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IMPACT OF A LIFESTYLE MODIFICATION INTERVENTION ON HEALTH
BEHAVIORS AND HEALTH OUTCOMES IN A MEXICAN AMERICAN POPULATION: A
MIXED-METHODS STUDY

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Ramandeep Kaur

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To: Dean Tomás R. Guilarte
Robert Stempel College of Public Health and Social Work

This dissertation, written by Ramandeep Kaur, and entitled Impact of a Lifestyle Modification Intervention on Health Behaviors and Health Outcomes in a Mexican American Population: A Mixed-methods Study, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

Susan Himburg

Patria Rojas

Boubakari Ibrahimou

Mary Shaw

Elena Bastida, Major Professor

Date of Defense: June 28, 2018

The dissertation of Ramandeep Kaur is approved.

Dean Tomás R. Guilarte
Robert Stempel College of Public Health and Social Work

Andrés G. Gil
Vice President for Research and Economic Development
and Dean of the University Graduate School

Florida International University, 2018

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DEDICATION

This work is dedicated to my parents. I thank you Mom and Dad for encouraging me at every step of my work. It is because of your blessings that I have been able to achieve this much.

Thanks to my sister, Milanjyot, for making me smile and motivating me to accomplish my goal.

I also dedicate this work to my loving husband Jasmeet. Thank you for your patience, thank you for motivating me to be a better person every day. Thank you for believing in me. Thank you for helping me realize I can do it.

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ABSTRACT OF THE DISSERTATION

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Ramandeep Kaur

Florida International University, 2018

Miami, Florida

Professor Elena Bastida, Major Professor

Metabolic syndrome (MetS), a global public health problem, is the primary cause of type 2 diabetes and cardiovascular disorders. Lifestyle modification interventions (dietary and physical activity modifications) are effective in preventing and ameliorating MetS and associated comorbidities. However, the impact of lifestyle changes on MetS among Mexican Americans has yet to be investigated, particularly due to high attrition rates in this population.

The overall goal of the explanatory mixed-methods study presented in this dissertation was to identify efficacious lifestyle modification efforts directed towards Mexican Americans to promote their retention in lifestyle modification programs, ameliorate the severity of MetS, and understand underlying behavior modification process. In particular, we examined secondary data from an extensive study Beyond Sabor to 1) examine predictors of program completion, 2) compare variation in MetS severity scores (z-scores) between intervention (Beyond Sabor) and attention control

(Healthy Living) groups, over time and, 3) investigate processual development of self-efficacy in a sample of 1153 disadvantaged Mexican Americans participants.

Findings suggest that program completers were more likely to be older, had more years of education, lower fasting blood glucose levels, and participated in sites with high group cohesiveness. Results also revealed that when compared with the standard nutrition program, Healthy Living, the lifestyle modification intervention, Beyond Sabor, was more effective in ameliorating MetS severity, systolic blood pressure, triglyceride, and fasting plasma glucose levels among study participants. Qualitative results demonstrate the high acceptability of Beyond Sabor intervention. Four sub-themes emerged illustrating important underlying conditions contributing to participants' improved self-efficacy: desire to gain knowledge about ways to improve health, development of social support, adoption of program teachings in family lifestyle, and improvement in health outcomes.

Findings of the current study may allow researchers to identify Mexican Americans at risk of non-completion and to develop strategies to improve lifestyle modification program attendance, and thus health outcomes. Qualitative findings underscore the importance of sociocultural context on individuals' attempts to make lifestyle changes to manage their chronic illnesses. Successful adaptation of lifestyle interventions such as Beyond Sabor for at-risk populations in community-based settings will be critical in stemming the tide of MetS.

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LIST OF ACRONYMS

| | |
|--------------|--|
| AHA | American Heart Association |
| ANOVA | Analysis of variance |
| CDC | Centers for Disease Control and Prevention |
| CHARMS | Community Health and Risk-reduction for Metabolic Syndrome |
| CVD | Cardiovascular Diseases |
| DBP | Diastolic Blood Pressure |
| FPG | Fasting Plasma Glucose |
| HDL | High-density lipoprotein |
| HEART | Health Education Awareness Research Team |
| IDF | International Diabetes Federation |
| LRGV | Lower Rio Grande Valley |
| MetS | Metabolic syndrome |
| NCEP ATP III | National Cholesterol Educational Program's Adult Treatment Panel III |
| NHANES | National Health and Nutrition Examination Survey |
| NHLBI | National Heart, Lung, and Blood Institute |
| RCT | Randomized Controlled Trial |
| SBP | Systolic Blood Pressure |
| SCT | Social Cognitive Theory |
| T2DM | Type 2 Diabetes Mellitus |

| | |
|-------|---|
| TDSHS | Texas Department of State Health Services |
| TG | Triglyceride |
| U.S. | United States |
| WC | Waist Circumference |
| WHO | World Health Organization |

CHAPTER I

Introduction

The metabolic syndrome (MetS), a cluster of risk factors including high blood pressure, abnormal glucose regulation, abdominal obesity, and abnormal blood lipid levels, is a global public health problem (Alberti, Zimmet, & Shaw, 2006; Mozaffarian et al., 2016). The syndrome affects approximately 25% of the world's adult population, and nearly 35% of the adult population in the United States (U.S.) is living with the condition (Mozaffarian et al., 2016). According to data from the 2003-2012 National Health and Nutrition Examination Survey (NHANES), MetS prevalence was highest among Hispanics (35.4%), as compared to non-Hispanic whites (33.4%), and non-Hispanic blacks (32.7%) (Aguilar, Bhuket, Torres, Liu, & Wong, 2015). Among U.S. Hispanics (i.e., Mexican Americans, Puerto Rican Americans, and Central/South Americans) the prevalence rate for Mexican Americans is the highest at 49.1% (Allison et al., 2008). Over the past few years, MetS prevalence has risen significantly and in simultaneity with the obesity epidemic, posing a more significant threat to Mexican Americans as nearly 43% of this population is obese (Ford, Li, & Zhao, 2010; Mozaffarian et al., 2016). NHANES findings also highlight an inverse association between socioeconomic status (approximated using education and household income) and odds of developing MetS among Mexican Americans (Aguilar et al., 2015). The increased prevalence of MetS among Mexican Americans is alarming since research has linked the presence of this condition to increased disability, reduced quality of life, and mortality (Mozaffarian et al., 2016). In particular, men and women of Mexican heritage suffer higher rates of type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD) secondary to MetS than

other Hispanic subgroups and are more likely than non-Hispanic Whites to die from the complications of MetS (Mozaffarian et al., 2016). There is a direct association between lifestyle and major risk elements for the development of MetS, and nearly 80% of the morbidity is preventable through the elimination of lifestyle-related risk factors such as physical inactivity and unhealthy dietary habits (Mozaffarian et al., 2016).

Lifestyle modification is crucial in controlling chronic disease progression and is considered first-line therapy for MetS (Chirinos et al., 2016). The use of lifestyle interventions (e.g., programs promoting healthy dietary intake and increased physical activity) is advocated and promoted in guidelines established by the National Cholesterol Educational Program's Adult Treatment Panel III (NCEP ATP III) for MetS management (Alberti et al., 2006; Grundy, Hansen, Smith, Cleeman, & Kahn, 2004). Much of the literature indicates that a change in dietary habits and physical activity can prevent the incidence or reduce the severity of MetS by controlling abdominal obesity and hypertension and improving lipid profile and glucose levels (Bassi et al., 2014; Chirinos et al., 2016). Previous randomized controlled trials (RCTs) implementing lifestyle modification interventions reported significant improvements in their participants' MetS components as a result of healthy dietary intake and increased physical activity (Bassi et al., 2014; Chirinos et al., 2016; Yamaoka & Tango, 2012). However, despite increased risk and prevalence of MetS among Mexican Americans, specific endeavors to promote lifestyle modifications to combat the syndrome in this vulnerable population are rare.

The limited research targeting minority populations reported poor retention of Mexican Americans in lifestyle modification programs (Bautista-Castano, Molina-

Cabrillana, Montoya-Alonso, & Serra-Majem, 2004; Erickson, 2000; Honas, Early, Frederickson, & O'Brien, 2003; Teixeira et al., 2004). Barriers which hinder Mexican Americans' continuous enrollment in lifestyle modification interventions include familial, financial, and work responsibilities, and restrictions due to language and cultural preferences (Kingry et al., 2007; Lovato, Hill, Hertert, Hunninghake, & Probstfield, 1997). Although recent advancements in research strategies such as tailored interventions and community engagement have reduced attrition rates for this understudied population, specific predictors of Mexican Americans' successful completion of a lifestyle modification program have not been identified.

High attrition of Mexican Americans in lifestyle modification programs makes it difficult to assess the impact of such behavioral interventions on the MetS related health outcomes among this hard to reach population. The insufficient research conducted among diverse populations to evaluate lifestyle modification programs often addresses the general Hispanic population (Balcazar et al., 2010; Chirinos et al., 2016). However, to date, no published study has reported on the lifestyle modification interventions to target MetS, specifically, among Mexican Americans (Zhao et al., 2016). Additionally, the existing studies conducted among predominantly non-Hispanic white groups use the binary MetS outcome variable (MetS present/MetS not present) for evaluation of lifestyle interventions, thus, they fail to acknowledge the small yet significant improvements in individual MetS components, as a result of participation in these interventions (Balcazar et al., 2010; Chirinos et al., 2016).

Furthermore, improvement in clinical and anthropometric measures is the primary criteria for evaluation of lifestyle modification interventions' success in the majority studies focused on MetS among Mexican Americans. Participants' perceptions of the interventions, their journey of behavior modification after participation in lifestyle modification programs are not explored. Moreover, the existing evidence on psychosocial factors and their influence on behavior modification is widely quantitative (Altman et al., 2014; Balcazar et al., 2010; Corona, Flores, & Arab, 2016; Lee, Misra, & Kaster, 2012). Existing literature lacks qualitative insights which may shed more light on what worked for participants, what motivated them, and what role the intervention played in their behavior modification process.

Increased prevalence of MetS in Mexican Americans and lack of substantial efforts to address the syndrome in this highly susceptible population calls for directing additional vigorous research to curtail the problem. It is crucial to identify culturally competent programs which address the issue of attrition and are useful in controlling the severity of MetS among the vulnerable population of Mexican Americans. Lifestyle modification programs which explore the mechanisms underlying intervention success and behavior modification in the understudied population of Mexican Americans, in addition to their impact on clinical and anthropometric measures, should be considered crucial for translation to a broader population.

Literature Review

Definition of Metabolic Syndrome

The concept of MetS was introduced in 1988 as “Syndrome X” (Handelsman, 2009) to include the multiple risk factors for T2DM and CVD in a single diagnosis. After that, the term “Syndrome X” was changed to “insulin resistance syndrome” (Alberti & Zimmet, 1998) and finally, “metabolic syndrome.” As mentioned earlier, MetS is a constellation of clinical disorders characterized by hypertension, abdominal obesity, hyperglycemia, and dyslipidemia (Aguilar-Salinas et al., 2005). Waist circumference (WC) is measured to determine abdominal obesity (Centers for Disease Control and Prevention [CDC], 2012c); dyslipidemia is characterized by increased blood serum triglyceride (TG) levels and reduced high-density lipoprotein (HDL) cholesterol levels (American Heart Association [AHA], 2012); systolic and diastolic blood pressure (SBP and DBP) are measured to determine hypertension (CDC, 2012b); and fasting plasma glucose (FPG) level determines hyperglycemia (CDC, 2012a). The NCEP ATP III, the International Diabetes Federation (IDF), the National Heart, Lung, and Blood Institute (NHLBI)/AHA, and the World Health Organization (WHO) established a harmonized definition of MetS, jointly (Alberti et al., 2009). According to this definition, an individual is diagnosed with MetS if he/she meets any three of the following five criteria; large waistline (≥ 35 inches or 88 cm for women, 40 inches or 102 cm for men), high triglyceride (TG) level (> 150 mg/dL or being on medicine to treat high TG), low high-density lipoprotein (HDL) cholesterol level (<50 mg/dL for women, <40 mg/dL for men or being on medicine to treat low HDL), high blood pressure (BP) (systolic BP > 130

mmHg or diastolic BP >85 mmHg or being on medicine to treat high BP), and high FPG (> 100 mg/dL or being on medicine to treat high blood sugar) (Alberti et al., 2009).

Prevalence of Metabolic Syndrome

In the U.S., more than one-third (35%) of the adult population has MetS (Aguilar et al., 2015). Despite many efforts to prevent and control MetS in the general population, the data revealed a growing trend in the prevalence of MetS from 25.3% in 1994 to 34.2% in 2012 within the U.S. (Moore, Chaudhary, & Akinyemiju, 2017). Moreover, gender and age-based disparities and racial/ethnic differences exist in MetS prevalence. Comparison between genders suggested a higher prevalence of the syndrome among females (35.6%) as compared to men (30.3%) (Aguilar et al., 2015). Moreover, the prevalence increased with increasing age and was highest among older adults aged 60 years or more (46.7%), followed by 40-59-year-old middle-aged adults (34%) and 20-39-year-old younger adults (18.3%) (Aguilar et al., 2015). According to the 2003-2012 NHANES data, nearly 28% of Mexican American men and 31% of Mexican-American women have MetS, which has emerged as the major contributor to the development of T2DM and CVD in this population (Moore et al., 2017). The data also showed that 38.6% of Mexican Americans had MetS compared to 37.4% of non-Hispanic whites and 35.5% non-Hispanic blacks (Mozaffarian et al., 2016). Looking at the various MetS components, Mexican American adults have the second highest rate of abdominal obesity (60%) in the U.S. compared to non-Hispanic blacks (63%) and non-Hispanic whites (54%) (Beltran-Sanchez, Harhay, Harhay, & McElligott, 2013). In comparison to non-Hispanic whites and non-Hispanic blacks, Mexican Americans have the highest

prevalence of dyslipidemia (22%, 16%, and 35%, respectively) (Beltran-Sanchez et al., 2013). Mexican Americans also have a high prevalence of hypertension (28%), next only to non-Hispanic blacks (38%), but higher than non-Hispanic whites (21%) (Beltran-Sanchez et al., 2013). Additionally, the prevalence of hyperglycemia is also highest among Mexican Americans (31%) as compared with non-Hispanic whites (19%) and non-Hispanic blacks (22%) (Beltran-Sanchez et al., 2013). There is a decreasing trend in the prevalence of MetS components amongst non-Hispanic blacks and non-Hispanic whites. However, the prevalence of these factors is disconcertingly increasing among Mexican Americans (Beltran-Sanchez et al., 2013). Moreover, these disparities are likely to increase given the projected growth of this population in the U.S. (U.S. Census Bureau, 2015b).

Comorbidities associated with Metabolic Syndrome

With dyslipidemia and hyperglycemia as its major components, MetS is a crucial contributory factor in the development of T2DM and CVD. According to a systematic review conducted with 951,083 participants from 87 prospective studies, MetS increased the risk of CVD by 2.4 times, and that of all-cause mortality by 1.5 times (Kahn, Buse, Ferrannini, & Stern, 2005). Another meta-analysis of 42,419 subjects from 16 studies found that the presence of MetS was associated with a 3.5 to 5.2 times higher risk for development of T2DM (Ford, Li, & Sattar, 2008). In 2012, 85.6 million American adults had one or more types of CVD, and 29.1 million adults had T2DM (Mozaffarian et al., 2016). CVD inflicted an annual economic burden of \$316.6 billion for direct and indirect health care costs as well as productivity losses in 2012 (Mozaffarian et al., 2016). This

cost is projected to rise to 1,208 billion by 2030 (Mozaffarian et al., 2016). The economic burden of T2DM was estimated to be \$245 billion in 2012 (Mozaffarian et al., 2016). The existing evidence also supports the association between the presence of MetS and the development of chronic kidney disease and liver cirrhosis (Kurella, Lo, & Chertow, 2005; Rendina, De Filippo, D'Elia, & Strazzullo, 2014; Vigil et al., 2011; Wong et al., 2009). Since the prevalence of MetS is highest among Mexican Americans, this population bears the most significant burden of T2DM, CVD and resultant health care costs (Mozaffarian et al., 2016).

Mexican Americans as the Population of Interest

The U.S. Census Bureau estimated that 54.2 million Hispanics were living in the U.S. in 2015, representing 17.4% of the nations' population (U.S. Census Bureau, 2015). This pattern is also reflected in Texas where 8.8 million people of Mexican origin live, representing 33% of the total population of the state (U.S. Census Bureau, 2015a). Approximately 84% of the population of the Lower Rio Grande Valley (LRGV) region located in the southernmost area of Texas is Hispanic, mainly Mexican American. (U.S. Census Bureau, 2015a). The region includes four counties; Hidalgo, Cameron, Starr, and Willacy. The LRGV ranks among the most disadvantaged regions in the country, with its counties ranked among the top 10 in indices of education and income (Mato, 2016; Tomlinson, 2013; Ura, 2016). Also, the region has many unplanned settlements, also known as *colonias*, which lack necessary infrastructures such as paved roads, sewage disposal systems and clean water (Ramos, May, & Ramos, 2001). Furthermore, the residents of the LRGV have limited access to health care. According to 2013 data from

the Texas Department of State Health Services (TDSHS), nearly 20% of adults in the LRGV had diabetes, 73.4% were overweight or obese, and 34.3% reported no physical activity. Mexican Americans in the region had a higher risk of dying from diabetes (38.2 deaths per 100,000 persons) as compared to the general population (30.3 deaths per 100,000 persons). Rates of hospitalization due to diabetes were also higher among Mexican Americans (21.9 hospital discharges per 10,000 persons) as compared to the general population (19.3 hospital discharges per 10,000 persons). Mexican Americans in the region had the highest rates of physical inactivity in comparison with their counterparts living in the non-border regions of the state and those from other racial/ethnic backgrounds (TDSHS, 2013). Moreover, fruit and vegetable consumption were also the lowest in this population (TDSHS, 2013). The high prevalence of obesity, diabetes, physical inactivity, and inadequate intake of a healthy diet among Mexican Americans living in the LRGV puts the population at risk for MetS. Therefore, there is a need to take adequate measures to promote a healthy lifestyle (healthy dietary intake and regular physical activity) among Mexican Americans to prevent the incidence of MetS and associated comorbidities, as well as to curb the high prevalence rates of the condition in this highly susceptible population.

Lifestyle Modification Intervention

Lifestyle comprises the health behaviors individuals engage in on a daily basis. Commonly studied lifestyle behaviors include physical activity and diet, and maintaining these behaviors is essential in preventing chronic illnesses. Broadly, lifestyle modification interventions are the activities which incorporate education and counseling

to improve health behaviors such as healthy dietary intake and regular physical activity. These interventions primarily aim to lower the risk of chronic diseases and reduce the burden of such diseases. As discussed earlier, the use of lifestyle interventions (e.g., healthy dietary intake and increased physical activity) is advocated and promoted in guidelines established by the NCEP ATP III for MetS management (Alberti et al., 2006; Grundy et al., 2004).

Factors associated with Lifestyle Modification Program Completion

The effectiveness of intensive lifestyle interventions, which promote regular physical activity and healthy dietary intake, in preventing chronic illnesses among high-risk individuals has been ascertained in several RCTs (Daubenmier et al., 2007; Ebrahim et al., 2011; Eriksson et al., 2010; Knowler et al., 2002; Otterstad, 2003; Pan et al., 1997; Tuomilehto et al., 2001). Recent studies conducted in community-based settings have also established the feasibility of implementing lifestyle modification programs in real-world settings with promising results (Ackermann, Finch, Brizendine, Zhou, & Marrero, 2008; Amundson et al., 2009; Eriksson, Franks, & Eliasson, 2009; Hardcastle, Taylor, Bailey, & Castle, 2008; Kramer et al., 2009; Laatikainen et al., 2007; Whittemore et al., 2009). Previous studies primarily tested lifestyle interventions for their empirical effect on improving risk factors such as obesity, impaired glucose metabolism, elevated blood pressure, and dyslipidemia known to be associated with the development of chronic disorders (Koniak-Griffin et al., 2015; Ma et al., 2013; Orchard et al., 2005; Pettman, Misan, Coates, Buckley, & Howe, 2007). Additionally, the existing literature also draws attention to a dose-response relationship between program attendance rates and changes

in lifestyle and physiological risk factors (Hardcastle et al., 2008; Laatikainen et al., 2007).

Completion of a lifestyle modification intervention has been found to be essential to achieve desired health outcomes and sustain improvements for an extended period. Attrition in lifestyle modification programs may mask the actual effectiveness of a program. Therefore, a first step towards addressing issues of sustainable lifestyle modification is the identification of characteristics that are predictive of program completion in behavioral intervention programs. Identification of program completion predictors may provide valuable insights for the marketing of health promotion programs and may also contribute in designing and implementing programs with strategies to improve retention by addressing conditions suitable for enhancing participants' continuous enrollment in lifestyle intervention programs.

