 1986). The advantages to foreign born H/L and those who have been in the United States for a few years has been extensively documented but there is evidence to suggest that the protective effects diminish as the generations progress (Balcazar, Grineski, & Collins, 2015; Perreira & Ornelas, 2011). Given the prevalence rate for diabetes and the diabetes related mortality rates for H/L, it can be inferred that the Hispanic Health Paradox does not hold true for all diseases. Contributing factors for high rates of diabetes in H/L include lower education, lower odds of seeing a diabetes specialist, not frequently checking for diabetes symptoms, and having a diet with higher saturated fats (Vaccaro, Anderson, & Huffman, 2016).

Although the CDC estimates that Hispanics have a 12.1% prevalence of diabetes and a 13.8% prevalence among those of Mexican descent, these are underestimates due to health

inequalities that affect sociodemographic groups, minorities, and immigrants (Dominguez et al., 2015; Singh, Rodriguez-Lainz, & Kogan, 2013). The Hispanic Community Health Study/Study of Latinos (HCHS/SOL), a study funded by the National Heart, Lung and Blood Institute, that was designed to understand the gap in information on health among H/L subgroups. This study estimates that diabetes prevalence among Hispanics is 16.9% and the prevalence of those of Mexican descent is 18.3% (Schneiderman et al., 2014). It was also found that H/L men have higher prevalence rates for diabetes compared to H/L women (Borrell, Crawford, Dallo, & Baquero, 2009; González, Wilson, & Thorpe, 2015). Men of Mexican background, specifically, having a prevalence of diabetes of 18.7% (Schneiderman et al., 2014).

Hispanic/Latino men vs. Hispanic/Latino women. Despite H/L men having lower prevalence and mortality rates in heart disease and cancer compared to their non-Hispanic white counterparts, they have higher rates of hypertension, obesity, high cholesterol, and experience higher rates of delayed quality of medical care and hospitalization rates (Thorpe, Richard, Bowie, Laveist, & Gaskin, 2013). H/L men of Mexican descent have diabetes rates that are 200% higher than non-Hispanic whites and 25% higher than H/L women (Dominguez et al., 2015).

Generally, a negative relationship has also been found between H/L and education and household income (Schneiderman et al., 2014; US Department of Health and Human Services, 2013). Women and men with higher education and household income had lower prevalence rates of diabetes, with men having higher rates than women. The greatest difference being seen among men, where men with less than a high school education had a diabetes prevalence rate of 20.1%, compared to men with more than a high school education having a prevalence rate of 12.9% (Schneiderman et al., 2014). Women, though lower than the prevalence rates seen in men, show a smaller difference in prevalence rates, with women with less than a high school education having

a prevalence rate of 18.6% and those with more than a high school education having a prevalence rate of 15.4% (Schneiderman et al., 2014). This is also consistent with research that has also shown a correlation between the risk of developing type 2 diabetes and low socioeconomic status (Agardh, Allebeck, Hallqvist, Moradi, & Sidorchuk, 2011). Women show an inverse relationship between household income and diabetes prevalence, with women whose household income is less than $20,000 being 16.9% and women whose household income is more than $75,000 being 12.8% (Schneiderman et al., 2014). Men show the greatest difference in prevalence rates of diabetes, with men whose household income being less than $20,000 having a prevalence rate of 18.5% compared to men whose household income being less than $75,000 being 8.3% (Schneiderman et al., 2014). The rates of people who are unaware that they have diabetes is also high. In the HCHS/SOL study, 41.3% of participants were unaware that they had diabetes (Schneiderman et al., 2014; US Department of Health and Human Services, 2013). There are also more undiagnosed chronic conditions, particularly diabetes, among recent immigrants to the U.S. (Barcellos, Goldman, & Smith, 2012).

Why Hispanic/Latino men are disproportionately affected. Racial/ethnic minority men generally have worse health profiles than non-Hispanic whites (Thorpe et al., 2013). Research suggests that chronic health conditions among H/L men are underestimated due to their lack of health insurance and limited access to care (Schneiderman et al., 2014; Thorpe et al., 2013).

There is research that indicates that men are less engaged with their health than women, a possible indication of worse diabetes outcomes. Patient engagement among women is well documented and less is known on the engagement of H/L men (James, Hibbard, Agres, Lott, & Dentzer, 2013). Recent literature has focused on medication nonadherence (Billimek & August, 2014), adherence to dietary recommendations (Matias, Stoecklin-Marois, Tancredi, & Schenker,

2013), therapies for myocardial infarction (Lauffenburger, Robinson, Oramasionwu, & Fang, 2014), and HIV prevention services (Freese, Padwa, Oeser, Rutkowski, & Schulte, 2017). Although there are many effective lifestyle management interventions available for people who have, or are at risk of diabetes, men are less likely to participate or adhere to diabetes treatment or self-management programs (Duggan et al., 2014; Katula, Blackwell, Rosenberger, Goff, & Healthy Living Partnerships to Prevent Diabetes Research Team, 2011). More research is needed on H/L men's engagement.

Current frameworks for diabetes management. There are three diabetes-specific self-management programs that are recommended by the CDC: The Diabetes Self-Management Program (DSMP), the Spanish Diabetes Self-Management Program (SDSMP), and the Diabetes Self-Management Education and Training Program (DSME/T), only one of which is dedicated to Spanish speaking individuals, SDSMP. The DSMP and SDSMP are both 6-week programs that focus on techniques for dealing with diabetes symptoms, integrating exercise appropriately, eating healthy, taking medication, and working with health care providers to create a better life for people with diabetes (Centers for Disease Control and Prevention, 2017b). A task force comprised of the American Association of Diabetes Educators (AADE) and the ADA created national standards for the DSME/S which are reviewed and revised approximately every five years by stakeholders and experts in the diabetes education community, and are outlined in Table 1 (Haas et al., 2014). The problem with these programs is that they are often costly and require extended follow-up that is not always possible to maintain. Diabetes Self-Management Education and Support programs vary in cost and take less time to complete than the other programs with the curriculum covering nutrition, exercise, diabetes management, and coping strategies (Centers for Disease Control and Prevention, 2017b).

The American Diabetes Association (ADA) created the "Standards of Medical Care in Diabetes" which outlines the clinical practice recommendations for diabetes as well as components for diabetes care, treatment goals and guidelines, and tools to evaluate quality of care (American Diabetes Association, 2018a). Part of these standards include lifestyle management techniques, specifically diabetes self-management education and support, medical nutrition therapy, physical activity, smoking cessation counseling, and psychosocial care (American Diabetes Association, 2018b). Thus, there are more efforts towards making these resources available for people with diabetes.

Diabetes self-management education and support model. Diabetes self-management education and support services were created to facilitate learning the knowledge, skills, and abilities that are needed for diabetes self-care and also incorporates the needs, goals, and life abilities of those with diabetes to create a more complete picture of long-term diabetes lifestyle management (American Diabetes Association, 2018b). This model places the person with diabetes and their family at the center while collaborating with health care professionals to create a program that supports patient empowerment by providing the tools to make informed self-management decisions (American Diabetes Association, 2018b).

The objectives of DSME/S are to 1) support informed decision making, self-care behaviors, and problem solving; and 2) active collaboration with the health care team to improve clinical outcomes, health status, and quality of life in a cost-effective manner (American Diabetes Association, 2018b). The burden of treatment and the self-efficacy/confidence in behavior management, and the level of social and family support are also considered when a DSME/S program is created.

Tailored DSME/S models. Results from traditional DSME/S programs have been found to be generalizable for the majority of adults with type 2 diabetes (Steinsbekk, Rygg, Lisulo, Rise, & Fretheim, 2012). While DSME/S programs are effective, studies have shown that tailored DSME/S programs that include more culturally specific community issues that reflect the needs of the population, can improve diabetes related outcomes (Gucciardi, Chan, Manuel, & Sidani, 2013; Nam, Janson, Stotts, Chesla, & Kroon, 2012; Steinsbekk et al., 2012). There is a gap in information on DSME/S programs tailored to H/L men, though it has been observed that women have been the primary participants in tailored DSME/S programs (Nam et al., 2012). However, programs that are appropriate in their language tailoring and in addressing cultural history, values, and norms are newly being published which would contribute to the current research to increase program effectiveness (Gucciardi et al., 2013; Nam et al., 2012).

Addressing the Issue: The Diabetes Garage, a Program for Men in El Paso, TX. The Diabetes Garage (DG) is a program created to address diabetes disparities in H/L man in El Paso, Tx. The program was designed to engage men by tailoring an existing accredited Diabetes Self-Management Education/Support (DSME/S) program that was developed by the El Paso Diabetes Association (EPDA) and is certified by and follows the standards of the American Association of Diabetes Educators and the American Diabetes Association. The tailoring of the DSME/S was done through a collaboration of the UTEP research team, the EPDA, the YMCA Diabetes Prevention Program, Southwestern University Automotive and Diesel Maintenance Program, the University Medical Center Diabetes Program. The aims of the DG are as follows:

1. Increase men's participation in diabetes management programs compared to past EPDA classes

2. Determine if participation in the DG delivery modes increases men's self-efficacy and engagement in diabetes self-care behaviors

Program description. Prior to a full-scale implementation of the DG, a pilot study of the diabetes education class was implemented in May and June of 2018. This study included four 1.5-hour sessions that were held once a week over a four-week period and were conducted by a Certified Diabetes Educator and automotive instructor. The sessions of the DG focused on the features of diabetes and the signs and symptoms of the disease; medication and nutrition; the benefits of physical activity and stress management; and the complications and consequences that can arise from unmanaged diabetes, as well as support resources that are available. This program uses auto/car maintenance analogies to improve men's diabetes knowledge, to engage in preventative health screenings, and treatment and management adherence behaviors.

Health belief model. This program was developed using the Health Belief Model as its theoretical framework. The researchers believed that by having this framework as the central model of this program, (Dominguez et al., 2015; Singh et al., 2013) men's participation in the DG will act at the cue to action that will engage men based on their perceived diabetes risk/severity/threat, and improve men's perceived threat of diabetes and interest and engagement in medical and self-care activities. The researchers hypothesize that by reframing diabetes knowledge by using auto/car maintenance analogies, like the seriousness of having their car break down, men's self-care behaviors and health outcomes would improve. The researchers chose this model based on literature that suggests that symptom severity and seriousness was the best predictor of men visiting the doctor for a health outcome (Vaccaro et al., 2016).

The health belief model (HBM) is a model that attempts to explain and predict health behaviors by focusing on the attitudes and beliefs of the individual (Glanz, Rimer, & Viswanath,

2008). The HBM operates on the core assumptions that a person 1) feels that a negative health condition can be avoided; 2) will have a positive outcome from taking the recommended action and will avoid the negative health condition; and 3) believes that they can complete the recommended action successfully. The HBM (see Figure 1) also has four constructs that represent a person's perceived threat and benefits: percieved susceptibility, percieved severity, percieved benefits, and percieved barriers which are supposed to account for a person's readiness to act. In this model, the concept of a cue to action is believed to work directly on a person's percieved threat to a negative health outcome leading action. (Glanz et al., 2008)

The HBM's role in the Diabetes Garage. As it relates to the HBM, the DG is considered the "cue to action", a modifying factor that will influence the individual perception of perceived risk and severity of diabetes increasing the likelihood of action. The creators of the DG believed that the use of the culturally tailored car maintenance analogy, that is viewed as a cultural asset to El Paso, TX, men would be more engaged in health promoting behaviors (see Figure 2). The researchers hypothesize that by raising men's awareness of their own diabetes risk and severity of diabetes, men would be more likely to engage in diabetes self-care, medical care, and glucose control.

Formative Evaluation Goals and Aims

The primary purpose of this proposal is to conduct a mixed methods formative evaluation of the DG pilot program. Specifically, the evaluation's main goal is to continue to inform the development and implementation of the DG in the engagement of men in diabetes self-care behaviors. Specifically, this research proposal asks: Is the Health Belief Model (HBM) a viable theoretical model for engaging Hispanic/Latino men in the DG program?

The specific aims of this research are to: 1) determine if participating in the Diabetes Garage increases men's awareness of diabetes risk and severity, vulnerability, benefits and barriers, and self-efficacy (with the independent variable being knowledge and the dependent variables being risk, severity, benefits, barriers, and self-efficacy), and 2) examine the relationship between men's diabetes perceived risk and severity, diabetes knowledge, benefits and barriers to preventative action, and self-efficacy for managing diabetes.

Methods

IRB Approval and Ethics Statement

This study (UTEP IRB 1208424-1) was approved in Summer 2018 by the University of Texas at El Paso's Institutional Review Board (UTEP IRB) as a project exempted from full IRB review due to using secondary data.

The parent study, entitled *"The Diabetes Garage": A pilot study to engage men in diabetes medical care and self-care*, UTEP IRB 1179426-1, was approved in 2017 by the UTEP IRB under the expedited category. The parent research did not include children, prisoners, fetuses, pregnant women, or cognitively impaired participants. The parent research also did not include deception or involve more than minimal risk.

The data that was used in this evaluation was used with the permission of Dr. Jeannie B. Concha, principal investigator of the parent study. All participation in the DG pilot was voluntary and confidentiality and anonymity of the participants was kept by the principal investigator and research staff. All identifiers were stripped before the data was passed on for use in this study.

The investigator of this study was present at the DG as an observer of committee meetings, planning meetings, and events but did not participate in recruiting or data collection. The Diabetes Garage program and protocol are described below.

Parent Study Methods: Diabetes Garage Pilot Program

Pilot study participants and recruitment. The participants of this evaluation were men enrolled in the pilot DG program. The inclusion criteria for the pilot program included men 18 years of age or older who were English or bilingual (English/Spanish) speaking. Participants did not have to report having diabetes to participate, but prioritization was given to individuals who self-reported having diabetes. Exclusion criteria for the pilot program included women, children,

non-English speaking men, and men with a hearing disability. The DG enrolled 10 men in Pilot 1 and 10 men in Pilot 2. In Pilot 1, three men attended the program and two men completed the program (attrition rate=33.33%). In Pilot 2, eight men attended the program and six men completed the program (attrition rate=25.0%). The participants of the DG pilot were conveniently recruited to participate in the pilot program through EPDA events, community diabetes risk surveys held at male-targeted events, word of mouth, and the DG Facebook page.

Instructors. The Diabetes Garage was delivered by a Registered Nurse who was also certified as a Diabetes Educator (CDE). There was also an instructor for automotive maintenance in attendance who was able to further inform the participants on the car analogies and answer questions about cars.

Education materials. Educational materials for the DG were 1) modified DSME/S PowerPoints (see Appendix A), and 2) a toolbox. The PowerPoint modules focused on a) features of diabetes and signs and symptoms of diabetes, b) medication use and nutrition, c) benefits of physical activity and stress management, and d) complications and consequences of suboptimal glucose control and available support resources. The toolbox included diabetes-related screening information, self-care equipment (glucometer, blood pressure cuff, resistance bands) and informational pamphlets.

Obtaining informed consent. Men interested in participating in the DG pilot were directed to register for classes by calling the EPDA or the principal investigator (PI) of the pilot program. Contact information for men who were registered for the DG classes was kept by the PI and the CDE instructor. During the registration process, the PI, CDE instructor, and the PI's graduate assistant screened participants for age and gender and described what would be involved in participating in the DG.

Informed consent was obtained prior to the first-class session where the instructor read the consent form and the participant signed if they agreed with participation (see Appendix B).

Intervention. The pilot DG program consisted of four 1.5-hour educational sessions held on consecutive Saturdays between 12 pm to 2 pm at the Diabetes Garage at the El Paso Diabetes Association. Each session consisted of instruction from one of the modules given by the diabetes educator via PowerPoint presentation followed by a discussion with a car present in the garage.

Prior to the first class, participants were asked to fill out paperwork and go through assessments, including reviewing and signing the consent form, filling out EPDA paperwork, filling out assessment surveys, and having a glycosylated hemoglobin A1c (HbA1c) test to determine diabetes risk and glucose levels administered by the RN/CDE at the EPDA. After the last class, participants completed assessment surveys, had a second HbA1c test, and were invited to participate in a focus group to provide feedback for approximately one hour.