The most frequently studied factors that affect Mexican Americans' participation and retention in a lifestyle modification program are age, marital status, number of children, gender, employment status, and income (Eakin et al., 2007; Keller, Gonzales, & Fleuriet, 2005). The limited research examining age as a predictor of successful completion of lifestyle modification programs provides contradictory results, with some studies identifying younger participants as more likely to be program completers (Crespo, Smit, Carter-Pokras, & Andersen, 2001; Erickson, 2000; Eyler et al., 2002; Scharff, Homan, Kreuter, & Brennan, 1999; Sternfeld, Ainsworth, & Quesenberry, 1999; Voorhees & Rohm Young, 2003), while others show older participants to be more likely to complete these programs (Bautista-Castano et al., 2004; Honas et al., 2003). For

example, in a study by Honas et al. (2003) et al., 76% of the participants aged 51-60 completed the physical activity-based program, compared to only 60% of participants under the age of 40. Although there are theoretical reasons why older participants may be more likely to complete a program or engage in healthy behaviors, declining health, and fewer family obligations are among the most prevalent (Honas et al., 2003). Studies including Mexican Americans showed similar differences in participation rates by age group (Bautista-Castano et al., 2004). In an obesity treatment program, the older participants in the sample that included an age range of 14-76 years were more likely to complete the program. Additionally, those who were 35 and younger were more likely to drop out. The studies explained that many participants in their younger years work outside of the home, resulting in more family responsibility and less priority over their wellness (Bautista-Castano et al., 2004; Honas et al., 2003).

No association between marital status and program completion is apparent (Honas et al., 2003). In the only study examining the association between marital status and program completion, marital status was not a significant predictor regardless of gender in a sample of men and women. On the other hand, there is evidence that having children may be a hindrance to successful completion of a lifestyle modification program (Erickson, 2000). Among a sample consisting mainly of women (91%), those who had young children in the home were most likely to drop out of the program. Based on post-program interviews, the participants with children appeared to be first concerned with a safe place for their children to stay before attending such programs could be considered (Erickson, 2000).

Additional studies indicate that Mexican American females are more likely to complete the lifestyle modification programs as compared to their male counterparts (Eakin et al., 2007; Keller et al., 2005). Moreover, females who are more educated (Eyler et al., 2002; Ford, Ford, Will, Galuska, & Ballew, 2001; Ransdell & Wells, 1998; Scharff, Homan, Kreuter, & Brennan, 1999; Sternfeld, Ainsworth, & Quesenberry, 1999), younger in age (Crespo, Smit, Carter-Pokras, & Andersen, 2001; Erickson, 2000; Eyler et al., 2002; Scharff et al., 1999; Sternfeld et al., 1999; Voorhees & Rohm Young, 2003), and either do not have or have few children (Sternfeld et al., 1999; Voorhees & Rohm Young, 2003) are more likely to complete the programs.

Despite low retention rates reported for Mexican Americans in previous lifestyle modification studies, the context of program completion was minimally examined. Moreover, the correlates of program completion identified in the literature did not show a consistent pattern across the studies conducted among Mexican Americans. Therefore, the existing contradictory evidence accentuates the importance of identifying and quantifying specific factors which influence retention of Mexican American participants in community-based lifestyle modification programs. Since program attrition hinders achievement of health outcome goals, it is essential for program planners to identify characteristics for those more likely to remain and those more likely to drop out.

Lifestyle modification intervention and Metabolic Syndrome

Research outcomes from studies conducted among mostly non-Hispanic White samples advocate for the beneficial role of lifestyle changes, including healthy dietary intake and increased physical activity, in prevention and management of MetS (Bo et al.,

2007; Grundy et al., 2004; Orchard et al., 2005; Watkins et al., 2003). Randomized controlled trials (RCT) have established that in comparison with standard educational programs, lifestyle modification interventions are more successful in improving MetS components, specifically, waist circumference and fasting plasma glucose levels, and blood pressure (Bo et al., 2007; Watkins et al., 2003; Yamaoka & Tango, 2012). Notwithstanding the high MetS risk speculated for Mexican Americans, RCTs using lifestyle modification interventions to address the disorder among this at-risk population are rare (Balcazar et al., 2010; Chirinos et al., 2016). Occupational and familial obligations and linguistic and financial constraints account for poor recruitment, and hence, lack of intervention endeavors to control MetS among Mexican Americans (Kingry et al., 2007; Lovato et al., 1997). Nevertheless, advancements in recruitment strategies and program planning have encouraged Mexican Americans' enrollment in research studies, thus providing more opportunities to improve the metabolic risk profile of this particular minority group (Keyzer et al., 2005).

Project Health Education Awareness Research Team (HEART), a randomized community trial with a community-based participatory research framework, used community health workers to promote behavior changes to decrease CVD risk factors in a high-risk Hispanic border population (Balcazar et al., 2010). The study recruited 328 participants with at least one CVD risk factor through randomization of ten U.S. Census tracts in El Paso, Texas, to either experimental or control groups (Balcazar et al., 2010). The experimental group had 192 participants who were assigned to 8 health classes based on *Su Corazon, Su Vida* (Your Heart, your Life) curriculum (Balcazar et al., 2010). The

2-hour per session classes were delivered every week for two months, and after that, participants were followed for two months through telephone calls and a small group session to discuss changes resulting from participation in the program (Balcazar et al., 2010). The control group had 136 participants who were given necessary health education materials at baseline (Balcazar et al., 2010). Clinical and anthropometric measures such as WC, BP, lipids, and risk for MetS (measured as a mean number of risk factors present) were measured for all participants at baseline and four months after the intervention (Balcazar et al., 2010). More than half (53%) of the study participants were of Mexican origin (Balcazar et al., 2010). The study had a retention rate of 87% and participants in the experimental group showed a significant decrease in mean number of MetS risk factors, SBP, and DBP ($p < .05$) (Balcazar et al., 2010). However, it is noteworthy that the study targeted the general Hispanic population; the location of the study, EL Paso, TX explains Mexican origin of the majority participants. Additionally, although the study had a high retention rate, the original study sample size was considerably small. Moreover, the study used a mean number of components with abnormal values as a measure of MetS risk, which does not consider minute improvements in the clinical and anthropometric measures that may have resulted from participation in the program.

Another study conducted by Chirinos et al. (2016), with a predominantly Hispanic sample, also made an effort to target MetS in this population. The Community Health and Risk-reduction for Metabolic Syndrome (CHARMS) RCT found significant reductions in fasting plasma glucose levels at six months post-intervention ($B = -0.522$, $SE = 0.234$,

95% CI -0.907 to -0.138) in a mostly Hispanic sample from Miami. Reductions were maintained through the 12-month assessment (Chirinos et al., 2016). Results from the CHARMS RCT suggest a potential for lifestyle modification interventions to have a similar impact in reducing the severity of MetS among Mexican Americans since the CHARMS RCT found promising results in a mostly Hispanic sample. However, it is unclear if one of the most susceptible and largest among Hispanic groups, Mexican Americans, were included in the Chirinos et al. (2016) study, since the composition of the sample, recruited in Miami, FL, did not specify the targeted Hispanic groups. Additionally, the study had a small sample size ($n = 120$) and measured improvements in MetS risk using a binary classification (MetS present/MetS not present).

Even though precise categorical criteria for MetS diagnosis were ascertained by several health organizations (WHO, NCEP ATP III, IDF) (Alberti et al., 2009), this binary classification method has received some criticism. Mainly because it does not acknowledge improvements in individual MetS components as an amelioration of MetS severity (Gurka, Lilly, Oliver, & DeBoer, 2014). For example, despite a clinically significant reduction in fasting plasma glucose (FPG) from 110 to 102 mg/dl after an intervention, it would still be categorized as a MetS risk factor according to the NCEP ATP III and IDF criteria ($FPG \geq 100$ mmHg) (Alberti et al., 2009; Gurka et al., 2014). Additionally, the binary classification of MetS does not consider the gender and race-specific average values for MetS components (Gurka et al., 2014). Therefore, a continuous severity score known as MetS z-score was recommended by Gurka et al. (2014) to more accurately identify those with or at risk of developing MetS and to better

understand the changes in MetS components following lifestyle modification interventions. However, despite recommendations of a continuous severity score (MetS z-score) to estimate the risk of the syndrome, there is a dearth of substantial evidence highlighting the use of a continuous measure of MetS in the context of community-based lifestyle modification interventions in general, and among Mexican Americans in particular.

Lifestyle Modification Intervention and Self-efficacy

The existing evidence suggests that culturally-tailored interventions that employ a theory-based approach to target health behaviors may be the most effective method to improve health outcomes and manage chronic diseases among vulnerable, high-risk Mexican American populations (Altman, Nunez de Ybarra, & Villablanca, 2014; Bautista-Castano et al., 2004; Erickson, 2000; E. S. Ford et al., 2001; Honas et al., 2003; Lorig, Ritter, & Gonzalez, 2003; Pettman et al., 2007; Ramos et al., 2001; Wehrly et al., 2010; Wilson, Brown, & Bastida, 2015). Theory-based interventions facilitate the study of processes resulting in behavioral change. The constructs of a theory which can repeatedly be tested in similar or different settings elucidate success of one type of intervention over another (Bandura, 2004). One such widely used comprehensive behavioral change theory is the Social Cognitive Theory (SCT) (Bandura, 2004). The SCT emphasizes the continuous interaction between the environment, the person, and the behavior. The theory explains the concept of outcome expectancy, i.e., an individual will continue the newly acquired behavior if he/she considers the outcome of behavior change to be positive. Otherwise, individuals discontinue the newly acquired behavior. A concept

more crucial than outcome expectancy for behavior change is that of self-efficacy expectancy, i.e., an individual's confidence in his/her ability to perform the behavior (Bandura, 2004). Since self-efficacy is critical to sustaining behavior modifications, it is fundamental to explore the role of lifestyle modification programs in the development of participants' self-efficacy, which may ultimately result in sustainability of behavioral change. A critical element in assessing the outcomes of lifestyle intervention is to capture participant experiences, as it is their perception of distinct program constituents that shapes the health behavior modification.

Although the existing literature on lifestyle modification programs reports positive short-term effects and modest improvements in biomarkers (the standard determinants of success in health behavior modification), there is seemingly limited long-term behavior modification success among Mexican Americans participating in longitudinal lifestyle modification studies (Altman et al., 2014; Balcazar et al., 2010; Corona, Flores, & Arab, 2016; Lee, Misra, & Kaster, 2012). Moreover, there is a lack of research on the underlying mechanisms that result in sustainable behavior modification within the Mexican American population. To researcher's knowledge, there are no specific studies that have examined the process of development of Mexican American participants' self-efficacy because of their participation in a lifestyle modification program.

The reviewed literature highlights the increased susceptibility of Mexican Americans to MetS and associated comorbidities. It also points towards the paucity of intensive endeavors to prevent and control the problem of MetS in this vulnerable

population. The scarce studies involving Mexican Americans suggest poor retention of this ethnic minority in lifestyle modification programs. Moreover, they do not provide any information regarding Mexican American participants' perception of lifestyle modification programs.

Purpose of the Study

The overall goal of the explanatory mixed methods study presented in this dissertation was to identify efficacious lifestyle modification efforts directed towards Mexican Americans to promote their retention in the program, ameliorate the severity of MetS, and understand the underlying behavior modification process. Qualitative and quantitative data from an extensive study *Beyond Sabor* were used to explore the three study aims stated below (Bastida, Brown, & Pagan, 2008; Bastida et al., 2010; Wilson et al., 2015).

Aim 1. Examine predictors of program completion among study participants through an analysis of quantifiable attendance data.

Aim 2. Compare the variation in MetS severity scores (z-scores) among Mexican American participants of *Beyond Sabor* and Healthy Living programs, over time.

Aim 3. Investigate the processual development of self-efficacy among *Beyond Sabor* intervention participants through a detailed analysis of qualitative data.

Dr. Elena Bastida headed the *Beyond Sabor* study funded by the National Institute of Minority Health and Health Disparities (Grant: 5R24MD001779-05). The

study aimed at 1) the prevention or reduction of overweight and obesity classifications; and 2) the prevention, delay of onset, or improved management of diabetes in a population of urban and rural adult Mexican-Americans (Bastida, Brown, & Pagan, 2008; Bastida et al., 2010; Wilson et al., 2015). Using a randomized cluster design, study sites were randomized to either Beyond Sabor (intervention) or Healthy Living (standard program). Trained staff were responsible for collecting sociodemographic, physical activity, and dietary recall data for each site at baseline, 12-week post-intervention, and 40-week follow-up using a standardized questionnaire. Data for anthropometric measures were collected by a professional nurse at each location during the three time periods. Clinical assessments were conducted at the Valley Baptist Medical Center Community Reference Laboratory during baseline, 12-week post-intervention, and 40-week follow-up assessments. The qualitative data included direct quotes from participants in the form of naturalistic observations and comments recorded during the intervention sessions, and as testimonials and open-ended interview responses recorded during the follow-up period (Bastida, Brown, & Pagan, 2008; Bastida et al., 2010; Wilson et al., 2015). The major findings of the Beyond *Sabor* program are under publication, with some findings reported elsewhere (Bastida, Tseng, McKeever, & Jack, 2010; Wilson, Brown, & Bastida, 2015).

Significance of the Study

The explanatory mixed methods study presented in this dissertation will expand the limited evidence on the effect of participation in lifestyle modification interventions on self-efficacy and MetS severity among Mexican Americans. It will further support the impact of self-efficacy on program completion, behavior modification, and consequently,

health outcomes. The use of qualitative data to corroborate result of quantitative data analysis strengthens the study. Overall, the proposed mixed methods study will have a significant impact on future research targeting racial/ethnic minorities and health disparities in the U.S. The study will contribute to the literature by providing a better understanding of MetS prevention among Mexican American adults living in the LRGV those who experience food insecurity.

Several avenues were explored to obtain an extended and in-depth view of factors influencing MetS prevention in the population of interest. First, identifying who is most likely to complete the program will inform the delivery of tailored MetS prevention interventions to the Mexican American population living in the Texas-Mexico border region. This study informed on how to increase retention and engage high-risk Mexican Americans in lifestyle modification programs, particularly in community-based settings. Second, this research will add to the literature by providing information on the impact of lifestyle modification intervention, as opposed to a standard program, on MetS severity over time in this disadvantaged and understudied population. It laid the groundwork in support of behavioral interventions' significant role in the improvement of MetS risk profile in disadvantaged populations and will advocate the use of continuous MetS severity scores as opposed to the standard categorical classification for evaluation of lifestyle modification programs. Third, findings from this study will provide qualitative evidence to elucidate the impact of participation in lifestyle modification intervention on Mexican Americans' self-efficacy and will illustrate the process of adoption of healthy behaviors by participants.

Results presented here strengthen evidence-based practice by providing support for theory-centered community-based, culturally-tailored lifestyle modification interventions in the improvement of participant's self-efficacy which might lead to sustainable lifestyle modifications imperative for prevention and management of chronic conditions, particularly among disadvantaged Mexican Americans. Lastly, findings from this study may be prudently extrapolated to the general Mexican American population, adding to the limited literature on the impact of a community-based culturally-tailored lifestyle modification intervention on self-efficacy, thus improving program completion and reducing MetS severity in this minority population.

Dissertation Organization

The overall purpose of this dissertation is to identify a community-based culturally-embedded lifestyle modification program, *Beyond Sabor*, which has a positive impact on the program retention, health behaviors, and health outcomes of its Mexican American participants from the Texas-Mexico border region of LRGV. The dissertation has been organized using the three-manuscript format. Given the mixed literature on factors associated with program completion by Mexican American participants and following the explanatory mixed methods design, the first manuscript aims to assess the quantitative data for predictors of program completion among study participants. The purpose of the second manuscript is to compare variation in MetS severity scores (z-scores) among participants of *Beyond Sabor* (intervention) and *Healthy Living* (control) programs, over time. Lastly, the third manuscript assesses qualitative data gathered during the implementation of the program searching for processual evidence supporting

the development of self-efficacy among study participants. This last manuscript by highlighting the influence of self-efficacy on program completion and risk reduction for MetS complements and explains earlier quantitative findings.

In general, the dissertation provides an overview of the problem of MetS, its importance in the population of interest, and the role of lifestyle modification programs designed to alleviate the problem. The literature review identifies specific factors influencing Mexican Americans' participation and retention in lifestyle modification programs which forms the basis of the first manuscript. The detailed review of the existing literature also sheds light on the impact of participation in lifestyle modification programs on participants' health outcomes, and how to assess that impact in the context of MetS severity, the objective of the second manuscript. Finally, the literature review provides a theoretical framework, social cognitive theory, for understanding the process of health behavior modification to improve health outcomes, as well as development of participants' self-efficacy. This framework forms the basis of the third manuscript, respectively.

The explanatory mixed methods design employed by this dissertation afforded the opportunity to draw from quantitative and qualitative data in investigating its proposed aims. The first and second manuscripts used quantitative analyses to identify participants' characteristics which predicted program completion and to gauge the impact of participation in a lifestyle modification program on health outcomes (MetS severity), respectively. Complementing quantitative findings in manuscripts one and two, the third manuscript is a qualitative study that draws from participants narratives in revealing and

illustrating reasons behind their involvement in the program and their acceptance and incorporation of program teachings in their lives as well their families' lifestyles. The manuscript also highlights the behavior modification process that participants undergo when participating in programs such as *Beyond Sabor*. Thus, the three manuscripts individually present results pertaining to their respective research aims while collectively providing a logical path for the attainment of the overall goal of the dissertation.

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CHAPTER II: FIRST MANUSCRIPT Factors Influencing Completion of a Community-based Lifestyle Modification Program by Mexican American Participants

Abstract

Background: Lifestyle modification interventions are known to be effective in achieving desired health outcomes and sustaining them for an extended period. The scarce research conducted among diverse populations has shown high attrition rates among Mexican Americans participating in lifestyle modification interventions. This study reports a secondary analysis of data from an intervention study known as *Beyond Sabor* to identify factors influencing the completion of the intervention delivered as part of this community-based program.

Methods: *Beyond Sabor* intervention used a culturally-tailored approach to prevent or reduce overweight and obesity, and prevent, delay the onset, or improve management of diabetes in a population of rural and urban adult Mexican Americans living in the Lower Rio Grande Valley region of southern Texas. The present study analyzed data from the sociodemographic, clinical, anthropometric, and physical activity assessments for intervention participants with complete baseline information. Program completion status was the dependent variable categorized as “non-completers” and “intervention/program completers.” Hierarchical multi-level logistic regression analysis was used to examine participant and site-level factors associated with program completion status.

Results: A total of 522 *Beyond Sabor* intervention participants completed the baseline assessment, and 424 (81%) completed the post-intervention assessment. Ninety-eight

(19%) were non-completers. Intervention/program completers were more likely to be older, had more years of education, lower fasting blood glucose levels, and participated in sites with high group cohesiveness. The logistic regression model was statistically significant for individual ($\chi^2 [4] = 28.441, p < .001$) as well as site level predictors ($\chi^2 [6] = 41.568, p < .001$). Four predictor variables (age, years of education, fasting blood glucose levels, and group cohesiveness) were statistically significant.

Conclusion: The findings of the current study describe the profiles of Mexican Americans found to be more likely to succeed in community-based culturally-tailored lifestyle modification programs. These findings may allow researchers to identify Mexican Americans at risk of non-completion and to develop strategies to improve lifestyle modification program attendance, and thus health outcomes.

Introduction

Chronic illnesses such as cardiovascular disorders and diabetes contribute significantly to global disease burden. Chronic disease risk factors such as obesity, hyperglycemia, hypertension, and hyperlipidemia often cluster together, a condition known as metabolic syndrome (Mozaffarian et al., 2016). In the US, metabolic syndrome, cardiovascular disorders, and diabetes are disproportionately prevalent among minority populations, with Mexican American adults exhibiting a higher prevalence of these conditions than their non-Hispanic white counterparts (Mozaffarian et al., 2016). The increased prevalence of chronic diseases among Mexican Americans is alarming since research has linked the presence of these conditions to increased disability, reduced quality of life, and mortality (Mozaffarian et al., 2016).

Lifestyle modification, including regular physical activity and healthy dietary intake, is considered first-line therapy for prevention and control of chronic diseases (Daubenmier et al., 2007; Eriksson et al., 2010; Otterstad, 2003; Tuomilehto et al., 2001). Several randomized controlled trials have established the effectiveness of intensive lifestyle modification interventions in the prevention of chronic illnesses among high-risk individuals (Ebrahim et al., 2011; Knowler et al., 2002; Pan et al., 1997). Recent studies conducted in community-based settings have established the feasibility of implementing lifestyle modification programs in real-world settings, with promising results (Ackermann, Finch, Brizendine, Zhou, & Marrero, 2008; Amundson et al., 2009; Eriksson, Franks, & Eliasson, 2009; Kramer et al., 2009; Whittemore et al., 2009). According to the literature, community-based lifestyle modification interventions were, primarily, assessed for their impact on chronic disease risk factors (obesity, impaired glucose metabolism, elevated blood pressure, and dyslipidemia) (Koniak-Griffin et al., 2015; Ma et al., 2013; Orchard et al., 2005; Pettman, Misan, Coates, Buckley, & Howe, 2007). Additionally, the existing literature also draws attention to a dose-response relationship between program attendance rates and changes in lifestyle and physiological risk factors (Hardcastle, Taylor, Bailey, & Castle, 2008; Laatikainen et al., 2007).

Completion of a lifestyle modification intervention has been found to be essential to achieve desired health outcomes and sustain gains for an extended period. Attrition in lifestyle modification programs may mask the actual effectiveness of a program. Therefore, a first step towards addressing issues of sustainable lifestyle modification is the identification of characteristics that are predictive of program completion in behavioral intervention programs. Identifying predictors may provide valuable insights

for the marketing of health promotion programs and may also contribute in designing and implementing programs with strategies to improve retention by addressing conditions suitable for enhancing participants' program completion.

The insufficient research conducted among diverse populations has shown high attrition rates among Mexican Americans participating in lifestyle modification interventions (Bautista-Castano, Molina-Cabrillana, Montoya-Alonso, & Serra-Majem, 2004; Erickson, 2000; Honas, Early, Frederickson, & O'Brien, 2003; Teixeira et al., 2004). Moreover, program completion rates in existing studies varied considerably with only a few studies identifying specific factors that affect Mexican Americans' successful completion of a lifestyle modification program (Bautista-Castano et al., 2004; Erickson, 2000; Honas et al., 2003; Teixeira et al., 2004). The most frequently studied factors are age, marital status, number of children, gender, employment status, and income (Eakin et al., 2007; Keller, Gonzales, & Fleuriet, 2005; Koniak-Griffin et al., 2015).

The limited research examining age as a predictor of successful completion of lifestyle modification programs provides contradictory results (Crespo, Smit, Carter-Pokras, & Andersen, 2001; Bautista-Castano et al., 2004; Honas et al., 2003; Voorhees & Rohm Young, 2003). While majority studies identified younger participants as more likely to be lifestyle modification program completers (Crespo, Smit, Carter-Pokras, & Andersen, 2001; Erickson, 2000; Eyster et al., 2002; Scharff, Homan, Kreuter, & Brennan, 1999; Sternfeld, Ainsworth, & Quesenberry, 1999; Voorhees & Rohm Young, 2003), there were a few with a higher proportion of older participants completing the programs (Bautista-Castano et al., 2004; Honas et al., 2003). Additional studies indicate that

Mexican American females are more likely to complete the lifestyle modification programs as compared to their male counterparts (Eakin et al., 2007; Keller, Gonzales, & Fleuriet, 2005). Moreover, participants with higher levels of education have also been shown to be more likely to complete lifestyle modification programs (Eyler et al., 2002; Ford, Ford, Will, Galuska, & Ballew, 2001; Ransdell & Wells, 1998; Sternfeld et al., 1999). Previous studies report that having children may be a hindrance to successful completion of a lifestyle modification program (Erickson, 2000; Sternfeld et al., 1999; Voorhees & Rohm Young, 2003). Furthermore, no association between marital status and program completion is apparent in the literature (Honas et al., 2003). The existing contradictory evidence accentuates the importance of identifying and quantifying specific factors which influence retention of Mexican American participants in community-based lifestyle modification programs.

Although attrition rates in lifestyle modification programs are typically high (Honas et al., 2003), the designing and implementation of culturally competent programs may be the best mechanism for controlling the high prevalence of chronic diseases among Mexican Americans (CDC, 2015). Since program attrition hinders achievement of health outcome goals, it is essential for program planners to identify characteristics for those more likely to remain and those more likely to drop out. Therefore, the identification of program completion factors specific to Mexican Americans is essential.

The Beyond *Sabor* intervention was a culturally-tailored program conducted among rural and urban adult Mexican Americans living in the Lower Rio Grande Valley region of southern Texas (Bastida, Tseng, McKeever, & Jack, 2010; Wilson, Brown, &

Bastida, 2015). The goal of the program was to prevent or reduce overweight and obesity and prevent, delay the onset, or improve management of diabetes in this vulnerable population (study described in detail in Methods section). The major findings of the Beyond *Sabor* program are under publication, with some findings reported elsewhere (Bastida, Tseng, McKeever, & Jack, 2010; Wilson, Brown, & Bastida, 2015). The present study reports a secondary analysis of data from Beyond *Sabor* to identify factors influencing the level of completion of the lifestyle modification intervention delivered as a community-based program. This study will inform on how to increase retention and engage high-risk Mexican Americans in lifestyle modification programs, particularly in community-based settings.

Methods

Study settings

The Lower Rio Grande Valley (LRGV) is one of the most disadvantaged regions in the US, has high levels of poverty, and low levels of education and per capita income (Wehrly et al., 2010). Approximately 84% of the population in the LRGV located in the State of Texas is Mexican American (U.S. Census Bureau, 2015a). The region is known for its unplanned settlements, known as *colonias*, which lack elementary infrastructures such as paved roads, sewage disposal systems and clean water (Ramos, May, & Ramos, 2001). According to 2013 data from the Texas Department of State Health Services (TDSHS), nearly 20% of adults in the LRGV had diabetes, 73.4% were overweight or obese, and 34.3% reported no physical activity (TDSHS, 2013). Moreover, a considerable proportion of the LRGV residents are uninsured and have limited access to health care

(U.S. Census Bureau, 2015b; Bastida, Brown III, & Pagán, 2008). The high prevalence of obesity, physical inactivity, and inadequate healthcare infrastructure in the LRGV puts its population at higher risk for chronic diseases.

Beyond Sabor

Beyond *Sabor* (the Spanish word for “flavor”) is a community-based lifestyle modification program designed to control weight gain and the progression of diabetes in Mexican Americans living in food desert neighborhoods of the Lower Rio Grande Valley region in the Texas-Mexico border area. The study used a mixed-methods design and was framed within a Community Based Participatory Research (CBPR) approach. Beyond *Sabor* is a 12-week culturally embedded intervention. It partnered with the area Food Bank and Migrant Farmworkers Union to conduct a 42-week randomized controlled design to assess the effect of the intervention. The study used multistage cluster sampling to recruit 1,153 men and women. Inclusion criteria were: Mexican American origin, 21-70 years of age, and a living arrangement within a family context (e.g., married/partnered/raising children). Subjects were excluded if they had a body mass index value higher than 40 (exception for doctor’s written authorization), inability to commit to regular attendance throughout the 12-week program, and existing medical or physical conditions precluding their involvement in a moderate physical activity or intake of a low-fat, low-carbohydrate, moderately high fiber diet.

Flyers were posted at each Food Bank pantry qualifying site and throughout neighborhoods to announce the study four weeks prior to the initiation of the intervention. Flyers contained information about study goals and objectives, and the day

and time for the introductory meeting to discuss the proposed research. During the initial visit, the research team informed participants about voluntary participation and the two programs, *Beyond Sabor* (intervention) and Healthy Living (attention control) that would be offered. Participants also received information relevant to their understanding of the Institutional Review Board (IRB) consent form and signature. Following the first visit, flyers were used to advertise the day and time of the second meeting. During the second visit, the research team formally recruited participants and obtained their consent. Researchers were blind to the treatment or control status of the sites during recruitment and at baseline.

The research team recruited a total of 35-45 participants at each site, accounting for an anticipated attrition rate of 30%. Baseline data collection on sociodemographics, anthropometric, and clinical measures, and dietary and physical activity recalls followed recruitment. Baseline data collection preceded randomization of 32 sites from 156 qualifying sites to either the *Beyond Sabor* intervention or the Healthy Living control groups. A minimum of two treatment and two control groups were conducted in each four-month cycle. *Beyond Sabor*, a 2-hour per week, 12-week health education program included three differently timed segments: a 20-minute education presentation, on either obesity, diabetes, or CVD, a 50-minute cooking demonstration and food sampling, and a 60-minute walk. Flexibility in the sequence of implementation was possible, though adherence to the fidelity of content and delivery of three segments was vigorously implemented. Lesson plans included the following topics: 1) The walking club, 2) Diabetes: What do you need to know? 3) Diabetes: Risk factors and complications, 4) The kidney and water essential to life, 5) Cholesterol, 6) Blessed calories, 7) Fat, 8)

Reading nutrition labels, 9) Portions, 10) Sweeteners, 11) Traditional quesadilla goes healthy, and 12) Eating and taking out.

The control group sites received the Healthy Living program, a standard nutrition education program delivered by the Food Bank at selected pantry sites. The Texas Department of Health and Human Services partially funded the Healthy Living program. It was a 30-minute, six-session program, offered once every two weeks. In order for control group participants to be exposed to the program for the same duration as the intervention participants, the Healthy Living program was offered every other week to correspond to the 12-week length of the *Beyond Sabor* intervention. Healthy Living was a lecture only program, with no food sampling or interaction time, although it was similar in content to *Beyond Sabor* and had the same goal of promoting healthy eating habits. The Food Bank nutrition manager and Healthy Living trainer taught the program, which emphasized the prevention of lifestyle diseases like diabetes. The Healthy Living presenter was culturally competent, of Mexican American descent, and born and raised in the region.

In both the intervention and control groups, trained staff were responsible for collecting sociodemographic, physical activity, and dietary recall data for each site at baseline, 12-week post-intervention, and 40-week follow-up (42 weeks since baseline assessment) using an adapted questionnaire. Data for anthropometric measures were collected by a professional nurse at each location during the three time periods. Clinical assessments were conducted by the Valley Baptist Medical Center Community Reference Laboratory during baseline, 12-week post-intervention, and 40-week follow-up

assessments. Naturalistic observations, quotes, and comments from participants were recorded by two ethnographers, only at intervention sites, and upon completion of the program as testimonials in an open-ended interview during the follow-up period.

Data collection and Analysis

The present study analyzed quantitative data from intervention group (Beyond *Sabor*) participants with complete baseline information. Data for sociodemographic, clinical, anthropometric, and physical activity assessments were analyzed. Only the intervention sites were included for analysis since data for group site characteristics were collected only at the intervention sites where the research team was present for all sessions.

Sociodemographic variables included age, gender (male/female), marital status (married/single), number of children, years of education, employment status (employed/unemployed), and annual household income. The analysis included physical activity as a behavioral factor, and a participant was “physically active” if the total duration of his/her self-reported physical activity duration was 150 minutes per week or more. Otherwise, the participant was physically inactive. Baseline health variables included in the analysis were body mass index (BMI), fasting plasma glucose (FPG) levels, systolic blood pressure (SBP), diastolic blood pressure (DBP), and total cholesterol (TC).

Three site-level variables included in the analysis were the location, leadership quality, and group cohesiveness (low/high). Data for the location of the site were obtained from US census categories and was group into “rural” or “urban” areas. Each

member of the research team present assessed the leadership quality and group cohesiveness based on ethnographic data collected by two ethnographers at each site during the 12-week intervention period. Codes were developed in group discussions, and an agreement was obtained. The research team determining the codes consisted of seven to nine team members at each site. Codes and categorizations were discussed until group agreement was reached. Leadership quality was assessed as the formal involvement of site leaders (pantry manager of food bank sites/priest or pastor of the church sites) during the program. Sites with the active involvement of leaders were coded as “strong” leadership quality sites, and those with minimal involvement as “weak” leadership quality. The level of interaction between site participants described group cohesiveness. Accordingly, those with greater interaction between participants were coded as “high” group cohesiveness sites, and those with lesser communication between participants as “low” group cohesiveness sites. Program completion status was the dependent variable. Participants who did not complete the post-intervention assessment were categorized as “non-completers,” those completing the post-intervention assessment or follow-up assessment were “completers.”

Data were initially subject to preliminary descriptive analysis using SPSS statistical software (SPSS 23, Chicago, IL, USA) to examine the frequency of participant and site-level characteristics. Univariate analysis was initially used to compare non-completers versus intervention/program completers, using sociodemographic characteristics, baseline health behaviors, and baseline clinical profile. The study also compared site characteristics for non-completers and completers. Significant differences

in categorical variables for non-completers and completers were examined using chi-square statistic and independent samples *t*-test for normally distributed variables.

Assumptions were tested by examining normal probability plots (histograms and Q-Q plots). Associations between predictor variables and dependent variables were examined through Odds Ratio (OR) and point-biserial (r_{pb}) correlations. Odds ratio were run when both the independent and dependent variables were dichotomous and point-biserial correlations when the independent variable was a continuous variable and dependent variable dichotomous. Variables found to be significant ($p < 0.05$) in the bivariate analysis were entered into a multivariate logistic regression model to examine the predictors of non-completion of the *Beyond Sabor* intervention. The data were then analyzed using hierarchical multi-level logistic regression analysis to examine participant and site-level factors associated with program completion status. Multi-level analysis was conducted considered appropriate as participant data for program completion status were clustered by sites. Therefore, to control the shared variance between the two, predictors were entered in blocks: (1) individual-level variables: age, household income, years of education, and fasting blood sugar levels; and (2) site level variables: leadership quality and group cohesiveness.

The Institutional Review Board of the University of North Texas Health Science Center at Fort Worth approved the parent study. The present dissertation was reviewed by Florida International University's Office of Research Integrity who exempted the study from a full review.

Results

Baseline characteristics of the 522 Beyond *Sabor* intervention participants are described in Table 2.1 Mean age of the participants was 46.58 ($SD = 14.82$), the majority were female (81.8%, $n = 427$) and married (67%, $n = 350$). The mean years of education attained by participants were 8.68 ($SD = 4.46$), and on average they had three children. In terms of clinical parameters, participants had severe health risks with mean BMI of 31.31 ($SD = 6.77$), mean FPG of 127.64 mg/dl ($SD = 48.43$), mean SBP of 128.08 mm Hg ($SD = 17.94$), mean DBP of 77.19 mm Hg ($SD = 11.42$), and mean TC of 183.61 mg/dl ($SD = 41.34$). Participants were mostly inactive with only 25.7% ($n = 134$) obtaining adequate physical activity (≥ 150 minutes per week). Most of the participants were clustered in urban sites (66.1%, $n = 345$) and experienced high group cohesiveness (63%, $n = 329$). Of the total 522 participants, 424 (81%) completed the intervention, and 98 (19%) were non-completers. Intervention completers were more likely to be older, had more years of education, and lower FPG levels, compared to non-completers (Table 2.2). Surprisingly, intervention completers were more likely to be nested in sites with weak leadership quality but high group cohesiveness. There were no differences between intervention completers and non-completers regarding gender, marital status, employment status, number of children, physical activity, BMI, SBP, DBP, TC, and site location.

Table 2.1 Baseline characteristics of participants enrolled in the Beyond Sabor intervention

| Variable | Mean | SD |
|------------------------------|--------------|-----------|
| Age (years) | 46.58 | 14.82 |
| Number of children | 3.21 | 1.98 |
| Education (years) | 8.68 | 4.46 |
| BMI (kg/m ²) | 31.31 | 6.77 |
| FPG (mg/dL) | 127.64 | 48.43 |
| SBP (mm Hg) | 128.08 | 17.94 |
| DBP (mm Hg) | 77.19 | 11.42 |
| TC (mg/dL) | 183.61 | 41.34 |
| | n=522 | % |
| Gender | | |
| Female | 427 | 81.8 |
| Male | 95 | 18.2 |
| Marital Status | | |
| Married | 350 | 67 |
| Single | 172 | 33 |
| Employment Status | | |
| Employed | 230 | 44 |
| Unemployed | 292 | 56 |
| Household Income | | |
| ≤ \$15000 | 399 | |
| ≥ \$15001 | 124 | |
| Physical Activity | | 25.7 |
| Adequate | 134 | 74.3 |
| Inadequate | 388 | |
| Site Location | | |
| Rural <i>N</i> (% of total) | 177 | 33.9 |
| Urban <i>N</i> (% of total) | 345 | 66.1 |
| Leadership quality | | |
| Weak <i>N</i> (% of total) | 272 | 52.1 |
| Strong <i>N</i> (% of total) | 250 | 47.9 |
| Group cohesiveness | | |
| Low <i>N</i> (% of total) | 193 | 37 |
| High <i>N</i> (% of total) | 329 | 63 |

Table 2.2 Baseline characteristics of those who completed the intervention/program (intervention completers) compared to those who discontinued participation previous to the end of the intervention (non-completers)

| Characteristic | Intervention Completers | Non-completers | <i>p</i> |
|----------------------------------|-------------------------|----------------|-------------|
| <i>n</i> | 424 | 98 | - |
| Age (years) | 47.3 ± 14.87 | 43.4 ± 14.26 | .02 |
| Gender | | | |
| Female <i>N</i> (% of total) | 348 (82.1) | 79 (80.6) | .884 |
| Male <i>N</i> (% of total) | 76 (17.9) | 19 (19.4) | |
| Marital Status | | | |
| Married <i>N</i> (% of total) | 288 (67.9) | 62 (63.3) | .339 |
| Single <i>N</i> (% of total) | 136 (32.1) | 36 (36.7) | |
| Number of children | 3.28 ± 1.97 | 2.90 ± 1.98 | .088 |
| Household Income | | | |
| ≤ \$15000 | 317 (74.8) | 81 (82.6) | .083 |
| ≥ \$15001 | 107 (25.2) | 17 (17.4) | |
| Education (years) | 8.88 ± 4.46 | 7.82 ± 4.39 | .037 |
| Employment Status | | | |
| Employed <i>N</i> (% of total) | 185 (43.6) | 45 (45.9) | .651 |
| Unemployed <i>N</i> (% of total) | 239 (56.4) | 53 (54.1) | |
| Physical Activity | | | |
| Adequate <i>N</i> (% of total) | 110 (25.9) | 24 (24.5) | .514 |
| Inadequate <i>N</i> (% of total) | 314 (74.1) | 74 (75.5) | |
| BMI (kg/m ²) | 31.17 ± 6.79 | 31.92 ± 6.64 | .331 |
| FPG (mg/dL) | 124.14 ± 39.65 | 142.53 ± 73.50 | .018 |
| SBP (mm Hg) | 128.20 ± 18.29 | 127.59 ± 16.49 | .767 |
| DBP (mm Hg) | 77.31 ± 11.69 | 76.68 ± 10.20 | .632 |
| TC (mg/dL) | 183.74 ± 42.14 | 183.06 ± 37.96 | .885 |
| Site Location | | | |
| Rural <i>N</i> (% of total) | 143 (33.7) | 34 (34.7) | .812 |
| Urban <i>N</i> (% of total) | 281 (66.3) | 64 (65.3) | |
| Leadership quality | | | |
| Weak <i>N</i> (% of total) | 232 (54.7) | 40 (40.8) | .012 |
| Strong <i>N</i> (% of total) | 192 (45.3) | 58 (59.2) | |
| Group cohesiveness | | | |
| Low <i>N</i> (% of total) | 145 (34.2) | 48 (49) | .008 |
| High <i>N</i> (% of total) | 279 (65.8) | 50 (51) | |

Data are means ±SD. Bold values signify *p* < 0.05 based on chi-square or independent *t*-tests

Table 2.3 depicts the respective OR and *r_{pb}* between predictor variables and program completion. Participant characteristics correlated with program completion were

- age, years of education, and FPG. Site level characteristics correlated with program completion were – group cohesiveness and leadership quality. Multilevel binomial logistic regression was performed to ascertain the effects of individual-level characteristics; age, years of educational attainment, and FPG, as well as site level characteristics; leadership quality and group cohesiveness on the likelihood of intervention completion by the participants of *Beyond Sabor* intervention. The logistic regression model was statistically significant, $\chi^2(4) = 28.441, p < .001$ for individual-level predictors, as well as site level predictors $\chi^2(6) = 41.568, p < .001$. The model including site level variables explained 12.8% (Nagelkerke R^2) of the variance in intervention completion status and correctly classified cases. Of the five predictor variables, only four were statistically significant: age, years of education, FPG, and group cohesiveness (Table 2.4). Participants in sites with high group cohesiveness had 2.1 times higher odds to complete the intervention than those from sites with low group cohesiveness. There was a positive association between age and levels of education, and the likelihood of intervention completion, but a negative association between FPG levels and the likelihood of intervention completion.