Pre- and post-intervention assessment. At the start of the DG pilot, the participants were given an intake survey that collected demographic information and diabetes-related information. This included questions on awareness of diabetes programs, diabetes knowledge, diabetes causation, perceived diabetes risk, perceived benefits and barriers to treating diabetes, intent to attend diabetes education classes and programs, and reasons men would not follow doctors' orders. For men who self-reported having diabetes, data on age and gender was collected. For those who did not self-report diabetes, the American Diabetes Association Risk Score survey was administered and recorded. To measure an increase in diabetes risk and severity, vulnerability, and self-efficacy, a pre- and post-assessment was used using the intake survey as the pre-assessment (see Appendix C) and a modified version of the survey for the post-assessment (see Appendix D). The same survey was used to understand the relationship between diabetes

perceived risk and severity, diabetes knowledge, benefits and barriers to preventative action, and self-efficacy. During the last class, the RN/CDE administered the post-assessment to the participants.

Focus groups. Qualitative data from the focus group was used to support the quantitative data. Supportive qualitative data was gathered from the focus group questions (see Appendix E) that were asked on the last day of instruction led by the RN/CDE instructor and participation was voluntary. The focus group was recorded and later transcribed. Focus group audio was then transcribed for use in analysis. Transcriptions were analyzed for major themes by individual coders, followed by consensus meetings to agree on major themes of the transcripts.

The list of contact information and names of participants was kept under an encrypted password protected Excel sheet only to be accessed by the PI, the RN/CDE instructor, and the PI's graduate assistant. The participant's names were not linked to assessment data and data collected from surveys and HbA1c tests was stored in a separate database with IDs for each participant. The ID were linked in a separate database with IDs associated to contact information. All databases were password protected.

Compensation. Participants received $20 cash and a $10 gas card for participation in the pilot program and focus group.

Study Design of Proposed Thesis

According to mixed methods guidelines, the current study uses a concurrent transformative approach to evaluate secondary data collected from the DG pilot study. Concurrent transformative designs involve collecting data from both quantitative and qualitative data concurrently and is guided by a theoretical perspective in the research question (Castro, Kellison, Boyd, & Kopak, 2010). This type of approach was chosen because this evaluation is focused on informing the

development and implementation of the DG in the engagement of men in diabetes self-care behaviors, specifically in using the Health Belief Model (HBM) as a viable model for engaging men in the DG program.

Quantitative data is collected for the purpose of the quantification of data, via statistical analysis, collected from a sample population that allows for the generalization of results from sample populations to the larger population of interest. Qualitative research is non-statistical analysis that is primarily used to understand underlying reasons and motivations that allows for the development of a deeper understanding of themes and the inspiration of rationale for further decision making. Quantitative analysis is largely considered to be objective, while qualitative analysis is considered subjective. Using both type of analysis together in research allows for the limitations of one type of analysis to be strengthened by the other.

Measures

Descriptive statistics. Demographic variables such as age, diabetes status, years with diabetes, marital status, ethnicity, nativity, education, employment status, income, insurance status, and likelihood of program participation were collected from participants' intake surveys. These measures were collected to inform this research on the demographic information of the participants as well as track the number of participants who completed the intervention. Items regarding psychological health, self-care behaviors, and physical health were also collected pre- and post-intervention. These items were collected to understand other factors that may have influenced the participants' health as well as observe how participation in the intervention influenced the participants' behaviors and physical and psychological health.

Participants' diabetes causation beliefs were measured by the Revised Illness Perception Questionnaire (IPQ-R), a 20-item list of diabetes causal items that included: behavioral causes

(smoking, alcohol, behavior, diet/eating habits), socioenvironmental causes (environmental pollution, germs/viruses, poor medical care in past, overwork), fatalistic causes (chance or bad luck, God's will, punishment from God), psychological causes (stress/worry, emotional state family problems/worries), and biological causes (aging, altered immunity, heredity) (Figueiras & Alves, 2007). The original scale was developed as a four-point Likert-scale from "Strongly Agree" to "Strongly Disagree" that was adapted to a "Select if this Applies" type of question. The frequencies of this measure were calculated and ranked.

Diabetes knowledge. Participants' diabetes knowledge was measured through questions taken from two questionnaires: the Starr County Knowledge Questionnaire and the Risk Perception Survey-Diabetes Mellitus (RPS-DM) Risk Knowledge subscale. The Starr County Knowledge Questionnaire was developed as a Spanish-language diabetes knowledge questionnaire in Starr County, TX, a county at the southern end of the U.S.-Mexico border. This questionnaire was created to be easy to use and provides a measure of general diabetes knowledge (Garcia, Villagomez, Brown, Kouzekanani, & Hanis, 2001). The RPS-DM scale was developed for English and Spanish speakers through a collaboration of the Albert Einstein College of Medicine and Columbia University Teachers College in New York to assess risk perception related to diabetes complications and their associations with participant characteristics in urban minority sample (Walker et al., 2007).

The Starr County Knowledge Questionnaire was originally a 21-item questionnaire with three response categories: "Yes", "No", and "I don't know". The parent study used five of the items and kept the same response categories. This measure was scored by adding together correct answers and then averaged. The highest score possible on this scale was a five, with higher scores

indicating an increase in diabetes knowledge. The α coefficient for internal consistency reliability for participants of 0.78 (Garcia et al., 2001).

The Risk Knowledge subscale is a five-item survey that asks if the survey items (1) increase the risk of getting diabetes complications, (2) have no effect on the risk of diabetes, or (3) decreases the risk of getting diabetes complications. Each correctly answered item is given one point and the final score is calculated by adding the correct points together. The highest score possible on this subscale was a five, with higher scores indicating a greater knowledge of diabetes complications (Walker et al., 2007). The α coefficient for internal consistency reliability for participants of 0.64 (Walker et al., 2007).

Diabetes risk perception and severity. Participants' risk perception was measured by the RPS-DM Composite Risk Perception Score. This survey was originally designed as a combination of five subscales that measure perceptions of risk for diabetes and its complications (Walker et al., 2007). The Perceived Personal Control subscale is a four-item scale that measures perceived control over developing diabetes. The Worry subscale is a two-item scale that assesses the degree of worry related to developing diabetes. The Optimistic Bias subscale is a two-item scale used to assess the belief that one is less likely to develop complications than others. The Personal Disease Risk subscale is a nine-item scale that assesses a person's perceived risk to different diseases or conditions. The Environmental Risk subscale compares a person's perceived risk to potential hazards in the environment. The Composite Risk Perception score was calculated by averaging the scores from the Perceived Personal Control, Worry, and Optimistic Bias subscales. Higher scores indicate a greater perceived risk, with an α of 0.85 (Walker et al., 2007).

In this study, the subscales that were used in the Composite Risk Perception Score were Perceived Personal Control, Worry, and Optimistic Bias. The Personal Disease Risk subscale was

not used in the final Composite Risk Perception Score. In the parent study, this subscale was included in both the pre- and post-assessments but record of the responses for the post-assessment were not captured. This was scored by averaging the scores from the Perceived Personal Control (highest score of four), Worry (highest score of two), and Optimistic Bias (highest score of two) subscales, with an average highest score of 2.67. Higher Composite Risk Perception scores indicate greater comparative perceived risk.

The four-item Perceived Personal Control subscale was originally developed as a four-point Likert scale from "Strongly Agree" to "Strongly Disagree". In the parent study the four-point Likert scale was not used, instead a simplified two-point scale was used using the options "Agree" and "Disagree". Two items in this subscale were reversed scored and then the average of the scores were taken, with the heist score being four. Higher scores in this subscale indicate more perceived control, while lower scores indicate less perceived control. The Cronbach's alpha for this subscale is 0.65(Walker et al., 2007).

The two-item Worry subscale was originally created with a four-point Likert-scale from "Strongly Agree" to "Strongly Disagree" and simplified to a two-point Likert-scale from "Agree" to "Disagree" was used in the parent study. The items in this subscale were reversed scored and averaged, with the highest score being a two. Higher final scores indicate more. This subscale has an α coefficient of 0.64 (Walker et al., 2007).

The two-item Optimistic Bias subscale was originally creased as a four-point Likert-scale from "Strongly Agree" to "Strongly Disagree" and simplified to a two-point Likert-scale from "Agree" to "Disagree" used in the parent study. The items in this subscale were reversed scored and averaged, with the highest score being two. Higher scores indicate more optimistic bias, while

lower scored indicate more realism/pessimism. The Cronbach's alpha for this subscale is 0.76 (Walker et al., 2007).

Perceived vulnerability. Participants' perceived vulnerability were measured by the Perceived Vulnerability questionnaire of the Health Belief Scales for Insulin-Treated Patients. This scale was created using the theoretical model of the Health Belief Model. It is believed that an individual's readiness to follow a treatment regimen is dependent on 1) the perceived desirability of avoiding symptoms and complications and 2) the belief that taking certain health actions will be effective but not costly to the individual in relation to the other aspects that are of value to the individual's lifestyle (Bradley, 2013). The Perceived Vulnerability questionnaire asks the respondent to rate how likely they believed they were to develop disorders related and unrelated to diabetes (Bradley, 2013).

The Perceived Vulnerability questionnaire uses a six-point Likert-Scale from "Very Unlikely" to "Very Likely" and a simplified version in the parent study that indicated if the participant felt they were "at risk" of a disease. The items of this questionnaire were added and averaged to get the Perceived Vulnerability score with the highest score being an eight. Higher scores indicating higher perceived vulnerability to disease (Bradley, 2013).

Perceived benefits and barriers. Participants' perceived benefits and barriers were measured by the Perceived Benefits and Barriers questionnaire of the Health Belief Scales for Insulin-Treated Patients. This scale was created to measure beliefs about diabetes and its complications to understand the differences in the preferences of treatment regimens and to assess treatment efficacy (Bradley, 2013).

Perceived benefits and barriers will be measured by the Perceived Benefits and Barriers subscales. This measure contains 12-items and is rated on a seven-point Likert-scale from

"Strongly Disagree" to "Strongly Agree". Scores on these subscales range from 0 to 36 where higher scores indicate more perceived Benefits or more perceived Barriers. To assess the perceived cost of treatment, the measure Cost-effectiveness was obtained by subtracting the participant's Barriers from Benefits scores. The perceived benefits scale has an alpha of 0.67 and the perceived barriers scale has an alpha of 0.79 (Bradley, 2013).

Self-efficacy. Participants' self-efficacy came from an adapted version of the National Diabetes Education Program, which is a DSME/S program (Devchand et al., 2017; Piccinino et al., 2017). The self-efficacy asks four question, two that correspond to self-efficacy attitudes and the other two that correspond to self-efficacy behaviors. This measure was measured on a five-point Likert-scale from "Strongly Agree" to "Strongly Disagree".

The items from each category, self-efficacy attitudes and self-efficacy behaviors, were added together and the scores averaged. Each category had a highest possible score of 10.

Psychological and physical health characteristics. Psychological health characteristics, self-care behaviors, and physical health characteristics were also collected and analyzed as part of the analysis of the overall HBM.

Psychological health was assessed using three different questionnaires: stress, depressive symptoms, and well-being. Stress was measured using the Chronic Stress Survey used by the Hispanic Community Health Study. This survey included seven items that were scored on a Yes or No basis. The score range for this survey was from 0-7. Depressive Symptoms was measured using the Patient Health Questionnaire-2 (PHQ-2) survey. This survey included two items and is used to know the frequency of depressed mood and inability to feel pleasure over the two-weeks prior to assessment (Kroenke, Spitzer, & Williams, 2003). The score range is from 0-6 with a cutoff score of 3, where scores of 3 or higher warrant further evaluation for a depressive disorder.

Well-Being was measured using the WHO-5 Well-Being Index developed by the Diabetes Attitude Whishes and Needs (DAWN) Study. This index included five items on positive mood, vitality, and general interests that has been shown to be a reliable measure of emotional functioning and a screener for depression among people with diabetes (Wit, Pouwer, Gemke, Waal, & Snoek, 2007). The score range for this index is 0-100, with scores of 50 or below indicating low mood and scores of 28 or below indicating likely depression and advises further assessment to confirm a diagnosis of depression.

Self-care behaviors were measured using standard DSME/S questions that ask questions on nutrition habits and physical activity during an average or typical week. Nutrition questions measured the amount of sugar-sweetened drinks consumed, number of days measuring food portions, and number of days counting carbohydrate servings. Physical activity questions included questions on the amount of time spent being physically active in a typical day and the number of days they are physically active per week.

Physical health was measured by taking several measurements from participants on the first (week 1) and last (week 4) days of the intervention. The measures included weight, blood pressure, waist circumference, non-fasting glucose, and HbA1c.

Procedures for Data Collection

Data for the evaluation of the DG pilot program was given to the evaluator by the PI, Dr. Concha. The data that was used is that of the assessments, surveys, and focus group and was given to the evaluator in the form of an integrated SPSS file and focus group transcript on a secure USB flash drive, all striped of identifiers prior to delivery.

Data from the pre- and post-test single sample evaluation design was used to determine if participation in the DG increases men's diabetes knowledge, awareness of diabetes risk and

severity, vulnerability, perceived benefits and barriers to treatment, and self-efficacy. That data was also used to examine the relationship between men's diabetes perceived risk and severity, diabetes knowledge, benefits and barriers to preventative action, and self-efficacy for managing diabetes.

First, data for the quantitative data was de-identified by the parent study PI and research assistant and given a secondary participant identification number. The spreadsheet that contained participant names, original participant identification numbers, and secondary identification numbers was only accessibly by the parent study researcher and research assistant. Paper copies of pre- and post-assessments were input into an SPSS database created by the thesis researcher and merged with the SPSS database of the electronically collected pre- and post-assessments created by the parent study research staff. The merged SPSS database was reviewed by the parent study PI for completeness and to ensure all information was input correctly.

Second, qualitative data from the focus group transcriptions was collected through thematic analysis. Transcripts were coded for major themes by four separate individual coders. The individuals then met on two separate occasions to compare themes and come to a consensus on the major themes in the focus groups. Data gathered included information on the participants' views of perceived diabetes risk and severity, diabetes knowledge, benefits and barriers to preventative action, and self-efficacy for managing diabetes.

Statistical and Data Analysis

Statistical analysis was carried out using SPSS Statistics Version 24 (IBM Analytics). Exploratory data analysis was conducted to assess descriptive statistics and to summarize quantitative and qualitative data that was collected. To address the aims of this study, non-parametric observational mean comparisons and frequency analyses were conducted to analyze

the differences between pre- and post-tests among the participants who had completed both pre- and post-assessments. *T*-tests were not conducted for this research because of previous studies that shows that *t*-tests that are run on small sample sizes (n=2 to n=5) yield statistically significant findings that are actually false positive (Winter, 2013). Those studies also stated that paired *t*-tests were acceptable to run on small samples only if the correlation coefficients were high (Winter, 2013). The correlation coefficients of the tests that were sued to score the quantitative data were not consistently high enough to rely on *t*-test results that would be run on the currently collected data.

Focus group transcriptions were coded using the interview questions as a coding guide (see Appendix E) and themes identifies. A group of coders for the larger DG pilot analysis met to determine a consensus of the coded data and themes that came from the focus group data.

Research question 1: Determine if participating in the Diabetes Garage increases men's awareness of diabetes risk and severity, vulnerability, and self-efficacy. An observational comparison of pre- and post-test means was used to illustrate if there was a change in diabetes knowledge, perceived diabetes risk and severity, vulnerability, benefits and barriers to treatment, and self-efficacy. Typically, a paired sample *t*-test would have been run on this data, but the lack of normal distribution in the data made a Wilcoxon rank-sum test not valid. For paired samples that are also small, (n=2 to n=5), other *t*-tests are not recommended because of their high rates of false positive statistically significant results (Winter, 2013).

Research question 2: Examine the relationship between men's diabetes perceived risk and severity, diabetes knowledge, benefits and barriers to preventative action, and self-efficacy for managing diabetes. Because of the small sample size, of the parent study, a correlation matrix was not able to be run on the data to examine the relationship between the measures because

correlations are very sensitive to outliers, which are increased by very small sample sizes. Instead, the relationships between the measures observed based on the increase or decrease of the variables' assessment from pre- and post-intervention data from a series of tables with corroboration from quantitative data from the focus groups.

Results

Quantitative Findings

A full list of descriptive statistics by pilot study can be viewed in Table 4. Table 5 shows a full description of participants causation beliefs pre- and post-intervention by pilot study. Table 6 includes information on the mean comparisons of the Health Belief Model Framework (diabetes knowledge, risk knowledge, risk perception, vulnerability, benefits and barriers, and self-efficacy) of pre- and post-intervention broken down by pilot study and Table 7 shows data from only paired samples (samples that correspond to participants who completed both pre- and post-assessments), pre-and post-intervention of the same data. Psychological and physical health characteristics (psychological health, self-care behaviors, and physical health) of pre- and post-interventions broken down by pilot study can be found in Table 8 and Table 9 shows only the data from paired samples pre- and post-intervention of the same data.

Descriptive statistics. The first pilot study (P1) had three men attend the first class and two men completed the program. The second pilot study (P2) had eight men attend the first class and five who completed the program. The mean age of participants for both pilot programs was 60.10 years (P1=51.33, P2=63.86). All men in the program except one in P2 had diabetes, with a mean of 3.11 years with the disease (P1=3.00, P2=3.17). Most men in the study were married (total=54.5%; P1=9.1%, P2=45.4%), Hispanic/Latino (total=70%; P1=30%, P2=40%), and born in the United States (total=80%; P1=30%, P2=50%). All the participants had at least a high school education (total=20%; P2=20%) and the rest having either gone to trade/vocational school (total=20%; P2=20%) or college/university (total=60%; P1=30%, P2=30%). There was a variety of income levels among the participants of the pilot, with half having a household income of $50,000 or more. Most individuals also had insurance of some form (total=90.9%; P1=18.2%,

P2=72.7%). All participants indicated that they were likely to participate in other diabetes self-management programs, with nine participants indicating responses of "very likely" to program participation (total=90%; P1=30%, P2=60%).

Pre-intervention, P1 participants ranked "Hereditary" (73rd percentile) as the highest diabetes causation belief followed by "Diet or eating habits" (55th percentile) as second, and a combination of "Poor medical care" (45th percentile) and various behaviors and attitudes in third. Post-intervention, P1 participants ranked "Stress or worry" and "Diet or eating habits" (56th percentile) as first, followed by "Hereditary", "Poor medical care", "Alcohol", and "Personality" (44th percentile) as second. Pre-intervention participants in P2 ranked "Stress or worry" and "Hereditary" (73rd percentile) as first at the beginning of the intervention, followed by "Diet or eating habits" (61st percentile) as second. Post-intervention, participants in P2 ranked "Stress or worry", "Hereditary" and "Diet or eating habits" (62nd percentile) as first and "Behavior" and "Family problems" (41st percentile) as second.

Diabetes knowledge. Diabetes knowledge was assessed via two questionnaires, results shown in Table 3. The Starr County Knowledge Questionnaire showed an increase of general diabetes knowledge from a mean score of 3.50 (SD=0.55) pre-intervention and a mean score of 3.83 (SD=0.75) post-intervention among six participants. Diabetes risk knowledge from the RPS-DM also showed an increase from a mean score of 3.29 (SD=1.70) pre-intervention to a mean score of 3.86 (SD=1.35) post-intervention among seven men.

Diabetes risk perception and severity. Risk perception was assessed through the RPS-DM Composite Risk Perception score which showed a decrease in perceived risk from a mean score of 1.53 (SD=0.21) pre-intervention to a mean score of 1.15 (SD=0.19) post-intervention among five men. Notable scores related to risk perception were in the Worry and Optimistic Bias

subscales used to calculate the Composite Risk Perception score (Table 4). Worry score means decreased from 1.58 (SD=0.45) pre-intervention to 0.90 (SD=0.22) post-intervention among five men. Optimistic Bias score means also decreased from 1.40 (SD=0.55) pre-intervention to 0.50 (SD=0.35) post-intervention among five men.

Perceived vulnerability. Perceived vulnerability (Table 5) was assessed by the Health Belief Scales for Insulin-Treated Patents Vulnerability subscale. The mean Vulnerability score decreased from 7.67 (SD=2.73) pre-intervention to 6.67 (SD=4.89) post-intervention among six men.

Perceived benefits and barriers. Benefits and Barriers were assessed by the Benefits and Barriers subscales from the Health Belief Scales for Insulin-Treated Patients. In this scale, Benefits and Benefits means decreased from 27.17 (SD=8.70) pre-intervention to 20.83 (SD=13.78) post-intervention among six men. Barriers score means also decreased from 13.67 (SD=8.69) pre-intervention to 8.50 (SD=8.67) post-intervention among six men. Cost-effectiveness score means also decreased from 13.50 (SD=11.62) pre-intervention to 12.33 (SD=14.98) post-intervention among six men.

Self-efficacy. Self-efficacy measured by an adapted DSME/S scale measured self-efficacy via self-efficacy in their attitudes and behaviors. Self-efficacy in attitude means decreased from 3.17 (SD=1.17) pre-interventions to 2.33 (SD=0.52) post-intervention among six men. Self-efficacy in behavior means decreased 2.83 (SD=1.33) pre-intervention to 2.67 (SD=0.82) post-intervention among six men.

Psychological and physical health characteristics. Psychological health was assessed through the assessment of Stress, Depressive Symptoms, and Well-Being. Stress score means increased from 2.17 (SD=1.72) pre-intervention to 2.83 (SD=2.56) post-intervention among six

men (Table 6). Depressive Symptom scores did not change from pre- to post-intervention with the mean score being 2.33 (SD=0.82) among six men. Well-Being score means increased from 79.33 (SD=15.06) pre-intervention to 80.67 (SD=13.72) post-intervention among six men (Table 7).

Self-care behaviors were measured through assessments of nutrition and physical activity behaviors. There were minimal changes in the number of sugar-sweetened drink that were consumed by the participants. Pre-intervention 4 (57.1%) participants drank one to three sugar-sweetened drinks per week and 3 (42.9%) participants drank zero sugar-sweetened drink per week. Post-intervention 4 (57.1%) participants drank zero sugar-sweetened drinks per week, while 2 (28.6%) participants drank one to three sugar-sweetened drinks per week, and 1 (14.3%) participant drank four or more sugar-sweetened drinks per week.

The amount of days that the participants measured their food portions increased pre- to post-intervention (Table 8). Pre-intervention, 2 (28.6%) participants measured their food portions four to seven day a week, while 4 (57.1%) participants did not measure their food portions at all and 1 (14.3%) participants did not know how to measure food portions. Post-intervention, 3 (42.9%) people measured their food portions one to three days a week and four to seven days a week, while only 1 (14.3%) participant continued to not measure their food portions during the past week.

When asked how many days the participant counted their carbohydrate servings in the last week, the number of participants who counted their carbohydrate servings increased pre- to post-intervention (Table 9). Pre-intervention, 5 (71.4%) participants did not measure their carbohydrate servings, while 1 (14.3%) participant measured their carbohydrate servings four to seven days a week, and 1 (14.3%) participant did not know how to count their carbohydrate servings.

Pre-intervention, participants were physically active three to seven days a week, with 3 (42.9%) participants being physically active seven days a week and 2 (281.6%) of participants being physically active three days a week. Post-intervention, most of the participants exercised five to seven days a week, with 4 (57.1%) participants being physically active seven days a week and 1 (14.3%) participant acting as an outlier being physically active one day a week.

Physical health was assessed by weight, blood pressure, waist circumference, fasting glucose, and HbA1c. All physical health measures showed improvements. The mean weight decreased from 217.58 lbs. (SD=40.58) pre-intervention to 212.67 lbs. (SD=34.01) post-intervention among six men (Table 10). Mean systolic blood pressure decreased from 145.40 mmHg (SD=20.31) pre-intervention to 129.60 mmHg (SD=19.78) post-intervention among five men (Table 11). Mean diastolic blood pressure also decreased from 74.40 mmHg (SD=9.45) pre-intervention to 67.40 mmHg (SD=10.85) post-intervention among five men (Table 11). The mean waist circumference decreased slightly from 44.80 inches (SD=4.66) pre-intervention to 44.60 inches (SD=4.67) post-intervention among five men (Table 12). The mean fasting glucose decreased from 126.75 mg/dL (SD=13.48) pre-intervention to 122.50 mg/dL (SD=31.04) post-intervention among four men (Table 13). Mean HbA1c levels also decreased from 7.62% (SD=1.70) pre-intervention to 7.34% (SD=1.29) post-intervention among five men (Table 14).

Qualitative Findings

Quantitative findings were supported by the qualitative data, which showed men's perceptions were in alignment with the HBM pathway for behavior change. The themes resulting from the qualitative analysis are organized and presented following the pathway of the HBM following the cue to action (see Figure 2 and Appendix E): perceived risk and severity, diabetes knowledge, perceived threat and vulnerability, perceived benefits and barriers, self-efficacy and

engagement, and health outcomes. Quotes from the participants are used to exemplify themes and subthemes.

Theme 1: perceived risk and severity. When specifically asked about risk being a motivating factor for men to engage in their health, the participants agreed that risk would be a motivating factor in getting men to engage in their health. The participants also thought that risk of complications or severity of disease being a motivating factor in attending the DG. As noted above, and in Table 7 and Figure 4, Composite Risk Perception scores decreased from pre- to post-intervention.

> Male participant 1: I think so…one of the reasons, I took this [class]…I have neuropathy in me feet so, my fear of losing a foot or toe or whatever, you know, is what brought me around to snap out of it and start taking classes.
>
> Interviewer: Ok, so you reached a level where you felt that it was time to engage in health? Ok.
>
> Male participant 2: For me, I was a counselor for 18 years, and I worked with people with disabilities, and a majority of people who had diabetes that I worked with, you know, had, you know, problems with their vision, problems with their feet, amputations, things of that nature…I mean that raised a red flag for me too because those are the type of things I don't want to happen. And so, this is why that I'm here too because I just don't want that to happen.

Theme 2: diabetes knowledge. Some participants indicated that though they had had diabetes for years, some of the information they had learned about managing their diabetes was

not accurate or sometimes incorrect. After participating in the DG, participant scores in Diabetes Knowledge and Risk Knowledge increased pre- to post-intervention (as seen in Table 7 and Figure 3).

> Interviewer: That's great, that's great. What about the rest of you? What made you all decide to come to The Diabetes Garage?
>
> Male participant 3: Well I came because I had diabetes since 1982…. I have diabetes I can manage it, I tried or somethings, for instance you go to the doctors [and they gave you insulin and told me to take] this in the morning and so much in the evening and I learned a completely different way of the right way….The eating problem is always very difficult, I work from 2 to 10. 10 o'clock at night so when I come home then I'm hungry I have to eat something. So, what you learn from this class is that you have to learn— this class has [helped] me to see what to eat… you have to simply learn how to eat….
>
> Male participant 4: The reason I [came] is because I wanted to you know, learn how to manage my eating, how to take care of myself and before I usually just eat and not take care of myself, knowing how to measure myself of what I can eat and what can I not eat and how much to eat—like that. Plus, I've had a lot of friends that have passed away from diabetes. What already one can learn more information how to take care of myself how to be more how to monitor yourself with diabetes.

Theme 3: perceived threat and vulnerability. Participants voiced that one of the major reasons that they came to the DG and participated in classes was because they knew someone with diabetes who had suffered from a complication from diabetes or they themselves had another

disease could be affected by diabetes. Vulnerability scores decreased pre- to post-intervention, as seen in Table 7 and Figure 5.

> Male participant 1: I've been diagnosed as a pre-diabetic for the last 10 to 15 years…. I suffered from a massive heart attack in 1997 to a connection with these [diabetes] meds, I've read here and there that diabetes can be more dangerous for individuals like myself with cardio problems so when I saw this at [Omitted University Name] I took the opportunity to input and came here to learn more about how to prevent it from going from this stage.

> Male participant 2: [A coworker] developed a little sore on the foot, but when he went to [Omitted place] they were just going to take off his toe, when he got bad he was so severe he lost his whole leg and the [Omitted name] paid for a fake leg, well he still didn't take care next thing I know he lost his other foot. He had both feet that were fake. And he worked in the basement of building one and he had to go down the stairs, he would take the foot off and he would just—we called it, he would duck walk all the way down to the bottom of the stairs. Next thing I know he passed away from diabetes. That made me a lot of aware of what's happening out there.

> Male participant 4: You got a lot of people—I've had friends to where—high blood pressure or they have had heart attacks or stuff like that. They are either smoking or too much drinking or don't care at all. I got—like I told my friend "hey you need to check yourself out" this and that "ahh what the heck for? I'm gonna die anyway" got that attitude, "I'm gonna die anyway so what the heck?" But they don't under—really don't know the

seriousness of what, you know, stuff like that. They just adding stress to your family, to your wife and stuff like that. They— "I don't care, I'm gonna die anyway" but they don't really know, they are going to leave the stress to the family members.

Theme 4: perceived benefits vs. barriers. Though Benefit and Barrier scores decreased from pre- to post-intervention (see Table 7), Cost-effectiveness scores still indicate that the participants saw that there were more benefits to treatment and preventative action than barriers because the scores remained positive, though lower post-intervention than pre-intervention. Participants viewed treatment to be important and necessary to managing diabetes. They also viewed participating in the DG as an addition to their treatment process.

Male participant 2: I don't know, to me it just depends on the person itself. If a man really wants to take care of himself then he will do something about it. If they don't, then they don't. Whatever happens, happens. Just like for cars, if you do the maintenance, it will work with you but If you don't eventually it's gonna breakdown. So, to me it just depends on the person and it depends on, what is important and what it is they want to do for themselves to make themselves better or be aware of what's going on.

Research has shown that H/L men seek treatment when they feel that their symptoms are severe enough to pose a threat to themselves or their lives. But, when asked if using the DG as a means of educating men on diabetes instead of using a seriousness approach to inform people with diabetes about the progression of the disease if not managed properly, the participants had the following to say.

Male participant 1: I don't think you—I've never like the approach where you scare somebody into coming to something. I like the approach where we're here to educate you on how to handle this condition/disease, I'm not sure what the right term is.

Theme 5: Self-efficacy and engagement. Self-efficacy scores were lower post-intervention than pre-intervention in both attitudes and behaviors questions. Participants generally felt that after participation in the DG program they were better equipped at managing their diabetes. The most talked about behavior that the participants mentioned in the focus group were in relation to their eating behaviors.

Male participant 1: …I'm the type of guy, I'll eat once a day, if I have time…and, she [instructor] really made me realize that I need to eat small meals or grabs snacks or to function, to get where I need to function properly.

Male participant 1: But yeah, you can eat anything just kind of in moderation.

Interviewer: Yeah and I think that's, we do this so that you know that you can eat anything.

Male participant 1: Yeah

Interviewer: It's about knowing what you need to eat.

Male participant 1: Exactly.

Theme 6: health outcomes. The most notable health outcome that was mentioned in the focus group were regarding weight and eating habits. As noted in Table 9 and Figures 8, 9, and 10, there was a shift in the number of men reporting changes in their eating habits (measuring food portions and counting carbohydrate servings), weight, blood pressure, waist circumference, non-fasting glucose, and HbA1c levels.

Male participant 3: This is the way to do it, the last four weeks since I started here, I lost 14lbs—just changing what I eat.

Male participant 5: [During a discussion about suggestions on recruitment the participant commented on how he had better control on this glucose levels after completing the DG] Give them to—the basics with the doctors. I practically got hurt over here by my doctor because I was totally confused on how to use insulin…. I just started on it. And they suggested I needed some understanding. You know, again I've been fighting this disease for years and I still didn't understand.

Male participant 2: … Me and my son went to [Omitted place] the other day, he ordered his steak, they brought the big salad and they brought the big plates and it was big. When she got my order as she was leaving, I said, "Wait a minute, can you make mine a small portion?" and she did! She brought me like a little small plate with all the ingredients around it. I left that restaurant content, not overstuffed and he had a lot of trouble. He just couldn't finish it and he was trying to finish it and stuff like that. And there—so were indulging because they learn from us.

Perception alignment that is not seen in quantitative data. Some themes that also came up during the focus group discussions revolved around culture, fear, and avoidance. These themes, though not the focus of this research offered greater insight to the male participants' views of diabetes and the barriers they have faced in seeking treatment. In the context of the HBM, these themes fall under the area of "modifiable factors" as beliefs of the individual (Figure 2).

Mexican-American culture. The aspects of Mexican-American culture that the participants referred to were that of the sense of pride that they associated with optimal health of a H/L man and as a potential barrier for men seeking treatment or management of diabetes before symptoms become severe.