Table 2.3 Bivariate analysis of predictors of completing the lifestyle modification program, Beyond Sabor

| Variable | OR | 95% CI |
|---|----------------|----------------------|
| Gender (Female vs. Male) | 1.043 | 0.591 – 1.843 |
| Marital Status (Single vs. married) | .794 | .501 – 1.258 |
| Employment status (Unemployed vs. Employed) | 1.124 | .722 - 1.750 |
| Household income category (≤ 15000 vs. ≥ 15001) | 1.544 | .875 -2.726 |
| Physical activity (Inadequate Vs. Adequate) | 1.213 | .712 – 2.066 |
| Site location (Urban vs. Rural) | 1.070 | .673 – 1.702 |
| Leadership quality (Strong vs. Weak) | .551* | .350 - .866 |
| Group cohesiveness (High vs. Low) | 1.847** | 1.185 – 2.880 |

| | <i>r</i> (<i>pb</i>) |
|--------------------|------------------------|
| Age | .102* |
| Years of education | .092* |
| FPG | -.149** |
| BMI | -.043 |
| BPS | .013 |
| BPD | .021 |
| Cholesterol | .006 |
| Number of children | .076 |

* $p < .05$; ** $p < .01$

Table 2.4 Multilevel logistic regression predicting the likelihood of Intervention completion based on individual and site level characteristics

| | Odds Ratio (OR) | 95% CI for OR | |
|---|-----------------|---------------|-------|
| | | Lower | Upper |
| Block1: Individual level factors | | | |
| Age | 1.030 | 1.011 | 1.050 |
| Years of education | 1.064 | 1.000 | 1.133 |
| FPG | .992 | .987 | .996 |
| Block 2: Site level factors | | | |
| Leadership quality | .703 | .431 | 1.148 |
| Group cohesiveness | 2.101 | 1.293 | 3.414 |

Note: Leadership quality is for strong compared to weak; group cohesiveness is for high compared to low

Discussion

The present study provides valuable new insights into the factors influencing Mexican American participants' retention in lifestyle modification programs for the prevention of chronic diseases. Nearly one-fifth of individuals recruited in the intervention did not complete the program. However, most of the participants were completers. Individuals who were older, and more years of education were significantly more likely to complete the program, while higher FPG levels were shown to be an obstacle. High levels of group cohesiveness at intervention sites promoted program completion.

The finding that there was a strong association between age and program completion was expected (Bautista-Castano et al., 2004; Honas et al., 2003). The literature on intervention completion also identifies age as a predictor of lifestyle modification program completion; our findings indicated that *Beyond Sabor* was actively taken up by older individuals (Bautista-Castano et al., 2004; Honas et al., 2003). A possible explanation is that older individuals were more motivated to complete the program because they believed that they were more susceptible to ill health (Bautista-Castano et al., 2004; Honas et al., 2003). Hochschild and Machung (2012) explained that many participants in their younger years work outside of the home resulting in more family responsibility and less priority over their wellness. Results also suggest that socioeconomic factors such as increased years of education completed may serve as protective factors against attrition as it provides more socioeconomic security and stabilize life predicaments providing more opportunities for healthy lifestyle choices

(Eyler et al., 2002; Ford, Ford, Will, Galuska, & Ballew, 2001; Ransdell & Wells, 1998; Sternfeld et al., 1999). However, low socioeconomic status is not a deterrent for older participants as they have fewer family obligations due to the empty nest stage, as explained in life course theory, which allows them to be more actively engaged in lifestyle modification programs (Honas et al., 2003).

Interestingly, there was no association between participants' health profile or health behaviors at baseline and program completion. The only exception was FPG. Participants with lower levels of FPG were more likely to complete the program, which could be interpreted as increased consistency in their health behaviors and motivations to improve or maintain their health.

To our knowledge, this is the first study to investigate the relationship between site level cohesiveness among participants and lifestyle modification program completion by Mexican Americans. The present study showed that the sites which reflected a higher level of cohesiveness had a more significant number of participants who were more likely to complete the program. It is possible that cohesiveness among participants at different sites served as a means of continuous social support required to ensure participation in the program.

The study also examined a wide range of ages and both genders, thus allowing a broader examination of lifestyle modification program completion. To our knowledge, this is the only study specific to predictors of Mexican Americans participants' program completion status in lifestyle modification interventions. The current study answers the

longstanding call in the chronic disease literature, to address program completion as a crucial issue in the success of lifestyle modification interventions.

The results of the study are mostly consistent with previous studies addressing correlates of attrition in lifestyle modification interventions. A review on both attrition and poor treatment outcome in lifestyle modification interventions demonstrated that most demographic variables (e.g., gender, marital status) have failed to reliably predict program completion (Tuomilehto et al., 2001). The authors' conclusions that few differences in baseline participant characteristics exist between completers and non-completers are consistent with the findings of the current study. These results further highlight the need to focus on theoretically grounded predictors of program completion.

This study had certain limitations. Researchers did not conduct follow up interviews with participants who did not complete the program. Despite no formal follow up with participants who did not complete the program, the effort was made to inquire from other group members about a participant's absence, given the community-based design of the study. Only a limited number of responses were recorded, but these indicate many younger group participants attending day programs were unemployed at the time and looking for employment. Hence, once hired they stopped coming to the session. Effort was made by group leaders to incorporate them into an evening program, but with little success. Given the limited information, we suggest to conducting qualitative interviews with participants who were recruited but did not complete lifestyle modification programs since these could elicit further insights into factors influencing Mexican American participants' retention and the way programs could be modified to

improve future participation. Additionally, the study focused on factors influencing retention of Mexican American participants in a community-based lifestyle modification program amongst those who volunteered to attend. Higher retention rates among highly motivated volunteer participants of this study limit its generalizability to a larger population.

Mexican Americans are the most substantial sub-group of Hispanics, which are the fastest growing and largest ethnic minority group in the United States. This population growth trend coupled with the fact that Mexican Americans are at a disproportionately higher risk of chronic diseases highlights the need to understand how participant characteristics may be related to the successful participation and completion of behavioral modification programs for this minority population group. Findings of the current study have significant implications for improving culturally-relevant interventions designed to promote successful lifestyle modification programs among Mexican Americans. Additionally, these conclusions allow the identification of personal and structural characteristics essential to the retention and success of Mexican Americans in community-based culturally-tailored lifestyle modification programs. The study results advocate the value of social interaction and support provided in a group program for encouraging retention. Data also indicate that a group approach may be more effective in promoting healthy lifestyles than individual-based interventions (Paul-Ebhohimhen & Avenell, 2009).

Approximately one-fifth of participants recruited in the *Beyond Sabor* intervention did not complete the program. Barriers to program completion identified in

this analysis is mainly related to young age, poor socioeconomic status, poor health status, and weak interactions with other participants at the site. Participants who were older, had higher education levels, and relatively healthier clinical parameters were more likely to complete the *Beyond Sabor* program. Factors considered to facilitate program completion included high levels of cohesiveness among site participants. These findings may allow researchers to identify Mexican Americans at risk for non-completion and to develop strategies to improve lifestyle modification program attendance, and thus health outcomes.

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CHAPTER III: SECOND MANUSCRIPT Metabolic Syndrome Severity Reduction among Mexican American Adults: Results from a Culturally-tailored Lifestyle Modification Program

Abstract

Background: Existing literature has established that unhealthy lifestyles intensify the risk of developing chronic diseases. However, the impact of lifestyle changes on metabolic syndrome (MetS), particularly among vulnerable Mexican Americans, has yet to be investigated. This study aimed to compare the impact of two programs, Beyond *Sabor*, and Healthy Living, on MetS severity (MetS z-score) among Mexican Americans living in a Texas-Mexico border region.

Methods: This study is a secondary analysis of data derived from an extensive community-based culturally-tailored lifestyle modification program. The present study used sociodemographic, clinical, and anthropometric data from 1,074 Mexican American participants in the Beyond *Sabor* program. Recruited participants were randomized to one of the following 12-week programs: (1) Intervention - Beyond *Sabor* (2) Attention control - Healthy Living. MetS z-scores were derived from levels of MetS risk factors at baseline, post-intervention, and follow-up assessment. A two-way (time: baseline, post-intervention, and follow-up; group: Beyond *Sabor* intervention and Healthy Living attention control) mixed ANOVA was performed to assess the difference in MetS z-scores between intervention and attention control group, over time.

Results: Of the 1,153 Food Pantry clients recruited for the study, 1,074 completed the baseline assessment (Beyond *Sabor*, $n = 480$; Healthy Living, $n = 594$) and were included

in the analysis. Two-way mixed ANOVA did not report any statistically significant group and time interaction effect on MetS z-score, $F(2,984) = 1.401, p = .247, \text{partial } \eta^2 = .003$. The main effect of time showed a statistically significant difference in mean MetS z-score at the different time points, $F(2,984) = 7.584, p = .001, \text{partial } \eta^2 = .015$. The main effect of group showed a borderline significant difference in mean MetS z-score between the intervention and attention control groups $F(1,492) = 2.944, p = .08, \text{partial } \eta^2 = .006$. In separated repeated measures ANOVAs, Beyond *Sabor* intervention elicited statistically significant changes in MetS z-score over time, $F(2,602) = 6.945, p = .002, \text{partial } \eta^2 = .023$, however, no statistically significant changes were observed in the attention control (Healthy Living) group, $F(2,382) = 2.9, p = .062, \text{partial } \eta^2 = .015$. Participants of the intervention group experienced a significant decrease in SBP ($p = .008$), TG ($p = .011$), and BS ($p < .001$), over time, as assessed by one-way repeated measures ANOVA.

Conclusion: Lifestyle modification intervention, Beyond *Sabor*, was successful in ameliorating MetS severity, systolic blood pressure, triglycerides, and fasting plasma glucose levels among disadvantaged Mexican Americans with or at risk of MetS. The successful adaptation of lifestyle interventions such as Beyond *Sabor* for at-risk populations in community-based settings will be critical in stemming the tide of MetS and lessening its disease burden.

Introduction

MetS is a constellation of clinical disorders characterized by hypertension, abdominal obesity, hyperglycemia, and dyslipidemia (Aguilar-Salinas et al., 2005). A harmonized definition of MetS was established through the joint effort of the National Cholesterol Educational Program's Adult Treatment Panel III (NCEP ATP III), the International Diabetes Federation (IDF), National Heart, Lung, and Blood Institute (NHLBI)/AHA, and the World Health Organization (WHO) (Alberti et al., 2009). According to this definition, an individual diagnosed with MetS if he/she meets any three of the following five criteria; large waist circumference (WC) (≥ 35 inches or 88 cm for women, 40 inches or 102 cm for men), high triglyceride (TG) level (> 150 mg/dL or being on medicine to treat high TG), low high-density lipoprotein (HDL) cholesterol level (<50 mg/dL for women, <40 mg/dL for men or being on medicine to treat low HDL), high systolic or diastolic blood pressure (SBP and DBP) (SBP > 130 mmHg or DBP >85 mmHg or being on medicine to treat high BP), and high fasting plasma glucose (FPG) (> 100 mg/dL or being on medicine to treat high blood sugar) (Alberti et al., 2009).

MetS has emerged as a global public health problem as it affects approximately 25% of the world's adult population (Mozaffarian et al., 2016). Nearly 35% of the adult population in the United States (U.S.) is living with the condition of MetS (Mozaffarian et al., 2016). According to data from the 2003-2012 National Health and Nutrition Examination Survey (NHANES), MetS prevalence was highest among Hispanics (35.4%), as compared to non-Hispanic whites (33.4%), and non-Hispanic blacks (32.7%) (Aguilar, Bhuket, Torres, Liu, & Wong, 2015). Among U.S. Hispanics (i.e., Mexican Americans, Puerto Rican Americans, and Central/South Americans) the prevalence rate

for Mexican Americans is the highest at 49.1% (Allison et al., 2008). Over the past few years, MetS prevalence has risen significantly and in simultaneity with the obesity epidemic, posing a more significant threat to Mexican Americans as nearly 43% of this population is obese (Ford, Li, & Zhao, 2010; Mozaffarian et al., 2016). NHANES findings also highlight an inverse association between socioeconomic status (approximated using education and household income) and odds of developing MetS among Mexican Americans (Aguilar et al., 2015). The increased prevalence of MetS among Mexican Americans is alarming since research has linked the presence of this condition to increased disability, reduced quality of life, and mortality (Mozaffarian et al., 2016). In particular, men and women of Mexican heritage suffer higher rates of type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD) secondary to MetS than other Hispanic subgroups and are more likely than non-Hispanic Whites to die from the complications of MetS (Mozaffarian et al., 2016). Major risk elements for the development of MetS are directly associated with lifestyle, and nearly 80% of the morbidity is preventable through the elimination of lifestyle-related risk factors such as physical inactivity and unhealthy dietary habits (Mozaffarian et al., 2016).

Lifestyle modification is crucial in controlling chronic disease progression and is considered first-line therapy for MetS (Chirinos et al., 2016). The use of lifestyle interventions (e.g., programs promoting healthy dietary intake and increased physical activity) is advocated and promoted in guidelines established by the National Cholesterol Educational Program's Adult Treatment Panel III (NCEP ATP III) for MetS management (Alberti et al., 2006; Grundy, Hansen, Smith, Cleeman, & Kahn, 2004). Literature indicates that a change in dietary habits and physical activity can prevent the incidence or

reduce the severity of MetS by controlling abdominal obesity and hypertension and improving lipid profile and glucose levels (Bassi et al., 2014; Chirinos et al., 2016). Previous randomized controlled trials (RCTs) implementing lifestyle modification interventions reported significant improvements in their participants' MetS components as a result of healthy dietary intake and increased physical activity (Bassi et al., 2014; Chirinos et al., 2016; Yamaoka & Tango, 2012). However, despite increased risk and prevalence of MetS among Mexican Americans, specific endeavors to promote lifestyle modifications to combat the syndrome in this vulnerable population are rare. Occupational and familial obligations and linguistic and financial constraints account for poor recruitment, and hence, lack of intervention endeavors to control MetS among Mexican Americans (Kingry et al., 2007; Lovato et al., 1997). Nevertheless, advancements in recruitment strategies and program planning have encouraged Mexican Americans' enrollment in research studies, thus providing more opportunities to improve the metabolic risk profile of this minority group (Keyzer et al., 2005).

Project Health Education Awareness Research Team (HEART), a randomized community trial with a community-based participatory research framework, used community health workers to promote behavior changes to decrease CVD risk factors in a high-risk Hispanic border population (Balcazar et al., 2010). The study recruited 328 participants with at least one CVD risk factor through randomization of ten U.S. Census tracts in El Paso, Texas, to either experimental or control groups (Balcazar et al., 2010). The experimental group had 192 participants who were assigned to 8 health classes based on *Su Corazon, Su Vida* (Your Heart, your Life) curriculum (Balcazar et al., 2010). The 2-hour per session classes were delivered every week for two months, and after that,

participants were followed for two months through telephone calls and a small group session to discuss changes resulting from participation in the program (Balcazar et al., 2010). The control group had 136 participants who were given necessary health education materials at baseline (Balcazar et al., 2010). Clinical and anthropometric measures such as WC, SBP, DBP, lipids, and risk for MetS (measured as a mean number of risk factors present) were measured for all participants at baseline and four months after the intervention (Balcazar et al., 2010). More than half (53%) of the study participants were of Mexican origin (Balcazar et al., 2010). The study had a retention rate of 87% and participants in the experimental group showed a significant decrease in mean number of MetS risk factors, SBP, and DBP ($p < .05$) (Balcazar et al., 2010). However, it is noteworthy that the study targeted the general Hispanic population; Mexican origin of the majority participants can be attributed to the location of the study, El Paso, TX. Additionally, although the study had a high retention rate, the original study sample size was considerably small. Moreover, the study used a mean number of components with abnormal values as a measure of MetS risk, which does not take into account minute improvements in the clinical and anthropometric measures that may have resulted from participation in the program.

Another study conducted by Chirinos et al. (2016), with a predominantly Hispanic sample, also tried to target MetS in this population. The Community Health and Risk-reduction for Metabolic Syndrome (CHARMS) RCT found significant reductions in fasting plasma glucose levels at six months post-intervention ($B = -0.522$, $SE = 0.234$, 95% CI -0.907 to -0.138) in a mostly Hispanic sample from Miami. Reductions were maintained through the 12-month assessment (Chirinos et al., 2016). Results from the

CHARMS RCT suggest a potential for lifestyle modification interventions to have a similar impact in reducing the severity of MetS among Mexican Americans since the CHARMS RCT found promising results in a mostly Hispanic sample. However, it is unclear if one of the most susceptible and largest among Hispanic groups, Mexican Americans, were included in the Chirinos et al. (2016) study, since the composition of the sample, recruited in Miami, FL, did not specify the targeted Hispanic groups. Additionally, the study had a small sample size (n =120) and measured improvements in MetS risk using a binary classification (MetS present/MetS not present).

Even though precise categorical criteria for MetS diagnosis have been ascertained by several health organizations (WHO, NCEP ATP III, IDF) (Alberti et al., 2009), this binary classification method has received some criticism. Mainly because it does not acknowledge improvements in individual MetS components as an amelioration of MetS severity (Gurka, Lilly, Oliver, & DeBoer, 2014). For example, despite a clinically significant reduction in FPG from 110 to 102 mg/dl after an intervention, it would still be categorized as a MetS risk factor according to the NCEP ATP III and IDF criteria (FPG \geq 100 mmHg) (Alberti et al., 2009; Gurka et al., 2014). Additionally, the binary classification of MetS does not consider the gender and race-specific average values for MetS components (Gurka et al., 2014). Therefore, a continuous severity score known as MetS z-score was recommended by Gurka et al. (2014) to more accurately identify those with or at risk of developing MetS and to better understand the changes in MetS components following lifestyle modification interventions.

Despite recommendations for the use of a continuous severity score (MetS z-score), there exists a dearth of substantial evidence highlighting the use of a continuous

measure of MetS in the context of community-based lifestyle modification interventions in general, and among Mexican Americans in particular. Therefore, to strengthen the evidence base for public health endeavors targeting MetS among Mexican Americans, additional research is required to investigate potential changes in quantifiable MetS outcomes because of participation in lifestyle modification programs. The Beyond *Sabor* intervention used a culturally-tailored approach to prevent or reduce overweight and obesity, and prevent, delay the onset, or improve management of diabetes in a population of rural and urban adult Mexican Americans living in the Lower Rio Grande Valley region of southern Texas (Bastida, Tseng, McKeever, & Jack Jr, 2010; Wilson, Brown III, & Bastida, 2015) (study described in detail in Methods section). The major findings of the Beyond *Sabor* program are under publication, with some findings reported elsewhere (Bastida, Tseng, McKeever, & Jack, 2010; Wilson, Brown, & Bastida, 2015). Taking into consideration the effect of a lifestyle modification intervention on MetS management in other populations, the present study reports a secondary analysis of data from the Beyond *Sabor* program to compare the variation in MetS severity scores (z-scores) among Mexican American participants of a lifestyle modification intervention (Beyond *Sabor*) and a standard nutrition program (Healthy Living), over time. It was hypothesized that the two programs, Beyond Sabor and Healthy Living, will have a similar positive impact on participants' MetS severity. The secondary aims were to determine the impact of these programs on MetS components - WC, TG, HDL, SBP, and FPG levels, over time.

Methods

Study settings

The Lower Rio Grande Valley (LRGV) is one of the most disadvantaged regions in the US, has high levels of poverty, and low levels of education and per capita income (Wehrly et al., 2010). Approximately 84% of the population in the LRGV located in the State of Texas is Mexican American (U.S. Census Bureau, 2015a). The region is known for its unplanned settlements, known as *colonias*, which lack elementary infrastructures such as paved roads, sewage disposal systems and clean water (Ramos, May, & Ramos, 2001). According to 2013 data from the Texas Department of State Health Services (TDSHS), nearly 20% of adults in the LRGV had diabetes, 73.4% were overweight or obese, and 34.3% reported no physical activity (TDSHS, 2013). Moreover, a considerable proportion of the LRGV residents are uninsured and have limited access to health care (U.S. Census Bureau, 2015b; Bastida, Brown III, & Pagán, 2008). The high prevalence of obesity, physical inactivity, and inadequate healthcare infrastructure in the LRGV puts its population at higher risk for chronic diseases.

Beyond Sabor

Beyond *Sabor* (the Spanish word for “flavor”) is a community-based lifestyle modification program designed to control weight gain and the progression of diabetes in Mexican Americans living in food desert neighborhoods of the Lower Rio Grande Valley region in the Texas-Mexico border area. The study used a mixed-methods design and was framed within a Community Based Participatory Research (CBPR) approach. Beyond *Sabor* is a 12-week culturally embedded intervention. It partnered with the area Food Bank and Migrant Farmworkers Union to conduct a 42-week randomized controlled

design to assess the effect of the intervention. The study used multistage cluster sampling to recruit 1,153 men and women. Inclusion criteria were: Mexican American origin, 21-70 years of age, and a living arrangement within a family context (e.g., married/partnered/raising children). Subjects were excluded if they had a body mass index value higher than 40 (exception for doctor's written authorization), inability to commit to regular attendance throughout the 12-week program, and existing medical or physical conditions precluding their involvement in a moderate physical activity or intake of a low-fat, low-carbohydrate, moderately high fiber diet.