> Interviewer: Ok. Anything else with recruitment? To get individuals to go, what do you think will get men with diabetes to go to this type of class?
>
> Male participant 2: Like [Omitted Name] was saying, just getting more information at the time that you're like at a car show. Having, going to different events, it's really hard to say because of the fact that, you know, males tend to be, very prideful in terms of any medical condition. They might sit there and say, well I'll need this because I know, I already know how to do, take care of myself, so, so forth and so on. That might be a possibility of why, some men, not saying all.

Other cultural aspects of the Mexican-American culture that the participants discussed were those associated with food and food consumption. They discussed how food was associated and intertwined with their family time and how important food was for those who grew up with less money.

> Male participant 2: You know, you need something, how to order in restaurants. Most us, I know my wife used to take me all the time. When it comes to a restaurant, the buffets are terrible. I always used to—the concept is we eat with our eyes instead of with our stomach. We see it, we want it, consume and coming from a very poor family, there were 5 of us and my mother would feed us and she would said "and don't leave the table until you eat it up"; to eat it up and that's the way I am, you put it on the plate and I'll eat it up!

Fear and avoidance to treatment. Participants also discussed that they believed that other men, as well as themselves, were hesitant to treatment because they did not have positive experiences with their doctors or other health care professionals.

> Male participant 1: I've been diagnosed as a pre-diabetic for the last 10 to 15 years and with all due respect to the medical profession, this issue is just one big fight sometimes to give you all the insight, like what to do to prevent you from being a diabetic.

> Male participant 1The other thing-- for example in my case, having been diagnosed as a diabetic for the last 10 to 15 years. When I go to my doctor and looks at my numbers and says "shall I be concerned? Na, not really." So when it comes to my doctors—they're like ok, what do we do?

> Male participant 1: You know, like I said I've got 40 years of healthcare service administration—I've worked with residents, students, doctors, and especially here in [Omitted Place] we lack so many doctors they don't have the time to spend with you to give you that information.

The participants also talked about how the aspect of pride, in addition to this fear of health care providers, led them or others that they knew to avoid seeking treatment for diabetes until their health or life was threatened by the severity of their symptoms.

> Male participant 2: Speaking for Hispanic people it's a macho thing. Like I said before, my whole family is diabetic aunts, uncles and stuff like that. Just about everybody. My younger brother—my baby brother, right now he's in the hospital, he drank a lot, he never checked himself and I kept telling him, "yo you need to check yourself." Well he ended up

in the hospital, his sugar level is up at 480 he decided to have complications and now you know, that he's going through that, now he's saying, "I'm just waiting to get out of here, I'm going to take care of myself" stuff like that, it's a rude awakening but sometimes it's too late. It's too late but they don't want to admit that and—….

Discussion

The purpose of this evaluation was to inform the development and implementation of the DG in the engagement of men in diabetes self-care behaviors by evaluating if the HBM is a viable model for engaging men in the DG. Specifically seeking to 1) determine if participating in the pilot DG increases men's diabetes knowledge, awareness of diabetes risk and severity, vulnerability benefits and barriers to treatment, and self-efficacy and 2) examine the relationship between the relationship between men's diabetes perceived risk and severity, diabetes knowledge, benefits and barriers to preventative action, and self-care for managing diabetes. The hypothesis of this research was to determine if participation in the pilot DG increased men's diabetes knowledge, perceived risk and severity, vulnerability, benefits and barriers to treatment, and self-efficacy.

Conclusions

Examination of the pilot data suggests an increase in diabetes knowledge, risk knowledge as well as improved changes in some nutritional behaviors and physical health measurements. Data also suggests a decrease in risk perception, and vulnerability. Although not all risk HBM constructs change in the direction that was hypothesized, risk perception knowledge did. Because of this, it is concluded by this research that the HBM may be a viable theoretical model for the engagement of H/L men in diabetes self-management. The central hypothesis of the HBM is that negative health consequences, or risk and severity of disease, are the primary motivating factor for people taking positive action in their health.

Comparison to Past Literature

Men's engagement in health is not well studied and there are few studies that look at men's engagement in their health. Of the literature that is available of patient engagement, it is posited

that men do not engage in their health mainly because of their backgrounds, health literacy, cost of treatment, and issues with health care providers (James et al., 2013). Studies have shown that men are more willing to engage in their health if they are participating in a gender-targeted lifestyle intervention, as was seen in a process evaluation of the PULSE Program for type 2 diabetes in Australia (Aguiar et al., 2017).

For H/L, specifically those of Mexican origin, a review of federal- and state-level policies surrounding immigration have had an impact on H/L health and their ability to engage in health related practices, including stress related to structural racism and discrimination, reduced access to social institutions and safety nets, worse access to healthcare, and limited access to material conditions (Barquera et al., 2018; Philbin, Flake, Hatzenbuehler, & Hirsch, 2018). There is little literature on why H/L men would or would not engage in their health, but the data that is available suggests that H/L men are more likely to engage in their health because of the serious or severity of their symptoms (Vaccaro et al., 2016). Because of H/L men's greater prevalence of diabetes (Borrell et al., 2009; Dominguez et al., 2015; González et al., 2015) and their lower engagement in self-care behaviors (Vaccaro et al., 2016), a culturally tailored diabetes education program aimed specifically at H/L men would be of greater benefit to them and could increase rates of self-care and lower the rates of diabetes in the El Paso border area, a conclusion that is supported by the results of this study.

Data on whether the Health Belief Model is a viable model for the basis of a diabetes education program among H/L has not been greatly researched. But some research on using the Health Belief Model in interventions has shown a greater adherence to medications (Gutierrez & Long, 2011) and has been shown to be an adequate model for understanding socio-psychological

factors that influence adherence to a diabetes self-care regimen (Gillibrand & Stevenson, 2006), which is supported by the findings in this research.

Pathway analysis of the use of the HBM in a type 1 diabetes treatment program among young people in the United Kingdom showed that individuals who were more empowered had higher scores in quality of life, as well as feeling a loss of control when they are less empowered (Gillibrand & Stevenson, 2006). Though pathway analysis could not be assessed in this research, participants in the DG were empowered by the intervention (data from the focus group transcripts) and well-being scores increased according to the quantitative data, even though data from the quantitative analysis showed that self-efficacy scores were lower post-intervention. This drop in self-efficacy may be explained by the participant being overwhelmed with the information that they have received in the DG classes, a pattern that has also been seen in the literature (Albikawi, Abuadas, & Petro-Nustas, 2015). The literature also showed that after the initial drop in self-efficacy post-intervention, there was a rise in self-efficacy two- and three-months post-intervention.

Having a culturally tailored intervention, like the DG, that focusses on cultural adaptations that are specific to a population are more successful in reaching effectiveness in minority populations. A systematic review on the effectiveness of cultural adaptations of interventions for smoking cessation, diet, and physical activity shows that specific culturally adapted programs had a statistically significant effect on primary program outcomes (Nierkens et al., 2013). Program participants agreed in the focus groups that using car analogies to relate diabetes health information was an effective strategy to engage men in their health. They also gave suggestion on other subjects that could be used to related health information to men like technology and sports.

Strengths and Limitations

Conducting a formative evaluation of a pilot intervention is a major strength of this research. Research on the implementation of theory use in intervention practices is not often seen in program evaluation and can further inform and strength a program. It is particularly important in this research because of the use of the HBM as a means of changing behavior by informing the participant on the risk associated with not treating or maintaining diabetes properly. This study also benefits from the parent and current study having amazed methods approach. Having the program participants' thoughts and ideas inform and influence the way the program operates in the future, is a benefit to a program that has a cultural component at its core. This cultural component is also strengthened by having local researchers being involved in the current and parent study. Programs that are culturally tailored usually refer to universal characteristics, such as family, food, and religious beliefs, but the DG focuses on a specific cultural aspect that is unique to the El Paso, Texas population (i.e. car culture). This study also benefits from serving an underserved and understudied population. Hispanic/Latino men are not very well studied in program research because they are not the majority population in program participation. Studies like this, and the parent study, can inform further research on H/L male engagement in programs.

This study's major limitation is the small sample size and low statistical power. Because of the small sample size, the data that was gathered in this study is not generalizable to a larger population. The sample size also affected the statistical analysis of the study because of the inability to run reliable *t*-tests and regression analysis. The sample size did not allow for regression analysis or pathway analysis of the variables. This study would also benefit from being able to analyze the data from the full diabetes garage program in order to support the findings from this study.

Implications to Public Health

Review of the model that was used to create and tailor the program, the HBM, and its focus on a person's perceived risk and severity would be beneficial to the overall success and implementation of the Diabetes Garage. There is not much information in the literature on the implementation of theoretical models in DSME/S programs and whether they are beneficial to the overall program outcomes, so research into this topic is needed to greater understand the impact of these models on DSME/S type interventions. Further research in this area through the comparative analysis of programs that include theory in their construction and those that do not could give greater insight to the benefits of including theory in the creation of a health relation intervention program.

Community health could also be impacted by further research into the findings of this study. Superficially, the DG and other diabetes self-management programs could be impacted by further study and research in this program. But on a larger level, the DG and its participants could inform community level efforts as well as the health care sector on diabetes treatment and management options. Participants voiced in the focus groups that they felt that there was a disconnect between community organizers, health care workers, and medical professionals in the options that were offered in diabetes management. They felt that if these health care professionals were more informed on programs and other resources for people with diabetes, there would be greater participation in classes and a greater understanding of the risks and severity associated with diabetes.

The participants of the DG also voiced that they wanted to stay involved with the DG and in helping to educate others in the diabetes self-management. The participants of the DG pilot programs are currently serving as advisors for the program to inform further development of the

program. Participants also showed modeling behaviors when they were participants in the pilot program. From the focus groups it is known that participants asked friends, family members, and co-workers if they were aware of their glucose levels, especially those who have been diagnosed with pre-diabetes and diabetes. Modeling was also shown in participants teaching their family about the better eating habits they had learned in class and suggesting and encouraging others to do the same.

Recommendations

Based on the results from this study, statistical analysis with a larger sample would greater inform this research and the DG on ways to engage men in diabetes self-care and their health. One of the major limitations of this study was that the relationship between the variables was not able to be analyzed. Because of this, regression analysis on a larger sample size would be beneficial and would be better able to inform researchers on the effect that risk has on the participant and engagement in their health. Pathway analysis, a common tool in bioinformatics, could be used to analyze the relationship between the independent and dependent variables in the HBM. This study would also benefit from correlation analysis which would be able to inform on the strength of any relationship that would have been analyzed and shown in regression analysis or pathway analysis.

The DG could also benefit from process evaluation of the full program with a focus on fidelity. This type of program evaluation would be beneficial because it would inform researchers on the extent to which the intervention was implemented as planned. This type of evaluation would involve a mixed methods approach which would include creating measures that would indicate successful implementation of the program, as well as contributions from stakeholders (i.e. community members and program participants) to assess the programs most successful elements.

If the full DG program operated with high fidelity, there would be greater success in replicating the program in the future.

Comparative effectiveness research (CER) would also benefit the research surrounding diabetes self-management among H/L men. This type of research aims to evaluate and compare the implications and outcomes of two interventions to identify which intervention would work best for improving health, in this case: traditional DSME/S vs the DG.

MPH Competencies and Strategic Frameworks

MPH competencies. The University of Texas at El Paso (UTEP) Masters in Public Health (MPH) program competencies cover the five core areas of public health: biostatistics, environmental health, epidemiology, health policy and management, and social and behavioral sciences. An additional competency was developed specifically for the MPH program Hispanic and Border Health concentration (Health Sciences Department of Public Health, 2017). This study integrated five of these competencies: biostatistics, epidemiology, health policy and management, social and behavioral sciences, and Hispanic/border health concentration.

Biostatistics. Biostatistics is the development and application of statistical reasoning and methods in addressing, analyzing and solving problems in public health. This study created a dataset from raw data and merged it with other DG datasets before attaining descriptive non-parametric statistical analysis pre- and post-survey data.

Epidemiology. In epidemiology patterns of disease and injury in human populations are studied as well as the application of this study to the control of health problems. This study reported prevalence and mortality rates of diabetes in the United States obtained from the CDC and HCHS/SOL study.

Health policy and management. Health policy and management is a multidisciplinary field of inquiry and practice concerned with the delivery, quality and costs of health care for individuals and populations. This study was a formative evaluation that was designed to inform the development and execution of that DG program.

Social and behavioral sciences. Social and behavioral sciences in public health address the behavioral, social, and cultural factors that relate to the health of the individual and the overall population. This study addresses the implementation and feasibility of the Health Belief Model as the main framework for changing men's perceptions, behaviors, and attitudes to diabetes self-management.

Hispanic/border health concentration. The Hispanic and border health concentration addresses the unique challenges that communities on the border between the United States and Mexico face. This study addresses the increased disparity that H/L men face regarding diabetes. This study also addresses the challenges H/L men face to treatment and management of diabetes.

Healthy People 2020. This research does not address any of the Healthy People 2020 objectives directly. But through the evaluation of the parent study, the Diabetes Garage pilot, this research aims to indirectly address the following objectives: Diabetes, Health Communication and Health Information Technology, and Healthy-Related Quality of Life and Well-Being.

Diabetes. One of the goals of Healthy People 2020 is to reduce the disease burden of diabetes and improve the quality of life for all those who have or at risk for diabetes (Office of Disease Prevention and Health Promotion, 2010a).

1. D-5 Improve glycemic control among persons with diabetes
2. D-6 Improve lipid control among persons with diabetes.

3. D-7 Increase the proportion of persons with diagnosed diabetes whose blood pressure is under control
4. D-8 Increase the proportion of persons with diagnosed diabetes who have at least an annual dental examination
5. D-9 Increase the proportion of adults with diabetes who have at least annual foot examinations
6. D-10 Increase the proportion of adults with diabetes who have an annual dilated eye examination
7. D-11 Increase the proportion of adults with diabetes who have a glycosylated hemoglobin measurement at least twice a year
8. D-12 Increase the proportion of persons with diagnosed diabetes who obtain an annual urinary microalbumin measurement
9. D-13 Increase the proportion of adults with diabetes who preform self-blood glucose-monitoring at least once daily
10. D-14 Increase the proportion of adults with diagnosed diabetes who receive formal diabetes education
11. D-16 Increase prevention behaviors in persons at high risk for diabetes with prediabetes

Health communication and health information technology. The goal of this objective is to use health communication strategies and health information technology to improve population health outcomes and health care quality, and to achieve health equality (Office of Disease Prevention and Health Promotion, 2010b).

1. HC/HIT-1 Improve the health literacy of the population

2. HC/HIT-7 Increase the proportion of adults who report having friends or family members with whom they talk about their health
3. HC/HIT-9 Increase the proportion of online health information seekers who report easily accessing health information

Health-related quality of life and well-being. The goal of this objective is to improve the health-related quality of life and well-being for all individuals (Office of Disease Prevention and Health Promotion, 2010c).

1. HRQOL/WB-1 Increase the proportion of adults who self-report good or better health

Healthy Border 2020. Like the Healthy People 2020 objectives, this research does not address any of the Healthy Border 2020 objectives directly. But through the evaluation of the parent study, the Diabetes Garage pilot, this research aims to indirectly address the following Healthy Border objectives.

Chronic and degenerative disease-diabetes. The U.S.-Mexico Border Health Commission objectives are as follows (Office of Border Health, 2015).

1. Improve screening in people 20 years of age and older by 10%
2. Reduce the proportion of diabetic adults with A1C >9%

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Tables

Table 1.
National Standards for Diabetes Self-Management Education and Support

Standard	Description
Internal structure	Documentation of the organizational structure, mission statement, and goals of their DSME/S program
External input	Maintaining of program quality by seeking support form external stakeholders and experts
Access	Determination of the target population, how best to deliver diabetes education to that population, and determining what resources will be needed to provide ongoing support for that population
Program coordination	Having a coordinator that will oversee the DSME/S program who will be responsible for planning, implementation, and evaluation of the program
Instructional staff	At least one of the instructors should be certifies in diabetes care and education
Curriculum	The curriculum created for the program be based on current evidence and practice guidelines, have criteria for evaluating program outcomes, and that will serve as the framework for the DSME/S program
Individualization	Diabetes self-management, education, and support needs of each participant will be assessed by instructors to create an individualized education and support plan that is focused on behavior change
Ongoing support	Personalized follow-up plans for ongoing self-management support will be created by the participant and instructor
Patient progress	Participant progress in achieving their personal diabetes self-management goals and other outcomes to evaluate the effectiveness of the interventions and measuring techniques
Quality improvement	Measurement of the effectiveness of the education and support of the program will take place to ensure improvements are made and gaps in services or quality are closed

Source: Haas, L., Maryniuk, M., Beck, J., Cox, C. E., Duker, P., Edwards, L., … Youssef, G. (2014). National Standards for Diabetes Self-Management Education and Support. Diabetes Care, 37(Suppl 1), S144–S153. http://doi.org/10.2337/dc14-S144

Table 2.
List of survey items and measures

Question #s	**Variable/Construct and Measurement Instrument**		
Q1	Zip code		
Q2-Q3	Assessment of Local Diabetes Programs Awareness		
Q4-Q10	Diabetes Knowledge: The Starr County Diabetes Knowledge Questionnaire		
Q11	Diabetes Causation Health Beliefs via the Illness Representation Questionnaire		
Q12	Self-report Diabetes Status		
	Yes – Self-reported diabetes	***No Self-reported diabetes***	
Q13	Years with diabetes		
Q14a-14e Q15a-15h Q16	Diabetes Risk Perception Survey-Developing Diabetes Complications	Q13a-13h Q14 Q15a-15f	Diabetes Risk Perception Survey-Developing Diabetes
	Perceived Benefits and Barriers Measure		Perceived Benefits and Barriers Measure
Q17-Q18	Age, Gender	Q16-Q24	American Diabetes Association Risk Score survey (Includes age and gender)
Q19-Q20	Intent to Adopt Healthy Lifestyle questionnaire (from the Diabetes Risk Perception Survey)	Q25-Q26	Intent to Adopt Healthy Lifestyle questionnaire (from the Diabetes Risk Perception Survey)
Q21	Intent to attend diabetes education classes/programs	Q27	Intent to attend diabetes education classes/programs
Q22, Q23	Reasons Men would **follow/not follow** what the Doctor suggests.	Q28, Q29	Reasons Men would **follow/not follow** what the Doctor suggests.
Q26-Q29	Nativity, Time in US, Generation Status,	Q32-Q35	Nativity, Time in US, Generation Status
Q21-Q32	Education, Employment, Household Income	Q37-Q39	Education, Employment, Household Income

Table 3
List of El Paso Diabetes Association DSME/S Survey Items

Question #s	**Variable/Construct and Measurement Instrument**
Q1-Q10	General Information
Q11a-Q22b	Health History (My Health, Family Health)
Q23-Q24	Well-Being
Q25-Q28	Diabetes Self-Management
Q29-Q31	Nutrition
Q32-Q33	Physical Activity
Measurements	Height, Weight, BMI, Blood Pressure, Waist Circumference, Lab Results

Table 4
Demographic Characteristics [a]

	Pilot 1 n= (%)	Pilot 2 n= (%)	Total n= (%)
N	3	8	11
Mean Age in Years			
Mean, SD, (n=)	51.33, 10.12, (n=3)	63.86, 12.24, (n=7)	60.10, 12.62, (n=10)
Gender			
Male	3 (30)	7 (70)	10 (100)
Total	**3 (30)**	**7 (70)**	**10 (100)**
Diabetes Status			
Yes	3 (30)	6 (60)	9 (90)
No	-	1 (10)	1 (10)
Total	**3 (30)**	**7 (70)**	**10 (100)**
Mean Years with Diabetes			
Mean, SD, (n=)	3.00, 1.73, (n=3)	3.17, 1.33, (n=6)	3.11, 1.36, (n=9)
Marital Status			
Married	1 (9.1)	5 (45.4)	6 (54.5)
Divorced	1 (9.1)	-	1 (9.1)
Widowed	-	1 (9.1)	1 (9.1)
Never Married	1 (9.1)	1 (9.1)	2 (18.2)
A Member of an Unmarried Couple	-	1 (9.1)	1 (9.1)
Total	**3 (27.3)**	**8 (72.7)**	**11 (100)**
Ethnicity			
Hispanic/Latino	3 (30)	4 (40)	7 (70)
White	-	3 (30)	3 (30)
Total	**3 (30)**	**7 (70)**	**10 (100)**
Country of Birth			
United States	3 (30)	5 (50)	8 (80)
Mexico	-	1 (10)	1 (10)
Other	-	1 (10)	1 (10)

Total	**3 (30)**	**7 (70)**	**10 (100)**
Highest Level of Education Achieved			
High School/Preparatory School/GED	-	2 (20)	2 (20)
Trade School/Vocational School	-	2 (20)	2 (20)
University/College	3 (30)	3 (30)	6 (60)
Total	**3 (30)**	**7 (70)**	**10 (100)**
Employment Status			
Employed Full-Time	2 (20)	4 (40)	6 (60)
Not Currently Employed	1 (10)	-	1 (10)
Retired	-	3 (30)	3 (30)
Total	**3 (30)**	**7 (70)**	**10 (100)**
Household Income [b]			
Less than $10,000	1 (10)	-	1 (10)
$20,001-$30,000	-	1 (10)	1 (10)
$30,001-$40,000	1 (10)	1 (10)	2 (20)
$40,001-$50,000	-	1 (10)	1 (10)
$50,001-$60,000	1 (10)	3 (30)	4 (40)
More than $100,000	-	1 (10)	1 (10)
Total	**3 (30)**	**7 (70)**	**10 (100)**
Insurance			
Yes	2 (18.2)	8 (72.7)	10 (90.9)
No	1 (9.1)	-	1 (9.1)
Total	**3 (27.3)**	**8 (72.7)**	**11 (100)**
Likelihood of Program Participation			
Very Likely	3 (30)	6 (60)	9 (90)
Somewhat Likely	-	1 (10)	1 (10)
Total	**3 (30)**	**7 (70)**	**10 (100)**
Participation			
Number of Men who Started the Program	3 (27.3)	8 (72.7)	11 (100)
Number of Men who Completed the Program	2 (28.6)	5 (71.4)	7 (100)

Table 5.
Causation Beliefs [a]

	Pilot 1		Pilot 2	
	Pre-Intervention n=3	Post-Intervention n=2	Pre-Intervention n=8	Post Intervention n=5
Illness Perception Questionnaire-Revised (IPQ-R) Rank (%)				
Stress or worry	-	1 (56th)	1 (73rd)	1 (62nd)
Hereditary	1 (73rd)	2 (44th)	1 (73rd)	1 (62nd)
Diet or eating habits	2 (55th)	1 (56th)	2 (61st)	1 (62nd)
Poor medical care in my past	3 (45th)	2 (44th)	3 (20th)	-
My own behavior	3 (45th)	-	-	2 (41st)
My mental attitude	3 (45th)	-	-	-
Family problems or worries	-	-	3 (20th)	2 (41st)
Overwork	-	-	3 (20th)	-
My emotional state	3 (45th)	-	-	-
Aging	-	-	3 (20th)	3 (26th)
Alcohol	3 (45th)	2 (44th)	3 (20th)	-
Smoking	3 (45th)	-	3 (20th)	3 (26th)
My personality	-	2 (44th)	-	-

Table 6.
Health Belief Framework

	Pilot 1		Pilot 2	
	Pre-Intervention	**Post-Intervention**	**Pre-Intervention**	**Post-Intervention**
Starr County Knowledge Questionnaire Mean, SD, (n=)				
Diabetes Knowledge (0-5)	4.00, 1.00, (n=3)	4.00, 0.00, (n=2)	3.71, 0.49, (n=7)	4.00, 1.00, (n=5)
Risk Perception Survey-Diabetes Mellitus (RPS-DM) Mean, SD, (n=)				
Risk Knowledge (0-5)	3.67, 0.58, (n=3)	3.00, 1.41, (n=2)	3.50, 1.69, (n=8)	4.20, 1.30, (n=5)
Composite Risk Perception (0-2.67)	1.56, 0.24, (n=3)	1.29, 0.06, (n=2)	1.56, 0.14, (n=7)	1.13, 0.21, 9n=4)
Perceived Personal Control (0-4)	1.67, 0.14, (n=3)	1.38, 0.18, (n=2)	1.89, 0.19, (n=7)	1.50, 0.00, (n=4)
Worry (0-2)	1.33, 0.58, (n=3)	1.00, 0.00, (n=2)	1.86, 0.38, (n=7)	1.00, 0.25, (n=4)
Optimistic Bias (0-2)	1.00, 0.00, (n=3)	0.25, 0.35, (n=2)	1.29, 0.49, (n=7)	0.50, 0.41, (n=4)
Personal Disease Risk	4.67, 3.22, (n=3)	n/a	5.00, 2.71, (n=7)	n/a
Health Belief Scales for Insulin-Treated Patients Mean, SD, (n=)				
Vulnerability (0-8)	6.67, 3.22, (n=3)	6.00, 5.66, (n=2)	6.29, 3.30, (n=7)	7.60, 4.83, (n=5)
Benefits (0-36)	25.67, 2.52, (n=3)	4.50, 6.36, (n=2)	29.00, 8.33, (n=7)	23.60, 13.15, (n=5)
Barriers (0-36)	12.00, 10.15, (n=3)	6.00, 8.49, (n=2)	10.86, 7.76, (n=7)	10.00, 8.46, (n=5)
Cost-effectiveness [b] (-36-36)	13.67, 9.29, (n=3)	-1.50, 2.12, (n=2)	18.14, 10.71, (n=7)	13.60, 17.18, (n=5)
Adapted National Diabetes Education Program (a DSME/S program) Mean, SD, (n=)				
Self-Efficacy (0-10)				
Attitudes (0-5)	3.67, 0.58, (n=3)	2.00, 0.00, (n=2)	4.13, 3.36, (n=8)	2.50, 0.58, (n=5)
Behaviors (0-5)	3.67, 1.53, (n=3)	3.00, 1.41, (n=2)	3.63, 3.46, (n=8)	2.50, 0.58, (n=5)

[a] Composite Risk Score only includes scores from the following subscales: Perceived Personal Control, Worry, and Optimistic Bias

[b] Cost-effectiveness calculated by subtracting Barriers from Benefits

Table 7.
Health Belief Framework (Paired Sample Statistics)

	Pre-Intervention Mean, SD, (n=)	**Post-Intervention** Mean, SD, (n=)
Starr County Knowledge Questionnaire		
Diabetes Knowledge (0-5)	3.50, 0.55, (n=6)	3.83, 0.75, (n=6)
Risk Perception Survey-Diabetes Mellitus (RPS-DM)		
Risk Knowledge (0-5)	3.29, 1.70, (n=7)	3.86, 1.35, (n=7)
Composite Risk Perception (0-2.67)	1.53, 0.21, (n=5)	1.15, 0.19, (n=5)
Perceived Personal Control (0-4)	1.80, 0.21, (n=5)	1.45, 0.11, (n=5)
Worry (0-2)	1.58, 0.45, (n=5)	0.90, 0.22, (n=5)
Optimistic Bias (0-2)	1.40, 0.55, (n=5)	0.50, 0.35, (n=5)
Health Belief Scales for Insulin-Treated Patients		
Vulnerability (0-8)	7.67, 2.73, (n=6)	6.67, 4.89, (n=6)
Benefits (0-36)	27.17, 8.70, (n=6)	20.83, 13.78, (n=6)
Barriers (0-36)	13.67, 8.69, (n=6)	8.50, 8.67, (n=6)
Cost-effectiveness [b] (-36-36)	13.50, 11.62, (n=6)	12.33, 14.98, (n=6)
Adapted National Diabetes Education Program (a DSME/S program)		
Self-Efficacy (0-10)		
Attitudes (0-5)	3.17, 1.17, (n=6)	2.33, 0.52, (n=6)
Behaviors (0-5)	2.83, 1.33, (n=6)	2.67, 0.82, (n=6)

[a] Composite Risk Score only includes scores from the following subscales: Perceived Personal Control, Worry, and Optimistic Bias

[b] Cost-effectiveness calculated by subtracting Barriers from Benefits

Table 8.
Psychological and Physical Health Characteristics

	Pilot 1		Pilot 2	
	Pre-Intervention	**Post-Intervention**	**Pre-Intervention**	**Post-Intervention**
Psychological Health				
Mean, SD, (n=)				
Stress (0-7)	1.67, 1.53, (n=3)	4.00, 2.83, (n=2)	1.71, 1.60, (n=7)	3.20, 3.11, (n=5)
Depressive Symptoms (0-3)	2.67, 1.16, (n=3)	2.00, 0.00, (n=2)	2.43, 0.79, (n=7)	2.60, 0.89, (n=5)
Well-Being (0-100)	89.33, 8.33, (n=3)	84.00, 16.97, (n=2)	75.00, 15.23, (n=8)	79.00, 14.38, (n=4)
Self-Care Behaviors [a]				
How many sugar-sweetened drinks do you drink?				
0	1 (33.3)	1 (50.0)	4 (50.0)	3 (60.0)
1, 2, 3	1 (33.3)	-	4 (50.0)	2 (40.0)
4+	1 (33.3)	1 (50.0)	-	-
How many days did you measure your food portions?				
I don't know how to measure food portions	-	-	2 (25.0)	-
0	2 (66.7)	1 (50.0)	5 (62.5)	-
1-3	-	-	-	3 (60.0)
4-7	1 (33.3)	1 (50.0)	1 (12.5)	2 (40.0)
How many days did you count carbohydrate servings?				
I don't know how to measure carbohydrate portions	-	-	1 (12.5)	-
0	2 (66.7)	-	5 (62.5)	1 (20.0)
1-3	-	1 (50.0)	2 (25.0)	2 (40.0)
4-7	1 (33.3)	1 (50.0)	-	2 (40.0)

How much time do you spend being physically active on a typical day? (minutes)				
Mean, SD, (n=)	79.0, 69.16 (n=3)	60.0, 84.51, (n=2)	262.0, 230.0, (n=8)	210.0, 192.0, (n=5)
How many days are you physically active?				
1	-	1 (50.0)	-	-
2	-	-	-	-
3	1 (33.3)	-	1 (12.5)	-
4	-	-	1 (12.5)	-
5	-	-	1 (12.5)	1 (12.5)
6	-	-	1 (12.5)	1 (12.5)
7	2 (66.7)	1 (50.0)	4 (50.0)	3 (37.5)
Physical Health				
Mean, SD, (n=)				
Weight	229.67, 44.79, (n=3)	252.00, -, (n=1)	204.38, 32.45, (n=8)	204.80, 31.33, (n=5)
Blood Pressure				
Systolic	n/a	n/a	148.13, 22.97, (n=8)	129.60, 19.78, (n=5)
Diastolic	n/a	n/a	82.63, 22.01, (n=8)	67.40, 10.85, (n=5)
Waist Circumference	n/a	n/a	43.69, 4.33, (n=8)	44.60, 4.67, (n=5)
Non-Fasting Glucose	229.33, 115.52, (n=3)	n/a	131.00, 16.16, (n=6)	122.50, 31.04, (n=4)
A1c	9.60, 0.44, (n=3)	n/a	7.34, 1.52, (n=8)	7.34, 1.29, (n=5)

[a] Values presented as No. (%) unless otherwise noted

Table 9.
Psychological and Physical Health Characteristics (Paired Sample Statistics)

	Pre-Intervention	Post-Intervention
Psychological Health		
Mean, SD, (n=)		
Stress (0-7)	2.17, 1.72, (n=6)	2.83, 2.56, (n=6)
Depressive Symptoms (0-3)	2.33, 0.82, (n=6)	2.33, 0.82, (n=6)
Well-Being (0-100)	79.33, 15.06, (n=6)	80.67, 13.72, (n=6)
Self-Care Behaviors [a]		
How many sugar-sweetened drinks do you drink?		
0	3 (42.9)	4 (57.1)
1, 2, 3	4 (57.1)	2 (28.6)
4+	-	1 (14.3)
How many days did you measure your food portions?		
I don't know how to measure food portions	1 (14.3)	-
0	4 (57.1)	1 (14.3)
1-3	-	3 (42.9)
4-7	2 (28.6)	3 (42.9)
How many days did you count carbohydrate servings?		
I don't know how to measure carbohydrate portions	1 (14.3)	-
0	5 (71.4)	1 (14.3)
1-3	-	3 (42.9)
4-7	1 (14.3)	3 (42.9)
How much time do you spend being physically active on a typical day? (minutes)		
Mean, SD, (n=)	192.00, 154.00, (n=7)	167.00, 176.00, (n=7)