Flyers were posted at each Food Bank pantry qualifying site and throughout neighborhoods to announce the study four weeks prior to the initiation of the intervention. Flyers contained information about study goals and objectives, and the day and time for the introductory meeting to discuss the proposed research. During the initial visit, the research team informed participants about voluntary participation and the two programs, *Beyond Sabor* (intervention) and *Healthy Living* (attention control) that would be offered. Participants also received information relevant to their understanding of the Institutional Review Board (IRB) consent form and signature. Following the first visit, flyers were used to advertise the day and time of the second meeting. During the second visit, the research team formally recruited participants and obtained their consent. Researchers were blind to the treatment or control status of the sites during recruitment and at baseline.

The research team recruited a total of 35-45 participants at each site, accounting for an anticipated attrition rate of 30%. Baseline data collection on sociodemographics,

anthropometric, and clinical measures, and dietary and physical activity recalls followed recruitment. Baseline data collection preceded randomization of 32 sites from 156 qualifying sites to either the *Beyond Sabor* intervention or the Healthy Living control groups. A minimum of two treatment and two control groups were conducted in each four-month cycle. *Beyond Sabor*, a 2-hour per week, 12-week health education program included three differently timed segments: a 20-minute education presentation, on either obesity, diabetes, or CVD, a 50-minute cooking demonstration and food sampling, and a 60-minute walk. Flexibility in the sequence of implementation was possible, though adherence to the fidelity of content and delivery of three segments was vigorously implemented. Lesson plans included the following topics: 1) The walking club, 2) Diabetes: What do you need to know? 3) Diabetes: Risk factors and complications, 4) The kidney and water essential to life, 5) Cholesterol, 6) Blessed calories, 7) Fat, 8) Reading nutrition labels, 9) Portions, 10) Sweeteners, 11) Traditional quesadilla goes healthy, and 12) Eating and taking out.

The control group sites received the Healthy Living program, a standard nutrition education program delivered by the Food Bank at selected pantry sites. The Texas Department of Health and Human Services partially funded the Healthy Living program. It was a 30-minute, six-session program, offered once every two weeks. For control group participants to be exposed to the program for the same duration as the intervention participants, the Healthy Living program was offered every other week to correspond to the 12-week length of the *Beyond Sabor* intervention. Healthy Living was a lecture only program, with no food sampling or interaction time, although it was similar in content to *Beyond Sabor* and had the same goal of promoting healthy eating habits.

The Food Bank nutrition manager and Healthy Living trainer taught the program, which emphasized the prevention of lifestyle diseases like diabetes. The Healthy Living presenter was culturally competent, of Mexican American descent, and born and raised in the region.

In both the intervention and control groups, trained staff were responsible for collecting sociodemographic, physical activity, and dietary recall data for each site at baseline, 12-week post-intervention, and 40-week follow-up (42 weeks since baseline assessment) using an adapted questionnaire. Data for anthropometric measures were collected by a professional nurse at each location during the three time periods. Clinical assessments were conducted by the Valley Baptist Medical Center Community Reference Laboratory during baseline, 12-week post-intervention, and 40-week follow-up assessments. Naturalistic observations, quotes, and comments from participants were recorded by two ethnographers, only at intervention sites, and upon completion of the program as testimonials in an open-ended interview during the follow-up period.

Data collection and Analysis

The present study analyzed quantitative data collected during the delivery of the study. The analyses included all participants in the intervention (Beyond Sabor) and control (Healthy Living) groups with complete baseline information. Data for sociodemographic assessment, clinical assessment, and anthropometric assessment collected at three assessment points were analyzed.

Sociodemographic variables included age, gender (male/female), marital status (married/single), number of children, years of education, employment status

(employed/unemployed), and annual household income. Baseline health variables included in the analysis were WC, TGL, HDL levels, SBP levels, FPG levels, and MetS z-score. MetS z-score was calculated using the following equations recommended by Gurka, Lily, Oliver, & DeBoer (2014):

For males: 5.5541+0.0135* WC in cm - 00278* HDL in mg/dL +0.0054* SBP in mmHg + 0.8340*ln (TGL in mg/dL) +0.0105* FPG in mg/dL

For Females: -7.7641+0.0162* WC in cm - 00157* HDL in mg/dL +0.0084* SBP in mmHg +0.8872*ln (TGL in mg/dL) +0.0206* FPG in mg/dL

Data were assessed for outliers using box-plots and normality of distribution for dependent variables was assessed using the Shapiro-Wilk test. A two-way (time: baseline, post-intervention, and follow-up; group: Beyond *Sabor* intervention and Healthy Living attention control) mixed analysis of variance (ANOVA) was performed to compare assess the difference in MetS z-scores between intervention and attention control group, over time. In addition, one-way repeated measures ANOVA was performed to assess change in WC, HDL, SPB, TG, and FPG within each group, over time. All statistical analyses were performed using Statistical Package for the Social Sciences (version 23; SPSS, Inc., Chicago, IL, USA), with a type I error rate of $\alpha = .05$.

Institutional Review Board of the University of North Texas Health Science Center at Fort Worth approved the parent study. The present dissertation was reviewed by Florida International University's Office of Research Integrity which exempted the study from a full review.

Results

The two-way mixed ANOVA compared the main effects of group type and time and the interaction effect between group type and time on the MetS z-scores of Mexican American participants of Beyond *Sabor* program. Group type included two levels (Beyond *Sabor* and Healthy Living) and time consisted of three levels (baseline, post-intervention, follow-up). Data analyses did not report any outliers in the data, as assessed by boxplot. The data was normally distributed, as assessed by Shapiro-Wilk's test of normality ($p > .05$). The studentized residuals and Q-Q plots obtained during the two-way mixed ANOVA did not report any outliers or violation in the normality of data. There was homogeneity of variances ($p > .05$) as assessed by Levene's test of homogeneity of variances. However, the Box's M test reported a violation in the assumption of homogeneity of covariances ($p < .05$). Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the two-way interaction, $\chi^2(2) = 52.275, p < .000$. Therefore, a Greenhouse-Geisser correction was applied ($\epsilon = .908$). There was no statistically significant group and time interaction effect on MetS z-score, $F(2,984) = 1.401, p = .247$, partial $\eta^2 = .003$ (Table 3.1). The main effect of time showed a statistically significant difference in mean MetS z-score at the different time points, $F(2,984) = 7.584, p = .001$, partial $\eta^2 = .015$ (Table 3.1). The main effect of group showed a borderline significant difference in mean MetS z-score between the intervention and attention control groups $F(1,492) = 2.944, p = .08$, partial $\eta^2 = .006$ (Table 3.1). Of all the covariates included in the analysis (age, annual household income, years of education, site location, gender, and marital category) to control for clustered

design, only age was a significant predictor of the effect $F(1,386) = 10.18, p = .002$, partial $\eta^2 = .026$.

Table 3.1 ANOVA summary for MetS z-scores by group type and time.

| Two-way mixed ANOVA | | | | |
|--|----------------|----|-------------|---------|
| Source | Sum of Squares | df | Mean square | F |
| Time | 3.008 | 2 | 1.656 | 7.584* |
| Group Type | 13.043 | 1 | 13.043 | 2.944** |
| Time*Group type | .556 | 2 | .306 | 1.401 |
| One-way repeated measures ANOVA | | | | |
| Beyond <i>Sabor</i> | 2.169 | 2 | 1.085 | 6.945* |
| Healthy Living | 1.535 | 2 | .849 | 2.9*** |

* $p < .05$, ** $p = .08$, *** $p = .06$

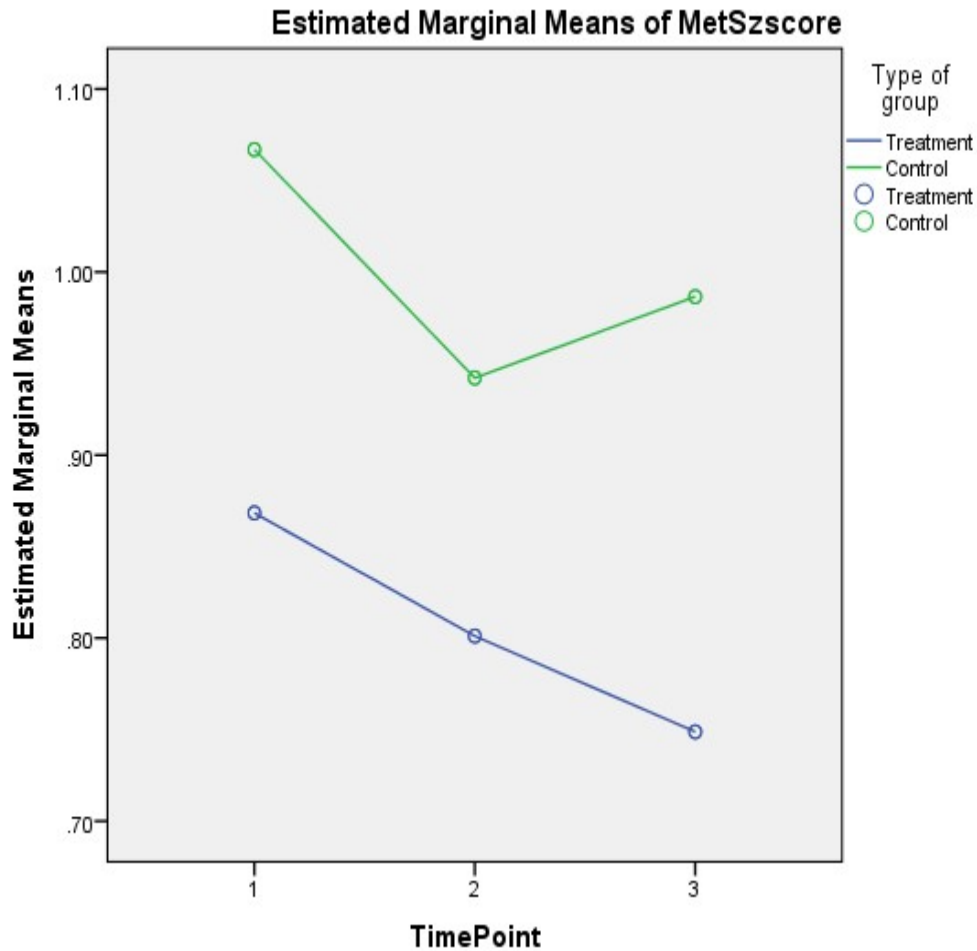


Figure 3.1 Plot depicting interaction between group and time on MetS z-score. Differences in means within-subjects analyzed using one-way repeated measures ANOVA ($p < .05$).

Since the assumption of homogeneity of covariances was violated, separate repeated measures ANOVAs were conducted for each group to determine whether there were statistically significant differences in MetS z-score over the course of 42 weeks. The Beyond *Sabor* intervention elicited statistically significant changes in MetS z-score over time, $F(2,602) = 6.945$, $p = .002$, partial $\eta^2 = .023$, with MetS z-score decreasing from baseline ($M = .87$, $SD = 1.16$) to post-intervention ($M = .80$, $SD = 1.22$) to follow-up ($M = .75$, $SD = 1.21$) (Figure 3.1). Post hoc analysis with a Bonferroni adjustment revealed

that MetS z-score was statistically significant decreased from baseline to post-intervention [$M = .067$, 95% CI (.002, .132), $p = .039$], and from baseline to follow-up [$M = .120$, 95% CI (.033, .206), $p = .003$], but not from post-intervention to follow-up [$M = .052$, 95% CI (-.027, .132), $p = .347$] (Table 3.2). Repeated measures ANOVA conducted for the attention control (Healthy Living) group report borderline significant changes in MetS z-score over time, $F(2,382) = 2.9$, $p = .062$, partial $\eta^2 = .015$, with MetS z-score decreasing from baseline ($M = 1.07$, $SD = 1.44$) to post-intervention ($M = .94$, $SD = 1.27$) and increasing to follow-up ($M = .99$, $SD = 1.40$) (Figure 3.1). Post hoc analysis with a Bonferroni adjustment revealed that MetS z-score was statistically significant decreased from baseline to post-intervention [$M = .125$, 95% CI (.016, .234), $p = .019$], but not from baseline to follow-up [$M = .08$, 95% CI (-.064, .225), $p = .542$] (Table 3.2).

Table 3.2 Bonferroni comparison for time of assessment for Beyond Sabor and Healthy Living groups.

| Time | Beyond Sabor Intervention | | | | Healthy Living Attention Control | | | |
|---------------------------------|---------------------------|------|-------------|-------------|----------------------------------|------|-------------|-------------|
| | M Diff. | SE | 95% CI | | M diff. | SE | 95% CI | |
| | | | Lower Bound | Upper Bound | | | Lower Bound | Upper Bound |
| Baseline vs. Post-intervention | .067* | .027 | .002 | .013 | .125* | .045 | .016 | .234 |
| Baseline vs. Follow-up | .120* | .036 | .033 | .206 | .080 | .060 | -.064 | .225 |
| Post-intervention vs. Follow-up | .052 | .033 | -.027 | .032 | -.044 | .052 | -.169 | .080 |

* $p < .05$

Table 3.3 represents changes in metabolic parameters in response to the intervention (Beyond *Sabor*) and attention control (Healthy Living) programs. Participants of the intervention group experienced a significant increase in WC ($p = .008$), and decrease in SBP ($p = .008$), TG ($p = .011$), and BS ($p < .001$), over time; these changes were not found for HDL ($p = .362$). Participants of the attention control group experienced a significant increase in WC ($p < .001$), and decrease in BS ($p < .04$), over time, a trend similar to the intervention group; these changes were not found for SBP ($p = .08$) TG ($p = .099$) or HDL ($p = .125$).

Table 3.3 Changes in MetS z-score components after 12 weeks of intervention (Beyond Sabor) and attention control (Healthy Living) program (means \pm SDs).

| | Beyond <i>Sabor</i> Intervention Group (n = 302) | | | | Healthy Living Control Group (n = 192) | | | |
|-----|---|-----------------------|-----------------------|----------|---|------------------------|-----------------------|----------|
| | Baseline | Post-Int. | Follow-up | <i>p</i> | Baseline | Post-Int. | Follow-up | <i>p</i> |
| WC | 100.04 \pm 14.50 | 100.3 \pm 14.95 | 101.1 \pm 14.84 | .008 | 100.98 \pm 13.15 | 100.69 \pm 13.19 | 103.25 \pm 12.9 | <.001 |
| HDL | 47.76 \pm 11.47 | 48.04 \pm 11.19 | 48.21 \pm 12.16 | .362 | 46.89 \pm 10.73 | 48.02 \pm 11.49 | 47.46 \pm 12.65 | .125 |
| SBP | 128.06 \pm 17.87 | 126.19 \pm 16.27 | 127.9 \pm 17.83 | .008 | 127.75 \pm 18.43 | 125.96 \pm 16.23 | 128.41 \pm 18.26 | .08 |
| FPG | 123.24 \pm 42.05 | 120.19 \pm 40.59 | 118.92 \pm 42.47 | <.001 | 126.65 \pm 51.69 | 122.66 \pm 43.76 | 122.46 \pm 49.39 | .04 |
| TGL | 153.19 \pm 107.87 | 149.03 \pm 96.74 | 142.27 \pm 79.80 | .011 | 162.57 \pm 135.78 | 155.64 \pm 111.33 | 147.36 \pm 89.84 | .099 |

Discussion

Despite Mexican Americans' increased odds of MetS and associated comorbidities (Ford, Giles, & Dietz, 2002; Ford, Li, & Zhao, 2010; Park et al., 2003), intervention studies involving this very susceptible population are rare. The present study examined MetS in a sample of 1,074 low-income Mexican Americans with or at risk of MetS. Data analysis underscores the importance of a community-based culturally-tailored lifestyle modification intervention *Beyond Sabor* in significantly reducing and sustaining reductions in MetS severity (measured as MetS z-score), as well as improvements in SBP, FPG, and TGL when compared with the standard nutritional program, Healthy Living, over a 40-week period. However, the study did not observe any positive significant effects of the intervention on WC and HDL. Participants of the control group showed a significant increase in WC and, surprisingly, an increase in FPG, over time.

Until recently, rigorous evidence on effective programs for MetS management in community-based settings has been non-existent. To researcher's knowledge, this is the first community-based study to evaluate the effectiveness of lifestyle modification in reducing MetS severity in a Mexican American sample with or at risk of MetS. There have been previous endeavors, however, to use well-thought-out interventions, such as the Diabetes Prevention Program, for ethnic minorities in community settings (Cox et al., 2013; Kumanyika et al., 2009; Kumanyika et al., 2011; Ruggiero et al., 2011). Translation and tailoring of Diabetes Prevention Program in a non-randomized study for the general Hispanic population demonstrated improvements in anthropometric measures (Ruggiero et al., 2011). Similarly, the CHARMS RCT conducted among low-income minority adults resulted in modest but significant reductions in weight and FPG (Chirinos et al., 2016).

Another study conducted by Balcazar et al. (2010), Project HEART, was successful in achieving a significant decrease in a mean number of MetS risk factors, and SBP and DBP in a predominantly Mexican American sample. However, it is noteworthy that the sample size for CHARMS RCT was 120 out of which only 93 participants completed the study, which is a considerably smaller number in comparison with the present study (Chirinos et al., 2016). Similarly, the Project HEART study sample size was much smaller (n=328) in comparison with the *Beyond Sabor* program (Balcazar et al., 2010).

The results of the present study indicate that lifestyle modification induces significant reductions in MetS z-score when compared to the standard nutrition program. These findings are consistent with a previous study targeting reduction in MetS severity among non-Hispanic white patients diagnosed with the condition using a lifestyle modification program, Canadian Health Advanced by Nutrition and Graded Exercise (CHANGE) (Leung, 2016). The MetS z-score criteria used in the CHANGE study, however, was based on the French population as opposed to the race/ethnicity-based criteria used in the present study (Gurka, Lily, Oliver, & DeBoer, 2014; Leung, 2016). Additionally, the CHANGE study evaluated the change in MetS z-score only between baseline and three-month post-intervention assessment, in contrast with the three-time point evaluation of the sustainability of MetS severity reduction in the present study (Leung, 2016). Moreover, in the CHANGE study, there was no control group (Leung, 2016) whereas the *Healthy Living* program affords a control comparison.

The study reported a significant reduction in FPG for participants in the treatment/intervention (*Beyond Sabor*) group. These findings corroborate results from previous research confirming intervention effects on FPG among participants with or at

risk of MetS (Bo et al., 2007; Chirinos et al., 2016; Watkins et al., 2003). Attaining improvements in FPG among food insecure Mexican Americans with or at risk of MetS, nonetheless, is of significance given their increased susceptibility to type 2 diabetes (Cheung et al., 2009; Zhang et al., 2009). Recent NHANES data (Zhang et al., 2009) indicated an alarming type 2 diabetes prevalence upsurge of 227% among overweight Mexican Americans in comparison with a 33% increase among non-Hispanic Whites. In congruence with previous studies, the present study also reported significant changes in TGL (Appel et al., 1997; Balducci et al., 2010; Bo et al., 2007; Leung, 2016; Watkins et al., 2003)

Research findings on the effect of lifestyle modification on other components of MetS are inconsistent (Balcazar et al., 2010; Bo et al., 2007; Chirinos et al., 2016; Watkins et al., 2003). In contrast with the significant reductions in SBP reported in the present study, most of the studies in the past did not report any considerable alterations in this clinical measure (Bo et al., 2007; Chirinos et al., 2016; Watkins et al., 2003) with Project HEART being an exception (Balcazar et al., 2010). As opposed to findings from earlier research, the present study did not find any significant changes in HDL (Appel et al., 1997; Balducci et al., 2010; Bo et al., 2007; Leung, 2016; Watkins et al., 2003). Surprisingly, participants in the control group exhibited a significant increase in FPG levels.

A vital strength of the present study was its success in recruiting and retaining a population of low-income Mexican Americans. As highlighted earlier, studies focusing on this highly vulnerable population are scarce in the wake of barriers related to occupational and familial obligations, and linguistic and financial constraints (Kingry et al., 2007;

Lovato et al., 1997). The treatment component of the study was more successful in recruiting and retaining participants with 81.5% completing the 12-week post-intervention assessment and 68.5% completing the 40-week follow-up assessment. The Healthy Living control group, on the other hand, despite its successful incorporation of a several highly successful treatment group strategies in the later stages of the program, had a retention rate of 62.1% at the 12-week assessment and 34.7% at the 40-week follow-up. Furthermore, the CBPR design recruited and involved community gatekeepers and leaders as members of the study's Advisory Board which may have strengthened participants' loyalty and support of the program.

The Beyond *Sabor* program makes a unique contribution to the growing literature on health behavior modification among racial/ethnic minority populations. It integrates health education with culturally-tailored group-based efforts to enhance physical activity and improve healthy dietary intake in a disadvantaged and food insecure Mexican American population. Although the intervention components and settings are not new, their integration into a structured intervention for use in a community-based setting and incorporating a CBPR approach addressing a Mexican American population with low participation in health and medical research is novel. The continued reduction in MetS z-score among intervention participants compared to increased z-score in control group participants may be due to the dynamic, interactive, and supportive environment provided by the Beyond *Sabor* program, as opposed to the education-only format of the Healthy Living program. The intervention was culturally tailored and comparatively easy for participants to adopt, thus enhancing the likelihood of effective reproduction in prospective research in addition to extrapolation to larger populations. The MetS z-score

used in the present analysis is the first to differentiate among adults by gender and race/ethnicity (Gurka, Lily, Oliver, & DeBoer, 2014). The score considers the contribution of individual MetS components to the MetS risk and severity which makes it unique (Gurka, Lily, Oliver, & DeBoer, 2014). The use of MetS z-score approach also considers the risk of syndrome severity amongst those just shy of cut-off values for traditional binary MetS classification (Gurka, Lily, Oliver, & DeBoer, 2014).

The study findings should be inferred cautiously because the study population represents a small subsection of the population at risk of MetS. Taking into consideration the specific characteristics of this population, the generalizability of results is somewhat limited. Additionally, the validation of MetS z-score is yet to be established in intervention studies to be considered useful as a health outcome measure. However, this continuous score provides a potential means of following changes in MetS-related abnormalities in each population over time. Finally, the program, lasting only 40 weeks, was not designed to evaluate event-based outcomes (e.g., metabolic syndrome incidence). Thus, the long-term effects of the *Beyond Sabor* intervention require additional research. A critical research goal for future studies should encompass unraveling the specific intervention components that result in changes in metabolic outcomes. Exploring participants' adherence to intervention recommendations could be a possible initial measure to ascertain specific lifestyle changes which improve the metabolic risk profile for Mexican Americans.

The lifestyle modification intervention *Beyond Sabor* was effective in achieving a significant reduction in MetS severity, SBP, TGL, and FPG among a vulnerable Mexican American population. The evaluation of program effectiveness using the MetS severity

score makes the study novel. At follow-up, the intervention was shown to have a more significant relative reduction in MetS severity risk, as compared to the increased score for control group participants. However, the study did not observe any significant positive intervention effect on WC or HDL. The study is one of the few of its kind involving highly susceptible and hard to access populations. It lays the groundwork in support of behavioral interventions' significant role in the improvement of MetS risk profile in disadvantaged populations. There is a need for future studies to investigate and improve procedures for translating behavioral modification interventions such as *Beyond Sabor* to diverse community settings. Evidence-based public health research in community settings provide successful strategies to disseminate interventions like *Beyond Sabor* in that they are adept in recruiting highly vulnerable populations in their communities of residence and in this manner provide a successful alternative for reducing health disparities. The successful adaptation of lifestyle interventions, such as *Beyond Sabor*, for at-risk populations in community-based settings will be critical to stem the tide of metabolic syndrome and lessen its disease burden.

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CHAPTER IV: THIRD MANUSCRIPT Increased Self Efficacy in a Sample of Mexican American Food Bank Clients: Results from a Community-embedded Lifestyle Intervention

Abstract

Background: Culturally tailored lifestyle modification interventions targeting health behaviors are effective in improving chronic disease outcomes. However, these interventions have achieved limited long-term success among Mexican Americans. Moreover, there is scarce information on the underlying mechanisms that promote sustainable behavior modification for this population group. The present study explores these underlying mechanisms through the examination of ethnographic data collected while delivering a community-embedded lifestyle modification program, known as *Beyond Sabor*. These textual data, part of the feasibility and qualitative evaluation of the larger intervention study, affords the possibility of examining the dynamic and processual development of self-efficacy and underlying behavior modification mechanisms among Mexican American intervention participants.

Methods: The *Beyond Sabor* intervention employed a mixed methods design in evaluating its implementation and results. The present study examines one evaluation component, recorded ethnographic data, gathered in the form of naturalistic observations of participants' public behaviors and comments while attending intervention sessions. Data were coded using an inductive approach to ascertain preliminary codes.

Results: Ethnographic notes included detailed accounts of participants' publicly made comments, statements, and observations during intervention sessions. Only intervention relevant comments were recorded and analyzed. Careful analysis of these data allowed

examination of participants' accounts relevant to learning intervention content and their gradual development of self-efficacy. Findings highlight participants' accounts of their learning process and its cumulative progression with increased intervention doses.

Excerpts from ethnographic data described their self-development and increased recognition of personal responsibility for their health and their families. Four sub-themes emerged illustrating important underlying conditions contributing to participants' improved self-efficacy. These are a desire to gain knowledge about ways to improve health, development of social support, adoption of program teachings in family lifestyle, and improvement in health outcomes.

Conclusion: Results from the *Beyond Sabor* intervention demonstrate the high acceptability of this intervention aimed at improving health behaviors by promoting chronic disease management in food insecure Mexican Americans. Findings underscore the importance of sociocultural context on individuals' attempts to make lifestyle changes to manage their chronic illnesses. Participants' efforts in helping and motivating each other resulted in increased social support and improved capacity building with the potential to extend intervention content and learning to their neighborhoods and eventually to the community, the goal of community-based public health interventions.

Introduction

According to the American Heart Association, obesity, type 2 diabetes, and cardiovascular disorders have become the leading cause of mortality among adults of Mexican origin, who are almost twice more likely than non-Hispanic whites to be diagnosed with these conditions (Allison et al., 2008; Mozaffarian et al., 2016). Coincidentally, the prevalence of obesity and associated type 2 diabetes mellitus and cardiovascular disorders is expected to increase because of the growing Mexican population in the United States (Allison et al., 2008; Mozaffarian et al., 2016). Major risk elements for these disorders are directly associated with lifestyle, and nearly 80% of related morbidity is preventable through the elimination of lifestyle-associated risk factors such as physical inactivity and unhealthy dietary habits (Mozaffarian et al., 2016). Research conducted in the last decade has established behavior modification as the standard intervention for prevention and control of obesity and concomitant chronic disorders (Bassi et al., 2014; Chirinos et al., 2016; National Center for Health Statistics [NCHS], 2012). Increased physical activity and healthy dietary intake have been found to be associated with multiple health benefits - such as weight loss and regulation of blood pressure, cholesterol, and blood sugar levels – which protect individuals against chronic diseases (Mozaffarian et al., 2016). Over the past decades, public health researchers have conducted effective interventions to promote healthy lifestyles among Mexican Americans (Balcázar et al., 2010; Berry et al., 2011; Dannefer et al., 2015; Koniak-Griffin et al., 2015; Toobert et al., 2011; Vincent et al., 2014). The existing evidence suggests that culturally-tailored interventions that employ a theory-based approach to target health behaviors may be the most effective method to improve health outcomes and manage

chronic diseases among vulnerable, high-risk Mexican Americans (Altman, Nunez de Ybarra, & Villablanca, 2014; Bautista-Castano, Molina-Cabrillana, Montoya-Alonso, & Serra-Majem, 2004; Erickson, 2000; Ford, Ford, Will, Galuska, & Ballew, 2001; Honas, Early, Frederickson, & O'Brien, 2003; Lorig, Ritter, & Gonzalez, 2003; Pettman, Misan, Coates, Buckley, & Howe, 2007; Ramos, May, & Ramos, 2001; Wehrly et al., 2010; Wilson, Brown III, & Bastida, 2015).

Theory-based interventions facilitate the study of processes resulting in behavioral change. The success of one type of intervention over another can be understood with the help of theoretical constructs which can repeatedly be tested in similar or different settings (Bandura, 2004). One such widely used comprehensive behavioral change theory is Social Cognitive Theory (SCT) (Bandura, 2004). The SCT emphasizes upon the continuous ongoing interaction between the environment, the person, and the behavior. The theory explains the concept of outcome expectancy, i.e., an individual will continue the newly acquired behavior if he/she considers the outcome of behavior change to be positive. Otherwise, the new behavior will be discontinued. A concept more crucial than outcome expectancy for behavior change is that of self-efficacy expectancy, i.e., an individual's confidence in his/her ability to perform the behavior (Bandura, 2004). Since self-efficacy is critical to sustaining behavior modifications, it is fundamental to explore the role of lifestyle modification programs in the development of participants' self-efficacy, which may ultimately result in sustainability of behavioral change.

A critical element in assessing the outcomes of lifestyle intervention is to capture participant experiences, as it is their perception of distinct program constituents that shape

health behavior modification. Although the existing literature on lifestyle modification programs reports positive short-term effects and modest improvements in biomarkers (the standard determinants of success in health behavior modification), there is seemingly limited long-term behavior modification success among Mexican Americans participating in longitudinal lifestyle modification studies (Altman, Nunez de Ybarra, & Villablanca, 2014; Balcázar et al., 2010; Corona, Flores, & Arab, 2016; Lee, Misra, & Kaster, 2012;). Moreover, little is known about the underlying mechanisms that result in sustainable behavior modifications in Mexican American participants' in lifestyle modification programs.

The Beyond *Sabor* intervention used a culturally-tailored approach to prevent or reduce overweight and obesity, and prevent, delay the onset, or improve management of diabetes in a population of rural and urban adult Mexican Americans living in the Lower Rio Grande Valley region of southern Texas (Bastida, Tseng, McKeever, & Jack Jr, 2010; Wilson, Brown III, & Bastida, 2015) (study described in detail in Methods section). The major findings of the Beyond *Sabor* program are under publication, with some findings reported elsewhere (Bastida, Tseng, McKeever, & Jack, 2010; Wilson, Brown, & Bastida, 2015). The overall goal of the present study was to explore ethnographic data, gathered while delivering the Beyond Sabor intervention, to understand and gain insights into the processual development of outcome expectancy and self-efficacy among participants. Within this broad goal, three objectives guided the study: to evaluate participants' perceptions of the intervention, to obtain a deep and comprehensive understanding of reasons for participation and retention, and to understand factors influencing adherence to lifestyle modifications. Results of this study strengthen evidence-based practice by

providing support for theory-centered community-based culturally-tailored lifestyle modification interventions. The latter is critical to the improvement of participant's self-efficacy, which might lead to sustainable lifestyle modifications imperative for prevention, and management of chronic conditions, particularly among disadvantaged Mexican Americans.

Methods

Study settings

The Lower Rio Grande Valley is one of the most disadvantaged regions in the US, with high levels of poverty and low levels of education and per capita income (Wehrly et al., 2010). Approximately 84% of the population in this region, located in the southernmost area of Texas along the Mexico border region is of Mexican American origin (U.S. Census Bureau, 2015a). The region is known for its unplanned settlements, known as *colonias*, which lack elementary infrastructures such as paved roads, sewage disposal systems and clean water (Ramos, May, & Ramos, 2001). According to 2013 data from the Texas Department of State Health Services (TDSHS), nearly 20% of the adults in the LRGV had diabetes, 73.4% were overweight or obese, and 34.3% reported no physical activity (TDSHS, 2013). Moreover, a considerable proportion of LRGV residents are uninsured and have limited access to health care (Bastida, Brown, & Pagan, 2008; U.S. Census Bureau, 2015b). The high prevalence of obesity and physical inactivity, and inadequate healthcare infrastructure in the LRGV region puts its population at higher risk for chronic diseases.

Beyond Sabor

Beyond *Sabor* (the Spanish word for “flavor”) intervention is a community-based lifestyle modification program designed to control weight gain and the progression of diabetes in Mexican Americans living in food desert neighborhoods of the Lower Rio Grande Valley region in the Texas-Mexico border area. The study used a mixed-methods design framed within a Community Based Participatory Research (CBPR) approach. Beyond *Sabor*, the 12-week culturally embedded intervention, partnered with the area food bank and the LUPE Farmworkers Union, in conducting and assessing the intervention. The study used multistage cluster sampling procedures, without replacement, to randomly draw four to six sites each cycle from the sampling frame of 156 qualifying sites, until the 32 sites comprising the entire cluster were selected. Recruitment efforts yielded 1,153 men and women interested in participating. Participants were 21-70 years of age, lived in a family context, e.g., married, living with a partner, or raising children, of Mexican American origin, and no medical or physical conditions that precluded involvement either in moderate physical activity or eating a low-fat, low-carbohydrate, moderately high fiber diet, and had no plans of moving away within the following twelve months. Criteria for inclusion and exclusion were determined by the Advisory Board that guided the study in line with the CBPR procedures framing the study. Adults who lived alone, had a BMI > 40 (unless they had a doctor’s written authorization), and were unable to commit to regular attendance throughout the 12-week program were excluded from parent study.

Researchers of the parent study announced the proposed intervention through flyers with information in both English and Spanish posted at each site and throughout

neighborhoods four weeks prior to the initiation of the intervention. Study goals and objectives and the day and time for the introductory meeting with the research team were listed on flyers. During the initial visit, participants were informed about voluntary participation and the two programs, *Beyond Sabor* (intervention) and Healthy Living (attention control) and gave their first consent to participate in the baseline assessment. Following baseline assessments, posted flyers advertised the day and time of the second meeting. During this meeting, participants were formally informed of their participation in either *Beyond Sabor* or Healthy Living, and their additional consent was obtained to participate in either program. Researchers were blind to the randomized assignment of sites during recruitment and baseline.

A total of 35-45 participants were recruited at each site accounting for an anticipated attrition rate of 30%. After completion of recruitment, baseline data including sociodemographic information, anthropometric and clinical measures, and dietary and physical activity recalls were collected. Baseline data collection was followed by randomization of 32 out of 156 probable sites to *Beyond Sabor* intervention or Healthy Living control groups. At least two treatment and two control groups were conducted in each four-month cycle. *Beyond Sabor*, a 2-hour per week, 12-week health education program was covered through three differently timed segments. A 20-minute education segment presenting information on obesity, diabetes, or CVD, its risk factors and related co-morbidities, a 50-minute segment which included a cooking demonstration and food sampling, and a 45-minute walking session were conducted with the flexibility of sequence of implementation. Lesson plans included the following topics: 1) The walking club, 2) Diabetes: What do you need to know? 3) Diabetes: Risk factors and

complications, 4) The kidneys and water essential to live, 5) Cholesterol, 6) Blessed calories, 7) Fat, 8) Reading nutrition labels, 9) Portions, 10) Sweeteners, 11) Traditional quesadilla goes healthy, and 12) Eating and taking out.

The control group sites received the Healthy Living program, which was a standard nutrition education program the food banks delivered to their program sites in LRGV. The program was partially funded by the Texas Health and Human Services. It was a 30-minute, six-session program, offered once every two weeks so that participants in the control group were exposed to the program for the same duration (12 weeks) as those in the intervention groups. Healthy Living was a lecture only program, with no food sampling or interaction time, although it was similar in content to *Beyond Sabor* and had the same goal of promoting healthy eating habits. The program was taught by the food bank nutrition manager and Healthy Living trainers and stressed on prevention of lifestyle diseases such as diabetes.

In the parent study, trained staff were responsible for collecting sociodemographic, physical activity, and dietary recall data for each site at baseline, 12-week post-intervention, and 40-week follow-up using the adapted questionnaire. Data for anthropometric measures were collected by a professional nurse at each location during the three time periods. Clinical assessments were conducted by the Valley Baptist Medical Center Community Reference Laboratory during baseline, 12-week post-intervention, and 40-week follow-up assessments. The ethnographic data included direct quotes from participants in the form of naturalistic observations and comments recorded during

intervention sessions, and as testimonials and open-ended interview responses recorded during the follow-up period.

Data collection

In the present study, ethnographic data collected during the *Beyond Sabor* program were analyzed. The initial purpose of collecting these data was to ascertain the feasibility and fidelity of the intervention. Ethnographic data were gathered in the form of naturalistic observations, behaviors, and comments from participants in the intervention group. Qualitative data were recorded, audiotaped and handwritten, during each of the 12-week sessions by two ethnographers at each of the 16 treatment sites. A minimum of two treatment sites was included in each cycle. On average ten weekly ethnographies were conducted for each treatment site, for a total of 20 weekly ethnographies per completed cycle. In total, eight cycles were conducted.

Data analysis

Qualitative methods are often used to explore intricate settings and interactions, and naturalistic observations, behaviors, and comments from study participants provide information about participants' "lived experiences" in their own words, rather than those imposed on them by researchers (Gellman & Turner, 2013). After the observation data had been cleaned and transcribed, 154 session observations became available for analysis. The data were coded using an inductive approach to ascertain preliminary codes (Fade & Swift, 2011). Data coding and analysis was a reiterative process that involved constant enhancement of the coding structure until no new codes emerged. The qualitative data

analysis software ATLAS.ti version 7 (ATLAS.ti Scientific Software Development GmbH, Berlin, Germany) was used for coding and analysis.

The researcher independently read all the transcripts to calibrate the codes and worked with investigators of the parent study to develop and refine the coding structure, code and analyze the data. Ethnographic data and salient codes were translated from Spanish to English and back-translated for translation accuracy and meaning. Original data in Spanish and corresponding English translations received a second and third reading prior to their inclusion in the manuscript. Emerging themes and interpretations of participant-reported experiences were regularly discussed with the principal investigator.

The parent study was approved by the Institutional Review Board of the University of North Texas Health Science Center at Fort Worth. The present dissertation was reviewed by Florida International University's Office of Research Integrity who exempt the study from a full review.

Results

All participants had a relatively similar positive experience of the intervention. Ethnographic notes reflected 154 accounts where participants alluded to the impact of the intervention on their own as well as their family's health behaviors and health outcomes. Recorded observations varied considerably in length and quality. Some sites were more active than other sites, resulting in greater and more significant interactions among participants.

Improved self-efficacy

The qualitative inquiry aimed to gain a deeper understanding of the processual development of self-efficacy among study participants and to identify several factors, which might have influenced this process. The qualitative exploration revealed a process where participants' views on lifestyle change were widened. The widened outlook-encompassed self-development and increased recognition of personal responsibility for their health that resulted in new insights about lifestyle change. Behavior change was not a straight, one-way process but instead, a complex collaboration influenced by individuals' progress and several intervention factors. Detailed analysis of textual data revealed how their gradual success in adopting healthier diets and physical activity behaviors reinforced and increased their self-efficacy. As results became more palpable, participants were surprised in realizing that it was up to them to control their health. The following quote by a male participant reflects participants' perceptions that the program empowered them to change their lifestyle:

“It is important to take care of myself; no one else will. But it is important to know how to do it. Through your program, I have learned to be conscious of what I buy at the store and of what I eat.”

Participants expressed satisfaction with the educational sessions and how it helped them to purchase healthy food and avoid food items rich in sugar and fat content, as mirrored in the following quote by a female participant:

“I have gotten rid of all the soft drinks from my house. The sugar activity from the week before stayed imprinted in my head. It was very scary to find out how much sugar I was consuming. I now read labels when I go to HEB (local grocery store). I went to a party

where they were serving chicken, but it was very greasy, and I knew it was not for me. Now I understand what bad food can do to me.”

Through the cooking demonstrations, participants learned to replace unhealthy ingredients of their traditional meals with healthy substitutes, as observed in the following experience of a female participant:

“My husband like this (taco) very much. And when we eat, we do not use tortillas anymore. We use lettuce; we roll up the leaves, as they were “taquitos.”

Participants were appreciative of the incentives received during the program such as water bottles, gifts, walking shoes, t-shirts, magnets, and magnifying glass. Walking shoes were the most popular incentive among participants. One participant expressed her happiness on receiving the shoes,

“Sincerely, earlier I did not walk because I did not have tennis shoes and apparently, in my thinking, I said well then later I have to buy tennis shoes. And it gave me great pleasure, and it was a surprise when the program gave us the shoes, it was a very good surprise.”

Participants considered the program as an opportunity to improve their health, and this feeling resonated among elderly participants as well. The following quote from a 60-year-old female stated how the program helped her increase physical activity:

“Since starting the program, I now walk twice a day. I walk 30 minutes in the morning and 30 minutes in the evening. Before the program I was feeling very weak all the time, now I get up with a lot of energy.”

When further exploring the textual data for manifestations of improved self-efficacy, four sub-themes emerged from the analysis. These themes illustrate several underlying factors that provide insights into participants' improved self-efficacy and subsequent changes in health behaviors. Participants' quotes identified these factors as reasons for participation and retention in the program. The processual development of self-efficacy, which preceded behavior modification among participants, comprised four major processes. These were (1) desire to gain knowledge about ways to improve health, (2) development of social support, (3) adoption of program teachings in family lifestyle, and (4) improvement in health outcomes. Direct quotes from intervention participants have been cited below.