How many days are you physically active?		
1	-	1 (14.3)
2	-	-
3	2 (28.6)	-
4	1 (14.3)	-
5	1 (14.3)	1 (14.3)
6	-	1 (14.3)
7	3 (42.9)	4 (57.1)
Physical Health		
Mean, SD, (n=)		
Weight	217.58, 40.58, (n=6)	212.67, 34.01, (n=6)
Blood Pressure		
Systolic	145.40, 20.31, (n=5)	129.60, 19.78, (n=5)
Diastolic	74.40, 9.45, (n=5)	67.40, 10.85, (n=5)
Waist Circumference	44.80, 4.66, (n=5)	44.60, 4.67, (n=5)
Non-Fasting Glucose	126.75, 13.48, (n=4)	122.50, 31.04, (n=4)
A1c	7.62, 1.70, (n=5)	7.34, 1.29, (n=5)

[a] Values presented as No. (%) unless otherwise noted

Figures

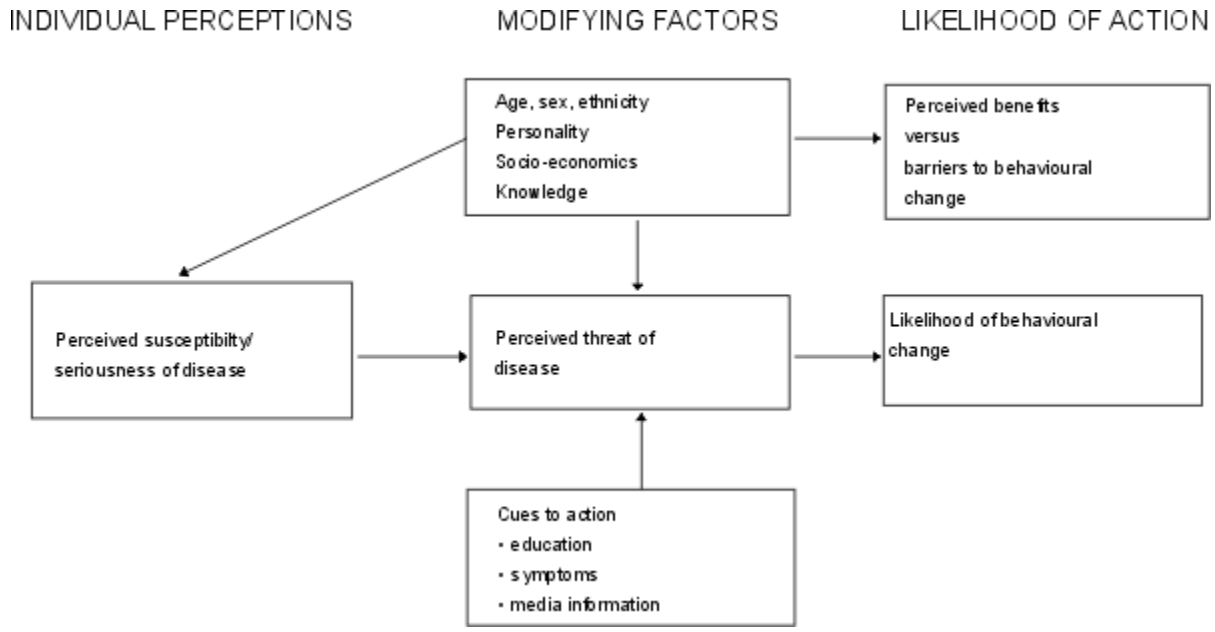

Figure 1. The Health Belief Model. (Glanz et al., 2008)

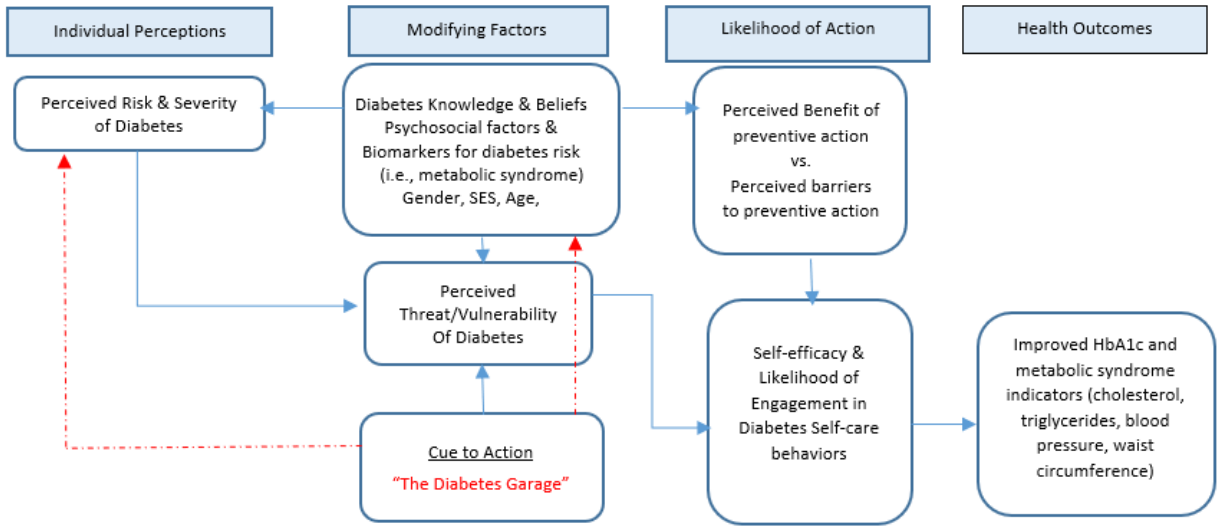

Figure 2. Diabetes Garage HBM conceptual framework for engaging Hispanic men. (Concha, Duarte-Gardea, Schober, Gonzalez, & Su, 2018)

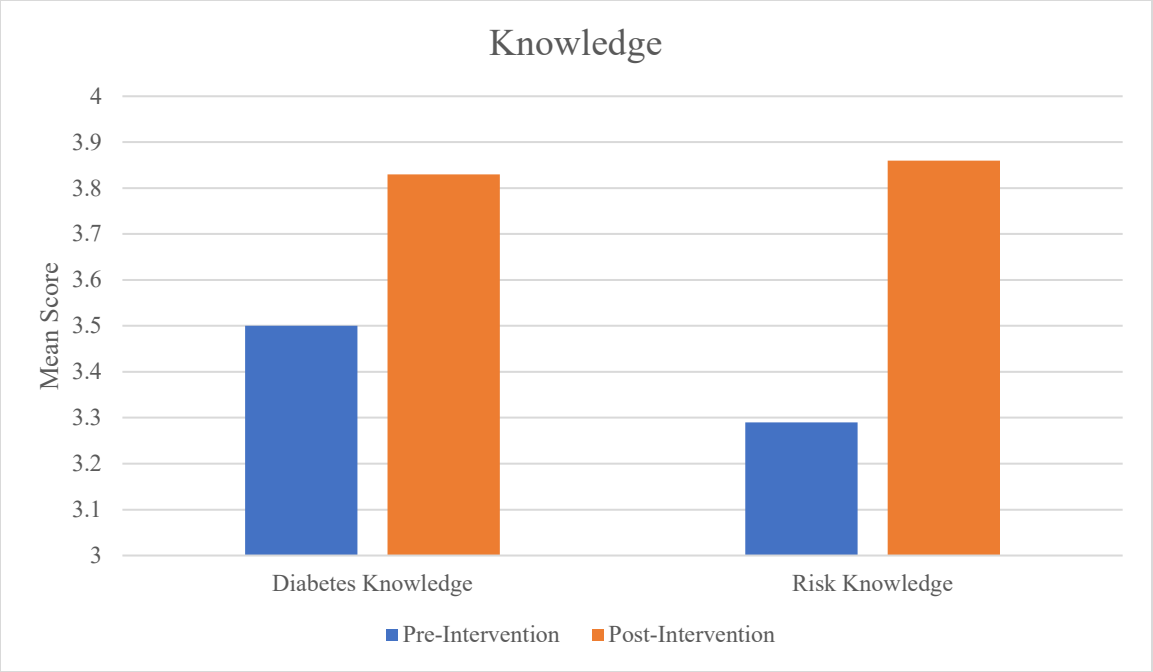

Figure 3. Pre- and post-intervention measures of knowledge scores. Diabetes Knowledge Scale: 0-5; Risk Knowledge Scale: 0-5

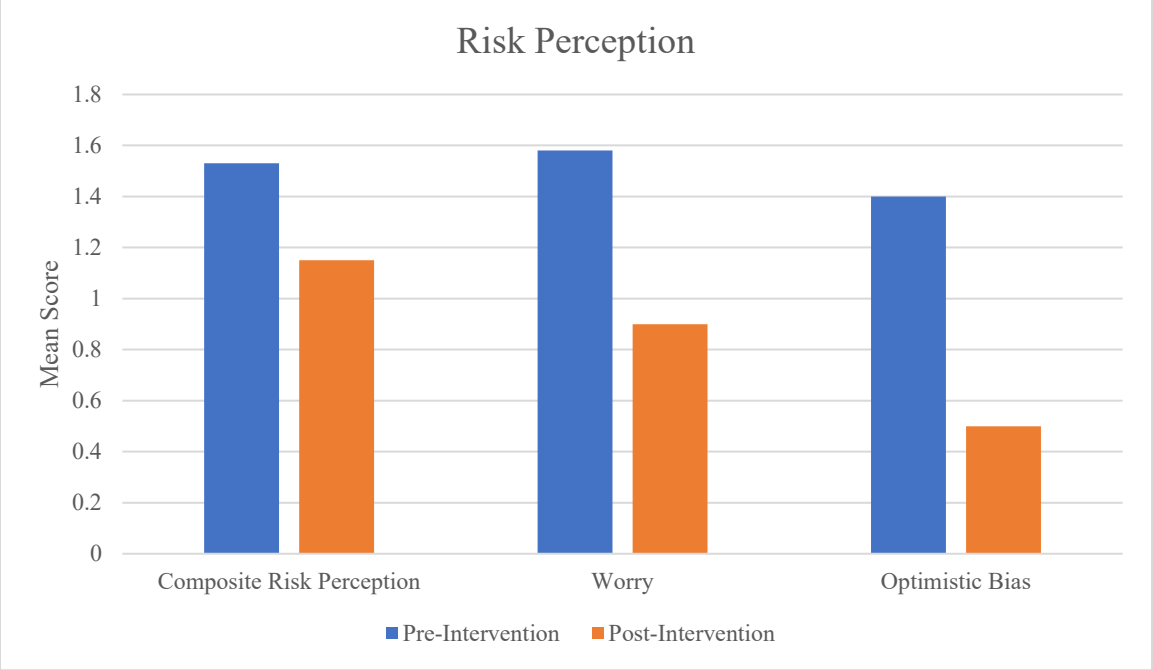

Figure 4. Pre- and post-intervention measures of risk perception. Composite Risk Scale: 0-2.67; Worry Scale: 0-2; Optimistic Bias Scale: 0-2

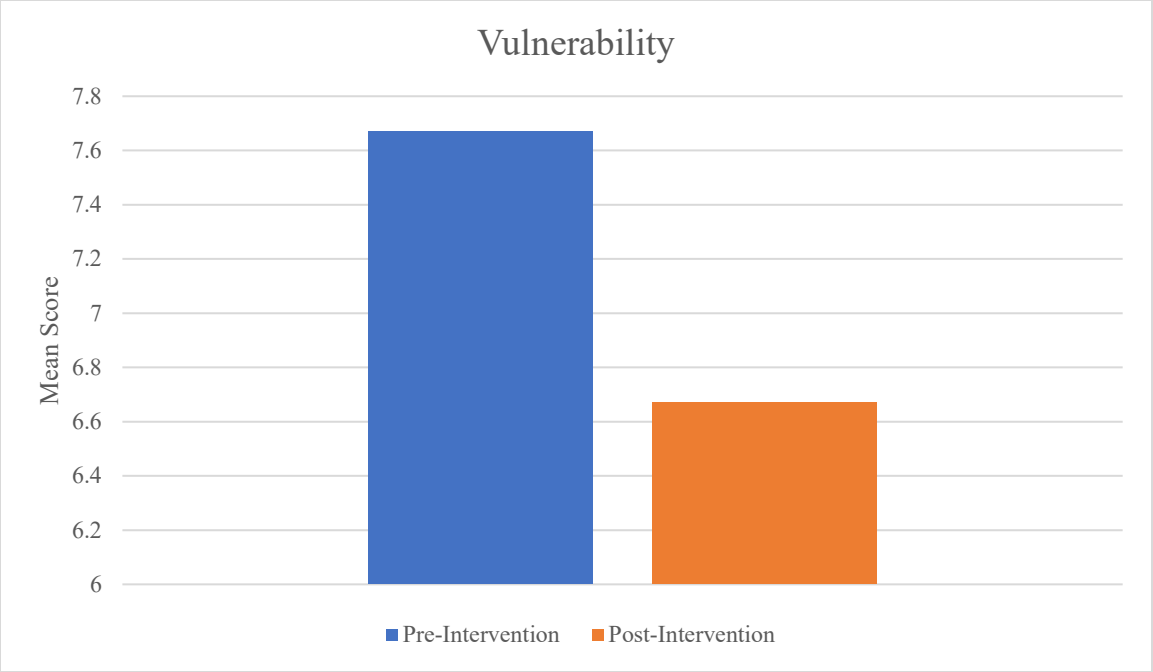

Figure 5. Pre- and post-intervention measure of vulnerability. Perceived Vulnerability Scale: 0-8

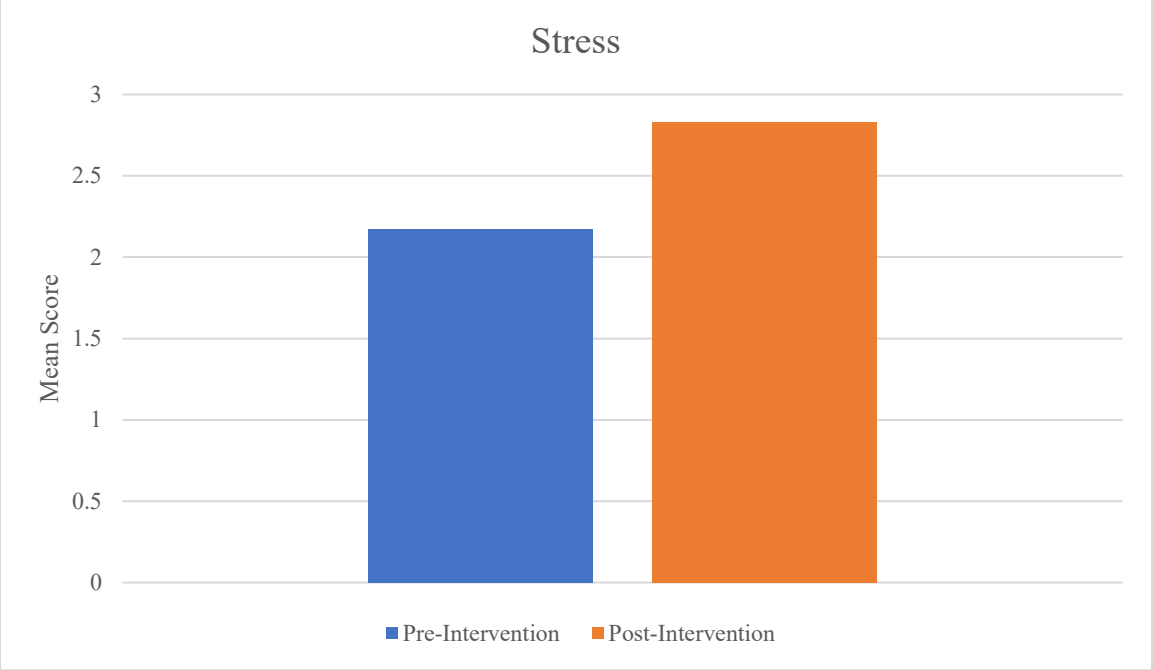

Figure 6. Pre- and post-intervention measure of stress. Stress Scale: 0-7

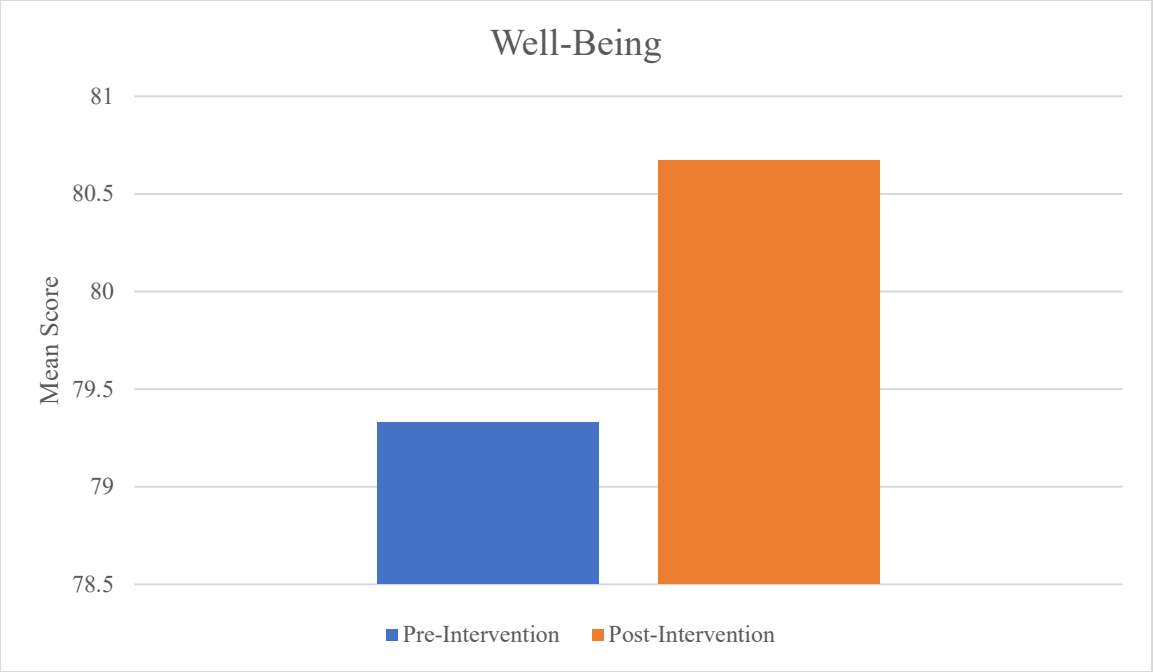

Figure 7. Pre- and post-intervention measure of well-being. Well-Being Scale: 0-100