Gaining knowledge to improve health

Participants asserted that a diagnosis of chronic conditions influenced their decision to join the program. Many viewed the program as an opportunity to gain new knowledge about healthy behaviors that help to prevent or control chronic diseases, particularly regarding, *“how to cook to feed my family in a healthy way”* and *“make a lifestyle change.”* Several participants also indicated that their family members suffered from chronic diseases, and knowledge gained in the program would be essential to share with them and continue to practice beyond the program. Demonstrating this point, a female participant said,

“My son is very heavy, and my husband has had heart surgery. Although he brings me to Elsa (pantry location) every week, he refuses to participate. He will either wait in the car

or go somewhere to eat what he should not. I worry about all of them, and I am here because I want to learn to take better care of them.”

Several participants had vicariously experienced family members’ battles with chronic diseases, a fact that motivated them to address personal health before it spiraled out of control, as stated by a male participant:

“Diabetes runs in my family and is a major concern for me. I joined the program because I want to make a lifestyle change and lose weight. I do not want to have the same health problems that older members of my family are going through.”

Participants’ experiences with health interventions influenced their decision to continue participation in the program, as expressed by a female participant:

“Thank you very much, this is the first time I have participated in a study and felt that you actually cared and tried to help me. In other studies, I have been in, people just talk but do nothing to help.”

Development of Social Support

Participants were comforted by the fact that they were not alone, but many others like them needed health improvement. Several had formed “walking clubs” based on friendship, family relationships, and sometimes on their pace. They compared their test results, shared tips and experiences with site members. Participants were keen to walk in the company of their groupmates, as stated by a male participant:

“Little under the weather but didn’t want to miss another day of class because I enjoy sessions so much.”

A female participant who had diabetes shared her papaya bread recipe with other participants, encouraging them to eat healthily:

“I am diabetic myself, and a lot of people here from the churches are diabetics...I said that I was going to make papaya bread and share it...A lot of our family, members, and churches, accepted it, and enjoyed it.”

Development of solidarity within the groups was evident. Group identity developed among participants; frequently they expressed that their goals and successes were communal. Their sense of collective efficacy was a significant factor in facilitating behavior modification among the regular attendees, as demonstrated by their frequent use of “we” instead of “I” statements. The following is an example of such a statement by a male:

“We have been walking every day and feel a lot better. Now we are aware of what we eat.”

Another female participant mentioned how the members of the group were connected:

“As a group, we take care of our people. It is a small group, but there is a lot of love here, and we share our love, and we share everything we know with each other. Participating in the group gave me enthusiasm, I saw people that needed advice, needed help, and needed that education.”

She also described how her group met beyond the premises of the intervention:

“The individuals that live close to the church, there are 4 or 5 of us, we walk regularly. We sit and talk together in one of the homes, and we walk the same area that we walk with you around the church. It has helped a lot. I am active now.”

Change in family lifestyle

In addition to changing personal dietary and physical activity habits, participants also motivated their family members to adopt healthy behaviors and engaged them in making healthy food choices and being more physically active. A female participant stated how she implemented teachings from the program to help her family eat healthily and become physically active:

“My husband was the type of person who would always be drinking soda; once I told him how much sugar was in those drinks, he began to drink less soda. Now when he eats, we will restrict him to one serving of diet coke, whereas before he could finish a three-liter coke. I replaced flour tortilla with corn tortillas, and we have a set amount he will eat, three or four. He would eat around seven or eight flour tortillas before. If he wanted sweet bread, we would go to the bakery and would get the small serving size of empanadas. He will never eat more than two; he’s finally controlled his craving. Before the program, he would eat the big size servings of sweet bread along with glazed doughnuts of many kinds. We also don’t use any red meat, simply chicken, turkey, and fish. My husband is the one that suffered most because he would eat red meat seven times a week. Everyone in our family always has a bottle of water with them, especially when leaving the house and these are habits that are new because of the program. My kids love pastries and instead of making them with sugar I use Splenda because the program taught me it is better. The

wheat bread took a while for everyone to get used to, the kids, especially, but now they do not mind it as much. I exercise with my daughter every day. Seven days of the week, one hour of dancing Zumba with some videos we have. We never used to do this, but it has become a daily thing, my husband even participates in the dancing sometimes.”

A 44-year-old male participant described how he encouraged his family to adopt healthy dietary habits:

“I also want to share with you that I read labels at the store now and tell my wife, get this or that because it is better for us. I also go by my mother’s house and check what she is buying, and I tell her, this is not good for you. And she says, what do you know? And I tell her, I do, I know a lot about food and what to eat or avoid. I am attending a program that teaches me a lot about food and healthy eating.”

A female participant stated how she cared for her grandchildren’s health and encouraged their mother (her daughter) to adopt healthy lifestyle habits:

“I went home after last week, looked in my refrigerator and emptied all the bottles of soda that I had. When my daughter came to pick up her kids, I said: from now on, they (grandkids) are not drinking soda in this house no more. My daughter kept asking me: but why mom? I said: because I go to a program, every week and I learn important things about what we eat and drink and soda has lots of sugar. It is as if your kids are just sitting down and eating sugar from the package.”

Improved Health Outcomes

Through the intervention, participants experienced a positive change in their health outcomes and reported feeling better than before. Some participants lost weight, while others were successful in controlling blood glucose levels and blood cholesterol levels; they felt that the lifestyle change was more beneficial to their health as compared with the standard medical treatment. Many also reported observing improvement in the health outcomes of their family members.

A female participant stated how the program helped her avoid a foot amputation.

Even her physician encouraged her to adhere to the program teachings:

“Thanks to the program, I was able to verify why my feet were very impaired, as my diabetes results were a little high, so much so, the doctor was annoyed and wanted to amputate. Therefore, I got frightened and continued going to Beyond Sabor. I think everything came together, because following what you told me about lowering my sugar, I started using Splenda. Now I do not have sugar problems; I have no cholesterol. My doctor said: keep doing what you have been doing.”

Participants who encouraged their family members to adopt healthy lifestyles reported a positive change in the health of their relatives, as shared by a female participant during an advisory council meeting and follow up session:

“Before I began the program, my husband weighed 570 pounds, and now he weighs 480. He lost about 100 pounds since I have joined the program. Every time he went to his doctor, they would raise his medication by 5, 10, 20 mg because his health was not improving, and this soon led to his depression. He would also take medication for his depression. He would

take insulin, medication for his blood pressure, another medication so that he would not retain liquids, medication for his heart, and every time he saw his doctor they would increase his medication more and more. 12 weeks passed in the program and my husband had his appointment for blood work (every two months) I was so happy because the doctor told him that he was losing weight and congratulated him for his weight loss. His blood pressure was not high, his sugar levels were also low, for once everything was stable, and his medications were not increased. The doctor told him that if he continued this, they would begin to lower the medications.”

Those who participated in the program reported an improvement in their health status and life in general, as stated by a female participant in her early 50s:

“It is a lifestyle change. As I have said, I have done many diets to try to stay in good shape. To try to stay slim. But I would lose weight 10 – 15 pounds and then I would gain 20. It was re-bounce. But with Beyond Sabor, it is a lifestyle change. Because each day you are learning. It is a lifestyle, and you stay healthy. There is no re-bounce. There is no ‘what if you lose 5 lbs.’ and gain 10. You read and learn and are always maintaining your weight.”

A male participant who was unable to walk before starting Beyond Sabor credited the program for helping him walk again:

“When I started coming, I did not want to. But now I want to keep coming. Every day I go for a walk, and before, I never ate salads, now we always have a salad. You are God sent because I could barely walk and now I can even take the stairs.”

Discussion

This study provides observational and narrative evidence in support of implementing, culturally tailored capacity building interventions to promote behavior change in ethnically and racially diverse low-income communities. Results obtained with food bank clients in the LRGV suggest that community-based approaches strengthen group solidarity and cohesiveness; and these, in turn, contribute to improved intervention outcomes. Increased self-efficacy through knowledge acquisition and social support emerged as the foundation of sustainable lifestyle modifications, and consequently, improved health outcomes among participants. Observational and narrative data presented here highlight the dynamic process by which study participants gradually increased their self-efficacy and acquired a sense of self-assurance, which deepened their understanding of personal responsibility towards health and strengthened their self-efficacy for lifestyle modification.

Learning and Empowerment

In all of the four subthemes presented (increased knowledge to improve health, development of social support, change in family lifestyle, and improved health outcomes), participants' experiences reflected on their active contribution to the behavior change process instead of presenting them as passive recipients. In their narratives, participants acknowledged that attending *Beyond Sabor* intervention empowered them to modify health behaviors and achieve positive health outcomes.

Participants' experiences when implementing program teachings to modify their lifestyle choices demonstrate improvement in their self-efficacy for behavior modification

(Bandura, 2004). Behavior-related tasks, such as cooking demonstrations, group walking sessions, and program incentives, were significant contributors to building participants' capacity to make healthy dietary choices and improve physical activity. The cooking demonstrations increased participant self-efficacy to measure portion sizes, read food labels, replace sugared-beverages with water, and include healthy substitutes in preparing traditional foods. Group walking sessions encouraged physical activity among participants as they saw their fellow participants walk, a phenomenon known as social modeling. Program incentives such as walking shoes, t-shirts, and water bottles, motivated participants' and increased their capacity to modify health behaviors.

Becoming Aware of Existing and Potential Risks

Participants' narratives suggest that through the *Beyond Sabor* program they became aware of their existing and potential health risks, as well as, the lifestyle modifications required to lower their risks. They reported that through the various intervention segments they not only learned but understood how changes in lifestyle, for example, dietary modifications and incorporation of regular physical activity, are crucial for sustainable improvement in their health outcomes. Participants' understanding of a healthy diet was not just limited to an increased fruit and vegetable intake, but they also learned to check nutritional content on food labels before purchasing and to cook traditional foods with healthier substitutes. Education imparted during the program increased participants' expectations of positive health outcomes, which in turn, impacted their readiness and strengthened their commitment to lifestyle modification (Chen et al., 2015). Furthermore, as the intervention progressed, and participants were increasingly

exposed to a broad range of information, they felt empowered by an increased sense of control over their health.

Giving and Receiving Social Support

A careful reading of intervention transcripts provides strong evidence for the social support participants experienced from other members of their groups and intervention staff. Their narratives suggest that they inspired and motivated each other in making and maintaining behavior modifications by setting an example for others (Balcázar et al., 2010; Dannefer et al., 2015; Koniak-Griffin et al., 2015). Participants' program expectations were not limited to their health outcomes, but extended to the group as a whole, as they addressed themselves as "we" instead of "I." Through the formation of "walking groups" beyond the premises of the intervention, participants supported and encouraged each other to improve their levels of physical activity; it also points to their capacity building in promoting sustainable behaviors on their own. Participants became motivated to share their cooking experiences, for example, the sharing of a papaya bread recipe for diabetics, with others in the group. Instances of members' initiatives and sharing with other group members reflected on their intention to help and support each other to make healthy food choices and achieve positive health outcomes. Moreover, participants not only acknowledged the broad-reaching effects of the program in their own lives but also emphasized the importance of passing on the knowledge gained to others in their family and community.

Improving Family Health: The Ripple Effect

Improving family health and future generations was another strong motivational factor for participants to join and stay in the program. The intervention served as a tool to connect knowledge and skills learned by individuals at the program sites to their home, consequently changing the participants' home environment. The ripple effect of the intervention on participants and their families became apparent as participants introduced their family members to healthy dietary modifications and physical activity learned during the program. Participants shared narratives that pointed to success stories in implementing modifications in their family's lifestyles; also, they described with pride their family members' success in improving health outcomes and reducing life-threatening health conditions. Since lifestyle changes, dietary modifications take place within a family context, participants' attempts to take into consideration their immediate family environment was a major factor contributing towards long-term behavior modifications resulting in sustainable positive health outcomes (Kirk, Penney, McHugh, & Sharma, 2012; Lin, Chiang, Tzeng, & Chiang, 2014). Participants' were keen on involving their family members, children, in physical activities. Participants acknowledged that lifestyle modifications not only helped them improve their health outcomes but also ensured that their younger generations would be healthier. In reciprocity, the support of family members was crucial for study participants to make sustainable lifestyle modifications.

Developing Concern for Chronic Diseases

Concern about chronic diseases was a significant motivator for behavior modification (Ma et al., 2013; Orchard et al., 2005). Participants noted improvements in

their health outcomes, including better management of cholesterol, diabetes, blood pressure, and weight. Participants described positive health outcomes as significant factors contributing to their increased self-efficacy and further strengthening their commitment to program participation, and ultimately, behavior modification. Participants were eager to acknowledge that their change in lifestyle helped them achieve positive health outcomes. The extent of improvement through lifestyle modifications could be gauged from participants' ability to avert severe clinical measures, such as amputations, that were deemed necessary by their physicians before they joined the program. Moreover, ethnographic accounts describe many instances where participants were eager to share their physicians' decision to reduce their medicine dosage after noticing improvements in levels of blood pressure, cholesterol, and blood glucose. They also reported that their physicians commended the dietary and physical activity measures they took and encouraged them to continue making those changes.

Understanding Mechanisms that Influence Health Outcomes

The study highlights the importance of a multidimensional approach – one that includes information sessions, cooking demonstrations, and physical activity - in modifying behaviors (Porter Starr, McDonald, & Bales, 2014). Influences that were not part of initial objectives and goals established by the study design were identified using qualitative procedures that captured participants' experiences in their natural settings. This inductive approach was designed to expand rather than a narrow understanding of the connections among all the various components of the study. Naturalistic observations of participants' comments and behaviors highlight the underlying behavior modification process and denote major strengths. Contrary to in-

depth interviews where participants reconstruct the past or focus groups where they may echo fellow members' experiences, naturalistic observations capture the moment.

Participants' comments and observations indicate that increased intervention doses and encouraged continuous interactions between the intervention team and participants allowed the program to reach beyond participants present to their families and friends (Dannefer et al., 2015).

This study succeeded in tapping existing social connections to achieve the goal of promoting healthy families, as endorsed by the community advisors when establishing the inclusion criteria for the study. Program information was culturally-tailored, possibly explaining its better acceptance by Mexican American participants, who were deeply rooted in their culture, especially, regarding cooking and feeding practices (Eakin et al., 2007; Rustveld et al., 2009). Presentations made use of and showed respect to participants' tradition, mainly cooking skills. Effort was made throughout all interventions sessions to share with participants' means for finding culturally embedded, inexpensive, healthy substitutions for various unhealthy foods. Findings from this study further support the potential benefit that well-informed participants can bring to their families and communities (Watanabe et al., 2017; Yamaoka & Tango, 2012).

Despite providing dynamic contextual information to understand the mechanisms by which lifestyle modification programs potentially influence health behaviors and health outcomes, the study had some limitations. The primary limitation is lack of feedback from the control group, limiting the study's ability to separate the effects of the intervention from those of the standard nutrition program. Secondly, the data presented in this study

reflect only positive participant feedback, and factors that inhibited retention in the program may be a subject of another study. It is possible that over-reliance on cultural norms, especially in presentation segments, may have influenced responses and introduced some bias by reporting more favorable perceptions and outcomes (Dannefer et al., 2015). Third, since participation in the program was voluntary, those who chose to participate were likely to be the most motivated to modify their behaviors and may not be representative of the broader Mexican American population. Finally, these findings may not be generalizable to all Mexican Americans due to the participant's unique characteristics and the region's demographics. However, participants' characteristics reflect the region's demographics, where Mexican Americans constitute 90% of community residents. The region is also characterized by low levels of education, high unemployment, and poverty (Dannefer et al., 2015). However, it is important to highlight that according to the CDC, these characteristics are also shared by individuals most at risk for chronic health conditions (U.S. Department of Health & Human Services [USDHHS], 2014; (USDHHS, 2015) and thus the importance of the study.

The theme of increased self-efficacy along with the six themes highlighted above build the foundation for behavior modification; the resulting conceptual framework can contribute to the development of interventions that capture the needs of low-income Mexican American populations at risk of chronic diseases. This study establishes that increased participant awareness, especially as it relates to existing and potential health risks and benefits,] influenced their willingness to modify their physical activity behaviors and dietary habits. Group participation generated social support, which served as a motivational factor for the continuation of behavior modification beyond the premises of

the program. Our findings support the view that “the family factor” can be a catalyst to individuals’ efforts to change behaviors (Berry et al., 2011). Involving entire families in behavior modification has the potential to improve the management and prevention of chronic diseases in families and the community at large (Koniak-Griffin et al., 2015). Findings presented here suggest that practitioners developing interventions targeting Mexican Americans should use a group behavior modification approach to improve self-efficacy and increase mutual social support (Ramos, May, & Ramos, 2001). Implications for research include the need to explore self-efficacy in Mexican Americans further and the extrapolation of these findings to other Hispanic groups. Given the rising rates of chronic diseases among Mexicans in the US, as well as a barrier to care faced by this community, efficient and culturally-tailored health care interventions provide an effective mechanism to overcome barriers and provide support for chronic disease prevention (Wehrly et al., 2010).

Overall, *Beyond Sabor* demonstrates the high acceptability of an intervention aimed at improving health behaviors in preventing and managing chronic disease among disadvantaged Mexican Americans participating in the intervention. Study findings underscore the significant influence of the sociocultural context on individuals’ attempts to make lifestyle changes to prevent or manage their chronic illnesses. Participants’ efforts to help and motivate each other created a ripple effect of social support and capacity building which extended the program teachings to the family and the community, which is the goal of community-based public health interventions. *Beyond Sabor*, is a promising, culturally and linguistically relevant intervention that formulated successful strategies for addressing chronic diseases among food insecure Mexican Americans. The

development, implementation, and evaluation of additional innovative programs such as Beyond *Sabor* that focus on local ethnic and cultural norms, build upon community resources, and are conducted in community-academic partnerships will provide vital information to improve chronic disease prevention programs and community health.

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CHAPTER V: Conclusions

The primary purpose of the findings presented in this dissertation was to examine quantifiable data collected by the *Beyond Sabor* intervention to identify factors influencing completion of the lifestyle modification intervention, and to compare the variation in MetS severity scores (z-scores) among participants of the lifestyle modification intervention (*Beyond Sabor*) and a standard nutrition program (Healthy Living), over time. In keeping with the explanatory mixed methods design (Creswell, 1998), quantitative analysis was followed by exploring complementary qualitative data, also collected in the study, to account for the processual development of self-efficacy among participants, to identify their reasons for participation and retention in the program, and to understand intervention factors which influenced changes in health behaviors and health outcomes. Literature highlights the increased susceptibility of Mexican Americans to MetS and associated comorbidities. It also points towards the paucity of intensive endeavors to prevent and control the problem of MetS in this vulnerable population. The scarce studies involving Mexican Americans suggest poor retention of this ethnic minority in lifestyle modification programs. Moreover, they do not provide any information regarding Mexican American participants' perception of lifestyle modification programs. Thus, as an effort to address gaps in the literature on lifestyle modification efforts directed towards Mexican Americans to promote their retention in lifestyle modification programs, ameliorate the severity of MetS, and understand the underlying behavior modification process, the study presented in this mixed methods dissertation was conducted.

For this dissertation, data from an extensive study *Beyond Sabor* (a culturally-tailored program to prevent or reduce overweight and obesity, and prevent,

delay the onset or improve management of diabetes) conducted in a population of rural and urban adult Mexican Americans living in the Lower Rio Grande Valley region of southern Texas were used (Bastida, Tseng, McKeever, & Jack, 2010; Wilson et al., 2015). Framed within a Community Based Participatory Research (CBPR) approach, the 12-week culturally embedded intervention with a randomized controlled design had a sampling frame of 156 sites across the LRGV. A total of 32 sites were randomly selected using a multistage cluster random sampling to recruit 1,153 participants.

The first research question addressed in Manuscript 1 examined data from *Beyond Sabor* to identify factors influencing the level of completion of the lifestyle modification intervention delivered as a community-based program. Participants from the intervention (*Beyond Sabor*) group with complete baseline information were included. Data for sociodemographic, clinical, anthropometric, and physical activity assessments were analyzed. Three site-level variables included in the analysis were the location (rural/urban), leadership quality (weak/strong), and group cohesiveness (low/high). Program completion status was the dependent variable. Data were initially subject to preliminary descriptive analysis to examine the frequency of participant and site-level characteristics. Univariate analysis was initially used to compare non-completers versus intervention/program completers, using sociodemographic characteristics, baseline health behaviors, and baseline clinical profile. The data were then analyzed using hierarchical multi-level logistic regression analysis to examine participant and site-level factors associated with program completion status. Intervention/program completers were more likely to be older, had more years of education, lower fasting blood glucose levels, and participated in sites with high group cohesiveness. The logistic regression model was

statistically significant for the individual as well as site level predictors. Four predictor variables (age, years of education, fasting blood glucose levels, and group cohesiveness) were statistically significant. Approximately one-fifth of participants recruited in the *Beyond Sabor* intervention did not complete the program. Barriers to program completion identified in this analysis are mainly related to young age, poor socioeconomic status, poor health status, and weak interactions with other participants at the site. The findings of the current study describe the profiles of Mexican Americans found to be more likely to succeed in community-based culturally-tailored lifestyle modification programs. These findings may allow researchers to identify Mexican Americans at risk for non-completion and to develop strategies to improve lifestyle modification program attendance, and thus health outcomes.