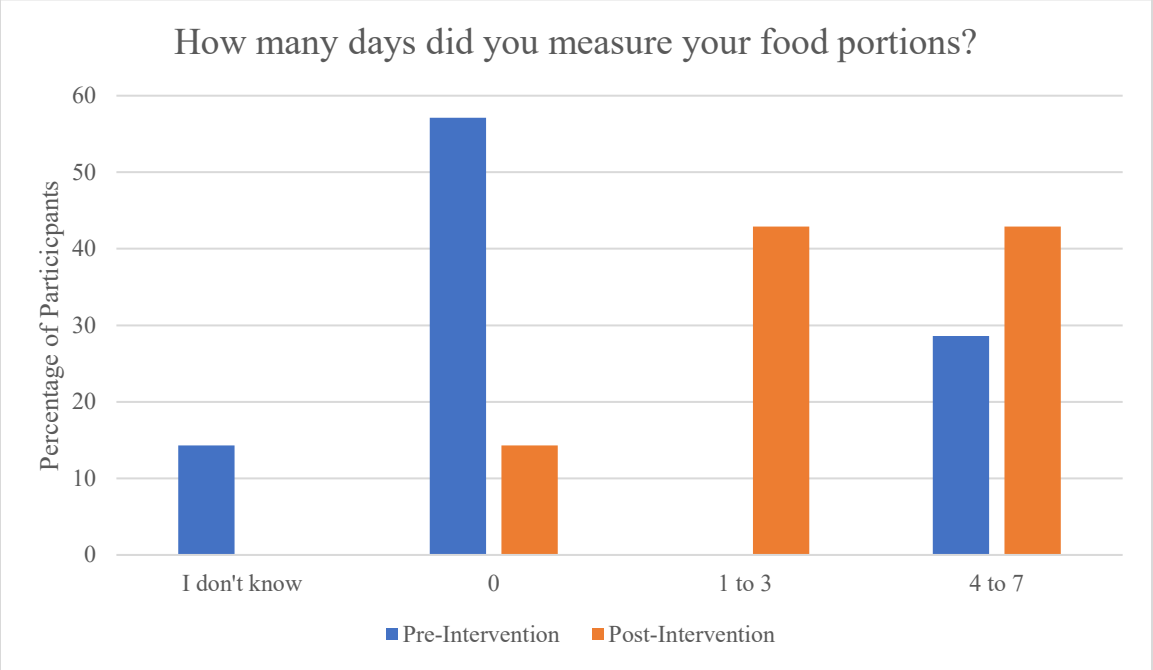

Figure 8. Pre- and post-intervention measure of weekly measurement of food portions.

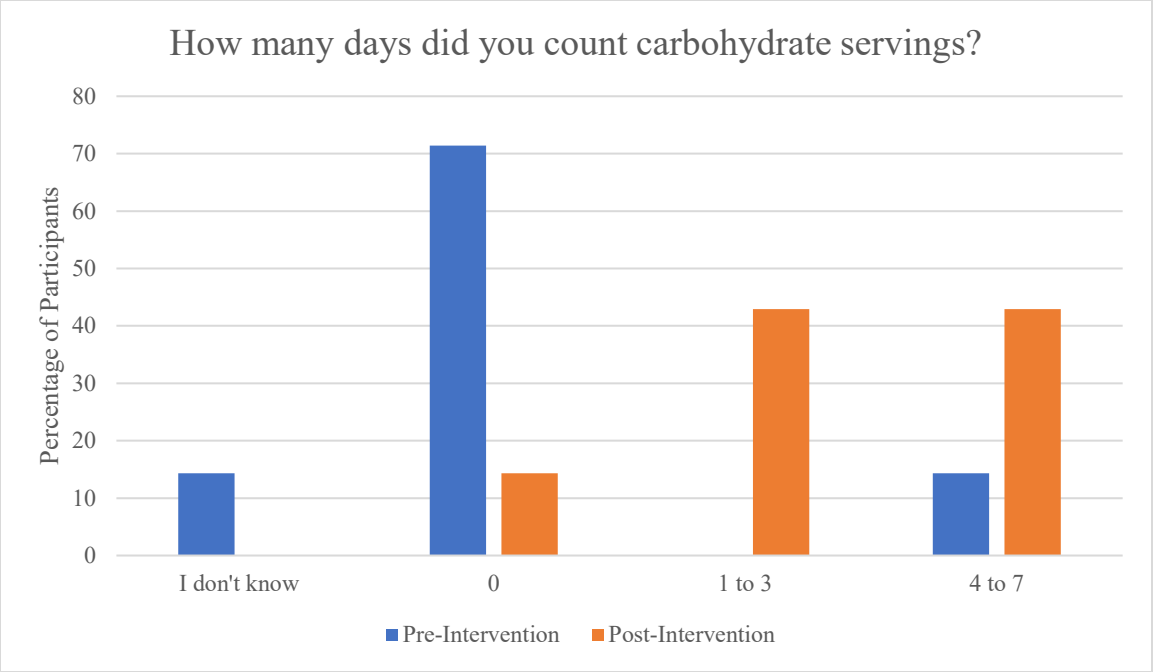

Figure 9. Pre- and post-intervention measure of weekly measurement of carbohydrate servings.

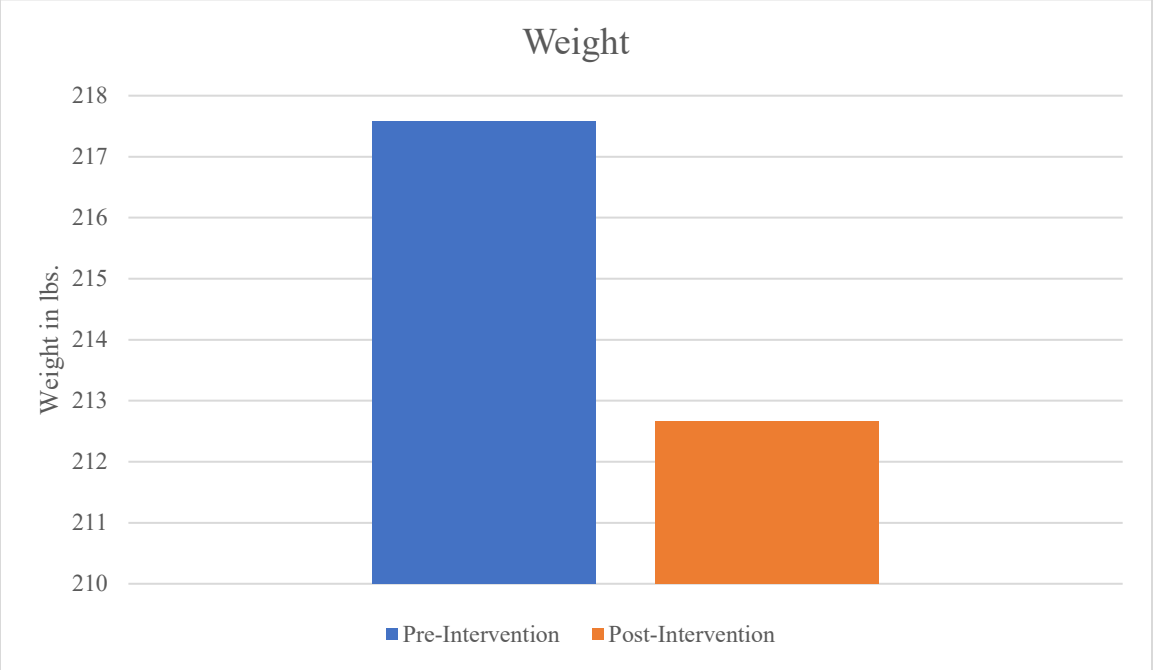

Figure 10. Pre- and post-intervention measure of weight.

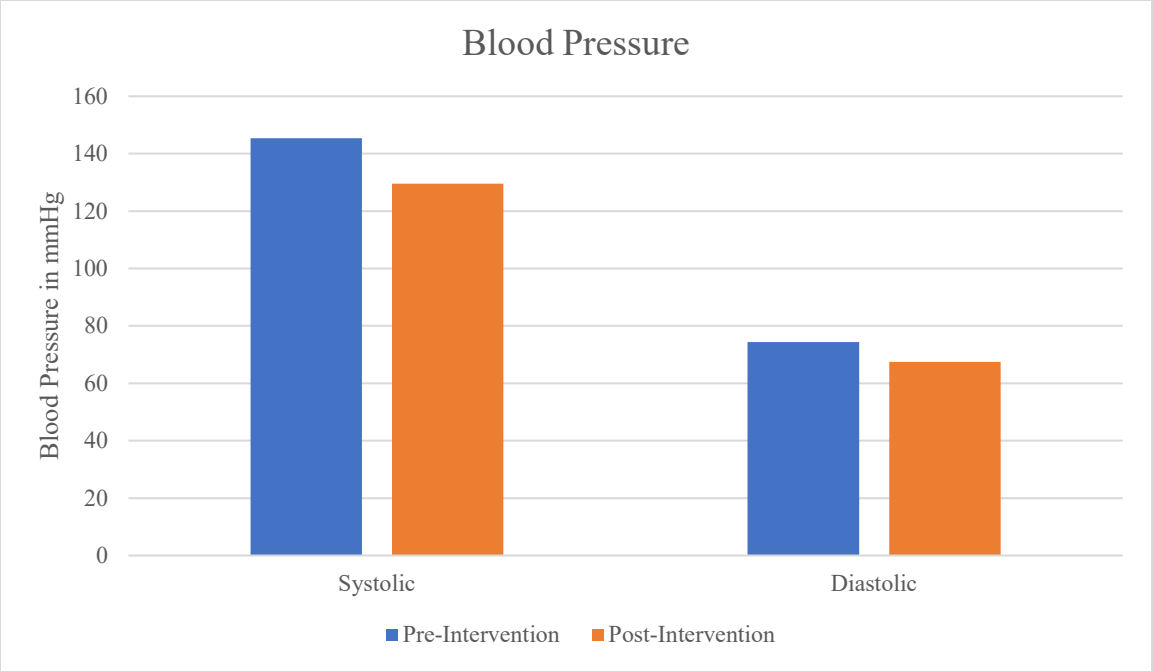

Figure 11. Pre- and post-intervention measure of blood pressure.

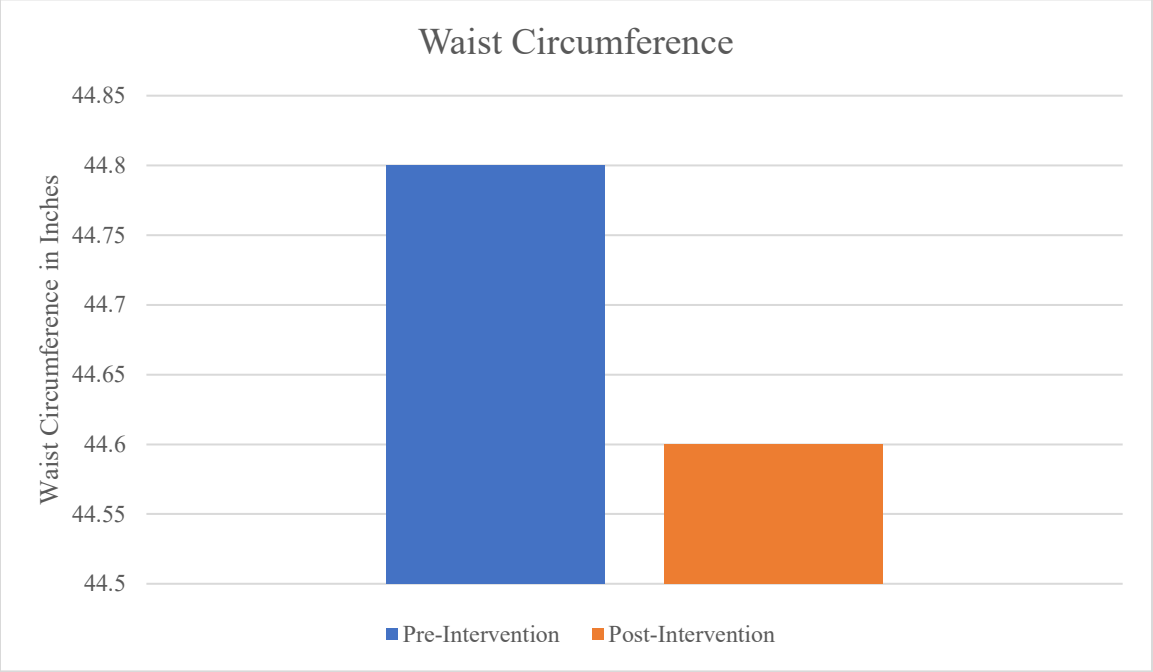

Figure 12. Pre- and post-intervention measure of waist circumference.

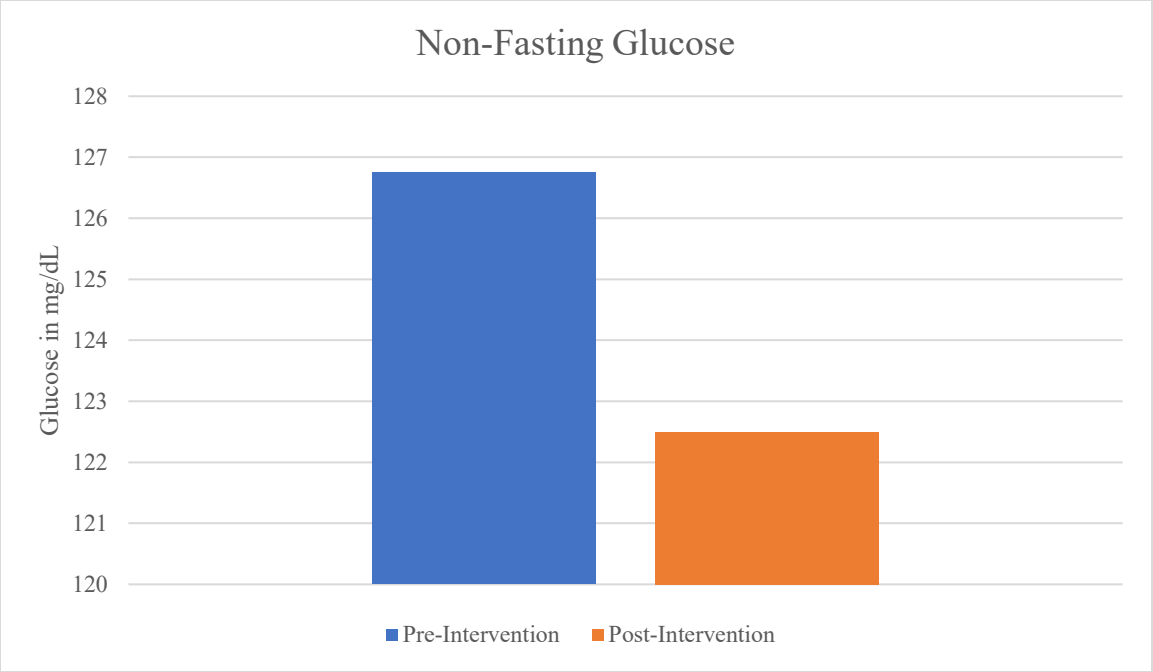

Figure 13. Pre- and post-intervention measure of non-fasting glucose levels.

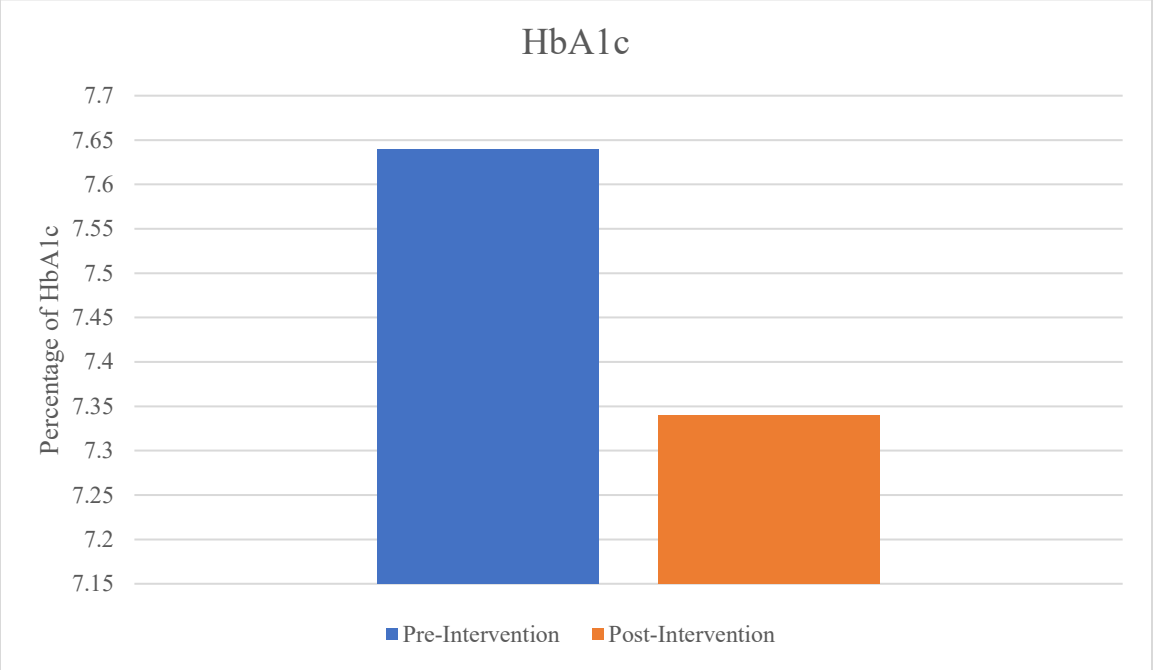

Figure 14. Pre- and post-intervention measure of HbA1c levels.

Appendix A: The Diabetes Garage Curriculum

The Diabetes Garage Intervention: The intervention involves four consecutive weekly classes and two diabetes self-management maintenance opportunities (i.e. website/Facebook and open garage). Spanish classes will be made available depending on the number of Spanish speaking individuals that are recruited. Participant randomized to will participate in four 1.5-hour diabetes educational sessions in the following order:

a. Saturday 1: Module 1- **Features of your body & diabetes** and **Check your gauges** (signs/symptoms)
b. Saturday 2: Module 2- **Keep your battery charged** (Medication use) and **Fuel** (nutrition)
c. Saturday 3: Module 3- **Mileage by steps** (Physical activity) and **Full throttle** (stress management)
d. Saturday 4: Module 4- **Catastrophic Failure** (Complications) and **Tune-ups/Inspections** (Visit your doctor)

Participants will be handed a Diabetes Maintenance Manual at the start of class and the Diabetes Essentials Toolbox with diabetes self-care essentials on the last day of class as a graduation gift.

Appendix B: Informed Consent

University of Texas at El Paso (UTEP) Institutional Review Board
Informed Consent Form for Research Involving Human Subjects

Protocol Title: "The Diabetes Garage": A pilot study to engage men in diabetes self-care.
Principal Investigator: Jeannie B. Concha, PhD MPH
UTEP: Department of Public Health Sciences

1. Introduction

You are being asked to participate in a pilot research study named "The Diabetes Garage" because you are an adult male and have an interest in learning about diabetes. The Diabetes Garage is a program designed to engage men in health behaviors by using automotive/car maintenance and repair analogies as a way to increase men's diabetes knowledge, perceptions and attitudes about diabetes, and self-care behaviors. Before agreeing to take part in this research study, it is important that you read the consent form that describes the study. Please ask the study researcher or the study staff to explain any words or information that you do not clearly understand.

2. Why is this study being done?

The purpose of this study is to determine if "The Diabetes Garage" concept is a useful approach to engage men in learning about diabetes and self-care behaviors. The goal of the program is to increase men's diabetes knowledge, improve perceptions and attitudes about diabetes, and increase men's engagement in self-care behaviors to reduce the risk of diabetes or diabetes related complications.

3. What is involved in the study?

This study will recruit 10 to 20 men to participate in 4 educational sessions (1 hour each) and a group discussion (1 hour) about ways to improve The Diabetes Garage Program. The session will take place at the El Paso Diabetes Association-Diabetes Garage on 3641 Mattox St, El Paso, TX 79925. If you agree to take part in this study, you will be asked to complete the following:

1. El Paso Diabetes Association assessments
2. A brief computer based survey (6 to 10 minutes to complete)

3. A finger stick to collect 3 drops of blood to assess your average glucose levels over the past 3 months (HbA1c).
4. Four 1 hour diabetes educational sessions in the Diabetes Garage
    a. Day 1: Features of diabetes and signs and symptoms of diabetes (1.5 hours to allow for assessments)
    b. Day 2: Medication use and nutrition
    c. Day 3: Physical activity and stress management
    d. Day 4: Diabetes complications and consequences of suboptimal glucose control and support resources
5. On Day 4, participate in a group discussion to obtain feedback about the program.

4. What are the risks and discomforts of the study?

There is minimal risk of infection, pain/bruise, or allergies at blood sampling site (finger stick). These risks will be minimized by having qualified personnel to perform the finger stick by following a standard clinical protocol designed to minimize such risks.

5. What will happen if I am injured in this study?

The University of Texas at El Paso and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness. You will not give up any of your legal rights by signing this consent form. You should report any such injury to Dr. Jeannie Concha at (915-747-8308) or jeannie@utep.edu and to the UTEP Institutional Review Board (IRB) at (915-747-7693) or irb.orsp@utep.edu.

6. Are there benefits to taking part in this study?

There benefit for participating in the study includes the knowledge gained from the four sessions of The Diabetes Garage.

7. What other options are there?

You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

8. What are my costs?

There are no direct costs to participating in the study. You will be responsible for travel to and from the research site and any other incidental expenses.

9. Will I be paid to participate in this study?

You will be compensated with a $20 gas card and a diabetes toolbox kit for participating in the Diabetes Garage classes. You will also be compensated $10 cash for participating in the group discussion.

10. What if I want to withdraw, or am asked to withdraw from this study?

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty or loss of benefit.

If you choose to take part, you have the right not to participate in any part of the study or stop participating at any time. However, we encourage you to talk to a member of the research group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.

The researcher may decide to stop your participation without your permission, if he or she thinks that being in the study may cause you harm.

11. Who do I call if I have questions or problems?

You may ask any questions you have now. If you have questions later, you may call Dr. Jeannie Concha at (915-747-8214) or jeannie@utep.edu
If you have questions or concerns about your participation as a research subject, please contact the UTEP Institutional Review Board (IRB) at (915-747-7693) or irb.orsp@utep.edu.

12. What about confidentiality?

Your part in this study is confidential. None of the information used for research purposes will identify you by name. All data to evaluate the program will not be linked to your personal information kept by the EPDA. Data for research purposes will be maintained in a secure database system at the University of Texas at El Paso.

The group discussion will be audio taped for research purposes and personal information identifying you will be left out and replaced by codes. The interview will be transcribed and you have the right to review the tape at any time prior to the destruction of the tape. This includes asking the project investigator to set an appointment for reviewing the tape and letting them know if there are any comments that you made that you do not want shared or used.

Every effort will be made to keep your information confidential. Your personal information may be disclosed if required by law, if:

- necessary to protect my rights or welfare; or
- if required by law.
- if any illegal activity is disclosed.

The results of this research study may be presented at meetings or in publications; however, your identity will not be disclosed in those presentations.

13. Mandatory reporting

If information is revealed about child abuse or neglect, or potentially dangerous future behavior to others, the law requires that this information be reported to the proper authorities.

14. Authorization Statement

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop being in this study without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant Name: _____ Date: _____

Participant Signature: _____ Time: _____

Consent form explained/witnessed by: _____

Printed name: _____ Signature

Date _____ Time: _____

Approved: 01/22/18
Expires: 01/21/19
Study Number: 1179426-1

Appendix C: Pre-test

Question #s	Variable/Construct and Measurement Instrument		
Q1	Zip code		
Q2-Q3	Assessment of Local Diabetes Programs Awareness		
Q4-Q10	Diabetes Knowledge: The Starr County Diabetes Knowledge Questionnaire		
Q11	Diabetes Causation Health Beliefs via the Illness Representation Questionnaire		
Q12	Self-report Diabetes Status		
	Yes – Self-reported diabetes	***No Self-reported diabetes***	
Q13	Years with diabetes		
Q14a-14e Q15a-15h Q16	Diabetes Risk Perception Survey-Developing Diabetes Complications	Q13a-13h Q14 Q15a-15f	Diabetes Risk Perception Survey-Developing Diabetes
	Perceived Benefits and Barriers Measure		Perceived Benefits and Barriers Measure
Q17-Q18	Age, Gender	Q16-Q24	American Diabetes Association Risk Score survey (Includes age and gender)
Q19-Q20	Intent to Adopt Healthy Lifestyle questionnaire (from the Diabetes Risk Perception Survey)	Q25-Q26	Intent to Adopt Healthy Lifestyle questionnaire (from the Diabetes Risk Perception Survey)
Q21	Intent to attend diabetes education classes/programs	Q27	Intent to attend diabetes education classes/programs
Q22, Q23	Reasons Men would **follow/not follow** what the Doctor suggests.	Q28, Q29	Reasons Men would **follow/not follow** what the Doctor suggests.
Q26-Q29	Nativity, Time in US, Generation Status,	Q32-Q35	Nativity, Time in US, Generation Status
Q21-Q32	Education, Employment, Household Income	Q37-Q39	Education, Employment, Household Income

Question #s	Variable/Construct and Measurement Instrument
Q1-Q10	General Information
Q11a-Q22b	Health History (My Health, Family Health)
Q23-Q24	Well-Being
Q25-Q28	Diabetes Self-Management
Q29-Q31	Nutrition
Q32-Q33	Physical Activity
Measurements	Height, Weight, BMI, Blood Pressure, Waist Circumference, Lab Results

Appendix D: Post-test

Question #s	**Variable/Construct and Measurement Instrument**		
Q4-Q10	Diabetes Knowledge: The Starr County Diabetes Knowledge Questionnaire		
Q11	Diabetes Causation Health Beliefs via the Illness Representation Questionnaire		
	Yes – Self-reported diabetes	***No Self-reported diabetes***	
Q14a-14e Q15a-15h Q16	Diabetes Risk Perception Survey-Developing Diabetes Complications	Q13a-13h Q14 Q15a-15f	Diabetes Risk Perception Survey-Developing Diabetes
	Perceived Benefits and Barriers Measure		Perceived Benefits and Barriers Measure
Q19-Q20	Intent to Adopt Healthy Lifestyle questionnaire (from the Diabetes Risk Perception Survey)	Q25-Q26	Intent to Adopt Healthy Lifestyle questionnaire (from the Diabetes Risk Perception Survey)
Q21	Intent to attend diabetes education classes/programs	Q27	Intent to attend diabetes education classes/programs

Question #s	**Variable/Construct and Measurement Instrument**
Q1-Q10	General Information
Q11a-Q22b	Health History (My Health, Family Health)
Q23-Q24	Well-Being
Q25-Q28	Diabetes Self-Management
Q29-Q31	Nutrition
Q32-Q33	Physical Activity
Measurements	Height, Weight, BMI, Blood Pressure, Waist Circumference, Lab Results

Appendix E: Focus group questions and coding

The Diabetes Garage Focus Group Interview Guide

1. Thank you for having participated in the Diabetes Garage. This is our first set of classes and we would like your opinion on the program and ways to improve the program.
2. First, we'd like to know why you decided to participate in the Diabetes Garage, what brought you here?
3. What did you like most about the classes?
4. What did you like least about the classes?
5. What could we do better to get men with diabetes or men who are risk for diabetes to attend these classes?
    a. Probe: Why would ben not come to diabetes classes?
6. The goal of the program was to reframe diabetes so that men will be more engaged with their health by viewing their body like an automotive machine. Do you think this concept will help engage men in their health and if not why?
7. Do you have any more suggestions or recommendations for us?

The Diabetes Garage Focus Group Code Guide

CODE	**Interview Question**	**Frequency of Code**
PARTCP	First, we'd like to know why did you decide to participate in the Diabetes Garage, what brought you here?	
LIKES	What did you like most about the classes?	
DISLIKES	What did you like least about the classes?	
ATTEND	What would we do better to get men with diabetes or men who are at risk for diabetes to attend these classes?	
NOATTEND	Probe: Why would men not come to diabetes classes?	
DGCONCEPT	The goal of the program was to reframe diabetes so that men will be more engaged with their health by viewing their body like an automotive machine. Do you think this concept will help engage men in their health and if not why?	
SUGGSTS	Do you have any more suggestions or recommendations for us?	
Please add other questions that are asked during FG that are relevant or codes for themes unrelated to the interview guide questions		
NEW CODE	**Question not in guide**	**Frequency of Code**
PRIDE		
RISK		
SEVERITY		
DEATH		
MODELING		
ENGAGE		
MANUAL		
INSTRUCTORS		

IMPACT		
DOCTOR CHALLENGES		
SUPPORT		
FAMHIST		
ILLNESSID		
NETWORKS		
CULTURE		

Curriculum Vita

Renee Orrantia obtained her Bachelor of Science Degree in Biological Sciences with a Biomedical Sciences concentration from the University of Texas at El Paso (UTEP). In the Fall of 2016, Ms. Orrantia began the Masters of Public Health (MPH) program at UTEP, where she was accepted to the Alpha Chi and Phi Kappa Phi National Honor Societies in the Spring of 2018.

In November 2016, Ms. Orrantia began working as a Graduate Research Assistant for the Rehabilitation Sciences Department of the College of Health Sciences at UTEP doing research on pain sensitization and musculoskeletal diseases of the upper extremities of the human body. As part of her Masters program, Ms. Orrantia was a Graduate Fellow at the Bowling Family YMCA where she collaborated with the LIVESTRONG Cancer Exercise Program. Ms. Orrantia has most recently been working as an Assistant Program Coordinator with the Empower Change, Paso del Norte Center for Mental and Emotional Well-Being Center at UTEP.

Ms. Orrantia is also involved in the greater El Paso community. She has worked with various community organizations, including the Hugh O'Brian Youth Leadership Organization and the Optimist Clubs of El Paso, in leadership seminars and local food banks and pantries sorting and distributing food to local communities.

Ms. Orrantia plans to receive her MPH at the UTEP 2018 Fall Commencement Ceremony where she will serve as the Graduate School Banner Bearer. Ms. Orrantia plans to continue her work in serving the communities of El Paso through her work in program coordination and management.

Contact Information: renee.orrantia@gmail.com