The second research question compared the variation in MetS severity scores (z-scores) among Mexican American participants of *Beyond Sabor* and the standard nutrition program, *Healthy Living*, over time. It was hypothesized that the two programs, *Beyond Sabor* and *Healthy Living*, would have a similar positive impact on participants' MetS severity. The secondary aims were to determine the impact of these programs on MetS components (WC, TG, HDL, SBP, and FPG levels, over time. The analyses included all participants in the intervention (*Beyond Sabor*) and control (*Healthy Living*) groups with complete baseline information. Data for sociodemographic assessment, clinical assessment, and anthropometric assessment collected at three assessment points were analyzed. MetS z-score was calculated using the age, gender, and race-based equations recommended by Gurka, Lily, Oliver, & DeBoer (2014). The analysis of program effectiveness considered the proportion of participants that saw a reduction or

increase in their metabolic syndrome severity risk. Data were initially subject to preliminary descriptive analysis to examine the frequency of participant characteristics. Differences in MetS z-score over time for both intervention and control groups were analyzed. Analysis revealed a statistically significant difference between intervention (Beyond *Sabor*) group MetS z-scores at baseline, post-intervention, and follow-up. Post hoc analysis revealed statistically significant differences in intervention group MetS z-score from baseline to 12-week post-intervention, and from baseline to 40-week follow-up. The study also observed significant reductions in mean SBP and mean FPG among intervention group participants, over time. On the other hand, the attention control (Healthy Living) group MetS z-score decreased from baseline to post-intervention and increased from post-intervention to follow-up, but the differences were not statistically significant. Additionally, no significant intervention effects were observed on WC, HDL, or TGL. The study is one of the few of its kind involving highly susceptible and hard to access populations. The evaluation of program effectiveness using the MetS severity score makes the study novel.

The third research question, addressed in Manuscript 3, aimed to explore the qualitative data gathered from naturalistic observations of participants of Beyond *Sabor* to understand the processual development of self-efficacy among them. The principal objectives of the study were to evaluate participants' perceptions of the intervention, to obtain a rich and multifaceted understanding of reasons for participation and retention in the Beyond *Sabor* program, and to understand factors influencing adherence to the lifestyle modifications to obtain insight into the underlying process of development of participants' outcome expectancy and self-efficacy expectancy. The ethnographic data

were gathered in the form of naturalistic observations, behaviors, and comments from the participants in the intervention group. After the observation data had been cleaned and transcribed, a total of 154 session observations became available for analysis. The data were coded using an inductive approach to ascertain preliminary codes (Fade & Swift, 2011). All participants had a relatively similar positive experience of the intervention. Ethnographic notes reflected a total of 154 accounts where participants alluded to the impact of the intervention on their own as well as their family's health behaviors and health outcomes. Overall, *Beyond Sabor* demonstrated the high acceptability of an intervention aimed at improving health behaviors to promote chronic disease prevention and management among disadvantaged Mexican Americans participating in the intervention. Improvement in self-efficacy through knowledge acquisition and social support emerged as the foundation of sustainable lifestyle modifications, and consequently, improved health outcomes among participants. This study establishes that increased awareness among participants regarding existing and potential health risks and benefits of adopting a healthy lifestyle to overcome these risks influenced their willingness to modify their physical activity and dietary habits. Group participation generated social support which served as a motivational factor for continuation of behavior modification beyond the premises of the program.

The three studies and analyses conducted here aimed to provide a better picture of the problem of MetS among impoverished Mexican American populations and the potential role of lifestyle modification interventions in ameliorating this condition. Given the mixed literature on factors associated with lifestyle modification program completion by Mexican American participants and following the explanatory mixed methods design,

the first manuscript assessed the quantitative data for predictors of program completion among study participants. The second manuscript compared variation in MetS severity scores (z-scores) among participants of Beyond *Sabor* (intervention) and Healthy Living (control) programs, over time. Lastly, the third manuscript assessed qualitative data gathered during the implementation of the program searching for processual evidence supporting the development of self-efficacy among study participants. This last manuscript by highlighting the influence of self-efficacy on program completion and risk reduction for MetS complements and explains earlier quantitative findings. The literature reports on the increased prevalence of MetS in Mexican Americans and lack of substantial efforts to address the syndrome in this highly susceptible population. The dissertation addresses the call for research to investigate the issue of program attrition among Mexican Americans and identifies the role of a culturally competent program, Beyond *Sabor*, in controlling the severity of MetS among this vulnerable population. The dissertation also explores the mechanisms underlying the success of Beyond *Sabor* intervention and Mexican American participants' reasons for behavior modification.

The research findings elucidate the significance of a community-based participatory research approach as they depict the development of social capital among study participants. It is possible that cohesiveness among participants at different sites served as a means of continuous social support required to ensure participation in the program. The results advocate the value of social interaction and support provided in a group program for encouraging retention. Data also indicate that a group approach may be more effective in promoting healthy lifestyles than individual interventions (Paul-Ebhohimhen & Avenell, 2009). The study also examined a wide range of ages and both

genders, thus allowing for a broader examination of the concept of program completion. A vital strength of the present study was its success in recruiting and retaining a population of low-income Mexican Americans. Furthermore, following the CBPR design, *Beyond Sabor* recruited and involved community gatekeepers and leaders as members of the study's Advisory Board which may have strengthened participants' loyalty and support of the program. Although *Beyond Sabor* intervention components and settings are not new, their integration into a structured intervention for use in a community-based setting and incorporating a CBPR approach addressing a Mexican American population with low participation in health and medical research is novel. The continued reduction in MetS z-score among intervention participants compared to increased z-score in control group participants may be due to the dynamic, interactive, and supportive environment provided by the *Beyond Sabor* program, as opposed to the education-only format of the Healthy Living program. The intervention was culturally tailored and comparatively easy for participants to adopt, thus enhancing the likelihood of effective reproduction in prospective research in addition to extrapolation to larger populations. The MetS z-score used in the present analysis is the first to differentiate among adults by gender and race/ethnicity (Gurka, Lily, Oliver, & DeBoer, 2014). The score considers the contribution of individual MetS components to the MetS risk and severity which makes it unique (Gurka, Lily, Oliver, & DeBoer, 2014). The use of MetS z-score approach also considers the risk of syndrome severity amongst those just shy of cut-off values for traditional binary MetS classification (Gurka, Lily, Oliver, & DeBoer, 2014). The qualitative findings underscore the significant influence that the sociocultural context has on individuals' attempts to make lifestyle changes to prevent or manage their chronic

illnesses. Participants' efforts to help and motivate each other created a ripple effect of social support and capacity building which had the potential to extend the program teachings to the entire community, which is the goal of community-based public health interventions.

Limitations

Limitations specific to each research question were described in the respective manuscripts. For this dissertation, secondary data were obtained from *Beyond Sabor*, the parent study. Therefore, the analyzed data were not primarily collected to address the research aims presented here, which may have affected the results obtained. Additionally, the voluntary participation of Mexican Americans and use of clustered random sampling in the parent study may have limited its generalizability to a larger population. Furthermore, the findings may not be generalizable to all Mexican Americans due to participants' unique characteristics and the region's demographics. However, participants' characteristics reflect the region's demographics, where Mexican Americans represent the most substantial minority, most of whom speak a language other than English from birth, lack higher education, and live below the national poverty level (Dannefer et al., 2015). According to the CDC, these characteristics are also shared by those individuals most at risk for chronic health conditions (U.S. Department of Health & Human Services [USDHHS], 2014; (USDHHS, 2015).

The validation of MetS z-score is yet to be established in intervention studies to be considered useful as a health outcome measure. However, this continuous score provides a potential means of following changes in MetS-related abnormalities in each population

over time. Moreover, the program, lasting only 40 weeks, was not designed to evaluate event-based outcomes (e.g., metabolic syndrome incidence). Thus, the long-term effects of the Beyond *Sabor* intervention require additional research.

Lack of feedback from the control group also limits the study's ability to separate the effects of the intervention from those of the standard nutrition program. In addition, the data presented in this study reflect only positive feedback from the participants, and factors that inhibited retention in the program may be a subject of another study. It is possible that cultural norms related to the social presentation may have influenced responses and introduced some bias by reporting more favorable perceptions and outcomes (Dannefer et al., 2015).

Recommendations

Mexican Americans are the most substantial sub-group of Hispanics, which are the fastest growing and largest ethnic minority group in the United States. This population growth trend coupled with the fact that Mexican Americans are at a disproportionately higher risk of chronic diseases highlights the need to understand how participant characteristics may be related to the successful participation and completion of behavioral modification programs for this minority population group. Findings presented in this dissertation have significant implications for improving culturally-relevant interventions designed to promote successful lifestyle modification programs among Mexican Americans. Additionally, these conclusions allow the identification of personal and structural characteristics relevant to the retention and success of Mexican Americans in community-based culturally-tailored lifestyle modification programs. A critical research

goal for future studies should also encompass unraveling the specific intervention components that result in changes in metabolic outcomes. Exploring participants' adherence to intervention recommendations could be a possible initial measure to ascertain specific lifestyle changes which improve the metabolic risk profile for Mexican Americans. The qualitative findings support the view that "the family factor" can be a catalyst to individuals' efforts to change behaviors (Berry et al., 2011). Involving entire families in behavior modification has the potential to impact the management and prevention of chronic diseases in subsequent generations and the community at large (Koniak-Griffin et al., 2015). Practitioners developing interventions targeting Mexican Americans should use a group approach to behavior modification designed to contribute to growing self-efficacy of participants as well as mutual social support (Ramos, May, & Ramos, 2001). Implications for research include the need to study self-efficacy in Mexican Americans and the applicability of these findings to other Hispanic subpopulations. Given the rising rates of MetS among Mexicans living in the US, as well as the language and access to care barriers faced by this community, efficient and culturally-tailored health care interventions are required to overcome barriers and provide support for MetS prevention (Wehrly et al., 2010).

This dissertation lays the groundwork in support of behavioral interventions' significant role in the improvement of MetS risk profile in disadvantaged populations. There is a need for future studies to investigate and improve procedures for translating behavioral modification interventions such as *Beyond Sabor* to diverse community settings. Evidence-based public health research in community settings provide successful strategies to disseminate interventions like *Beyond Sabor* in that they are adept in

recruiting highly vulnerable populations in their communities of residence and in this manner provide a successful alternative for reducing health disparities. The successful adaptation of lifestyle interventions, such as *Beyond Sabor*, for at-risk populations in community-based settings will be critical to stem the tide of metabolic syndrome and lessen its disease burden.

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APPENDICES

Appendix A
IRB Approvals

MEMORANDUM

To: Dr. Elena Bastida, Principal Investigator
CC: File
From: Eliza Gomez, M.Ed., Coordinator, Research Integrity *EG*
Date: November 15, 2016
Protocol Title: "The Impact of a Lifestyle Modification Intervention on Self-Efficacy, Program Completion, and Metabolic Syndrome Severity in a Disadvantaged Population of Texas: A Mixed Methods Study"

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #: IRB-16-0439 **IRB Exemption Date:** 11/15/16
TOPAZ Reference #: 105241

As a requirement of IRB Exemption you are required to:

- 1) Submit an Event Form and provide immediate notification of:
 - Any additions or changes in the procedures involving human subjects.
 - Every serious or unusual or unanticipated adverse event as well as problems with the rights or welfare of the human subjects.
- 2) Submit a Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at <http://research.fiu.edu/irb>.

Appendix B
Sample Questionnaire

Location:

Date:

NAME: _____
ID _____

I want you to think about what you ate and drank yesterday and I will ask you some questions about it. Think about meals, but also think about snacks, place and time.

I'm going to begin by asking you questions about what kind of beverages you drank yesterday and their size. I have with me samples of various sizes that we will use to make it easier for you to decide your drink sizes.

Interviewer please display the various glasses by size, so that the participant may choose the size that comes closest to what they consumed yesterday.

Did you drink any water yesterday?

1. Yes
2. No

If yes, how many glasses? _____

Amount of Serving Size

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

Interviewer: Please display the various sizes and types provided: cans, bottles, regular glasses and super size glasses.

Did you drink any soda (soft drinks) yesterday?

1. Yes
2. No

If yes to above

1. Regular

2. Diet

Name of drink _____

How many glasses, cans or bottles of soda (soft drinks)? (estimate) _____

Amount of Serving Size

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

Interviewer, please display glasses and bottles as provided

1. Did you drink iced tea yesterday?

1. Yes
2. No

If yes to above

1. Sweetened
2. Unsweetened

How many iced tea servings?(estimate) _____

Amount of Serving Size

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

Interviewer: Please display the various cups and mugs provided for this component

Did you drink coffee yesterday?

1. Yes
2. No

If yes to above

1. Regular

2. Decaf

If yes, did you add

1. Cream or milk
2. Sugar

If yes, (to sugar), how many teaspoons or packets?

Interviewer, please display a teaspoon.

1. 1 tsp
2. 2 tsp
3. 1 packet
4. 2 packets
5. Other _____

26. If yes to packet, what kind of sugar

Interviewer, please display an average size packet.

1. Sweet n' Low (pink)
2. Equal (blue)
3. Splenda (yellow)
4. Reg. sugar (white)

27. If yes to cream (Please display sample sizes, as provided)

1. regular cream
2. light cream
3. no fat cream
4. regular powdered cream
5. light powdered cream
6. no fat powdered cream
7. Whole milk (4%)
8. Low fat milk (2 or 1%)
9. Fat Free milk
10. Other _____

28. Did you drink any fruit juices yesterday? (Please display sample sizes as provided)

1. Yes
2. No

29. If yes, what kind _____

30. How many servings? (Estimate) _____

31. Amount of Serving Size

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz

4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

32. Did you have any tortillas yesterday? (if no, go to # 40)

1. Yes
2. No

33. If yes, were they

1. Corn
2. Flour
3. Both

34. Tortillas use

1. Alone
2. Tacos
3. Gorditas
4. Tostadas
5. Enchiladas
6. Other _____

35. How many corn tortilla?

1. One
2. Two
3. Three
4. Four
5. Other _____

Interviewer: Please display sample sizes as provided

36. Size _____

37. How many flour tortillas?

1. One
2. Two
3. Three
4. Four
5. Other _____

38. Size _____

39. How many Tacos

1. One
2. Two
3. Three
4. Four
5. Other _____

40. Size _____

41. How many Gorditas

1. One
2. Two
3. Three
4. Four
5. Other _____

42. Size _____

43. How many Tostadas

1. One
2. Two
3. Three
4. Four
5. Other _____

44. Size _____

45. How many Enchiladas

1. One
2. Two
3. Three
4. Four
5. Other _____

46. Size _____

47. How many other (tortilla use)

1. One
2. Two
3. Three
4. Four
5. Other _____

48. Size _____

49. Did you have any chips and salsa yesterday?

1. Yes

2. No

50. If yes, (Please display sample sizes as provided)

1. Whole Serving
2. Half Serving
3. Other _____

51. Do you usually cook with?

1. Oil (Aceite)
2. Lard (Manteca)
3. Other _____

52. In general, can you give us an idea of how much oil or manteca do you use on an average day when cooking ?(If person does not cook, whoever cooks at home –Spouse, mother substitute for whoever cooks). Please display sample sizes as provided.

53. Did you eat any Mexican rice (like Mexican our rice fried with tomato sauce yesterday)?

1. Yes
2. No

54. If yes, how many total servings (if they ate rice for lunch and dinner just record it as total) Display sample sizes as provided.

1. One
2. Two
3. Three
4. Four
5. Other _____

55. To your knowledge was the rice fried with

1. Oil (Aceite)
2. Lard (Manteca)
3. Other _____

56. Size _____ (Display as provided)

57. Have you ever tried just eating boiled white rice, like in the Chinese restaurants?

1. Yes
2. No

58. Did you eat a salad, vegetable or fresh fruit yesterday?

1. Yes
2. No

59. If yes,

1. Salad
2. Vegetables
3. Fresh fruit

60. Salad Size (Display samples as provided)

1. Small (4 oz)
2. Medium (10 oz)
3. Large (18 oz)

61. Vegetable Serving (Display samples as provided)

1. Small (4 oz)
2. Medium (10 oz)
3. Large (18 oz)

62. Now I want you to think of the whole of last week: Did you have any salads?

1. Yes
2. No

63. If yes, how many? _____

64. Size _____

65. Now I want you to think of the whole of last week again: Did you have any rice (Mexican rice)?

1. Yes
2. No

66. If yes, how many times during the week did you Mexican rice?

1. Every Day
2. Every Other day
3. One or two days a week
4. Other _____

67. Portion Size (If yes, display sample sizes)

1. Small (4 oz)
2. Medium (10 oz)
3. Large (18 oz)

68. Did you eat out yesterday?

1. Yes
2. No

69. If yes, where?

70. What did you eat?

71. Size, if applicable

1. Regular

2. Super Size

3. Other _____

72. Did you eat out at all last week?

1. Yes

2. No

73. If yes, where?

74. What did you eat?

Think of a regular week in your life, what do you usually have for breakfast?

Mark as many as needed

75. Breakfast Tacos

1. papas con huevos

2. huevos, papas y chorizo

3. frijol y huevos

4. barbacoa

5. Other _____

76. Cereal

1. Oatmeal (avena)

2. Box Cereal

3. Made at home
4. Other _____

77. Milk

1. Whole
2. No fat
3. Low fat 1-2%
4. Other _____

78. Bread

1. White
2. Wheat
3. Pan Dulce
4. Donuts
5. Cinnamon rolls
6. Other _____

79. Drink

1. Coffee
2. Juice
3. Water
4. Other _____

80. Other foods

1. Bacon and Eggs
2. Sausage
3. Pancakes/French Toast
4. Other _____

Now, I'd like to ask you a few questions about how you felt during the last week. These questions are important because it allows us to better understand how your emotions and feelings may play a part in what and how you eat and even in your physical activity

89. When you think about how you felt during the past week, would you say that you felt sad?

1. Never
2. Rarely
3. Sometimes
4. Frequently
5. Most of the Time

90. Did you ever feel that you could not get going during the past week?

1. Never
2. Rarely
3. Sometimes
4. Frequently
5. Most of the Time

91. During the past week, did you not feel like eating?

1. Never
2. Rarely
3. Sometimes
4. Frequently
5. Most of the Time

92. During the past week, did you feel depressed?

1. Never
2. Rarely
3. Sometimes
4. Frequently
5. Most of the Time

Nombre: _____ ID: _____

Piense en lo que comió y bebió ayer, incluyendo las comidas y antojitos y la hora y el sitio donde los consumió.

10. Tomó agua ayer?

1. Si
2. No

11. Si, Cuantos Vasos ? _____

12. Capacidad del Vaso:

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

13. Tomó soda o coca?

1. Si
2. No

14. Si tomo soda, de cual?

1. Regular
2. Dieta

15. Nombre de refresco _____

16. Cuantos vasos o latas (estimado) _____

17. Capacidad del Vaso:

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

18. Tomó té helado ayer?

1. Si
2. No

19. Si,

1. Endulzado

2. Sin endulzar
20. Cuantos vasos se tomo? _____
21. Capacidad del Vaso:
1. 8 fl oz
 2. 8.5 fl oz
 3. 12 fl oz
 4. 16 fl oz
 5. 20 fl oz
 6. 32 fl oz
 7. 44 fl oz
 8. Other _____
22. Tomo café?
1. Si
 2. No
23. Si, de cual
1. Regular
 2. Decaf
24. Si, le agrego
1. crema
 2. azúcar
25. Si, cantidad de crema y azúcar
1. 1 cucharadita
 2. 2 cucharaditas
 3. 1 sobre
 4. 2 sobres
 5. Otra medida _____
26. Si de sobre, que clase
1. Sweet n' Low (rosado)
 2. Equal (azul)
 3. Splenda (amarillo)
 4. azúcar regular (blanco)
27. Si, crema:
1. Leche regular
 2. Leche descremada
 3. Leche en polvo
 4. Otra _____
28. Tomó algún jugo de frutas?
1. Si
 2. No
29. Si tomó, de qué clase _____
30. Cuantos vasos se tomo? _____

31. **Capacidad de vaso?**
1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____
32. **Comiste tortillas ayer? (if no, go to # 49)**
1. Si
2. No
33. **las tortillas eran de:**
1. masa
2. harina
3. de las dos
34. **Uso de la tortilla:**
1. Solas
2. Tacos
3. Gorditas
4. Tostadas
5. Enchiladas
6. Otra _____
35. **Cuantas tortillas de masa se comió?**
1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras
36. **Tamaño _____**
37. **Cuantas tortillas de harina se comió?**
1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras
38. **Tamaño _____**
39. **Cuantos tacos?**
1. Una
2. Dos
3. Tres

4. Cuatro
5. Otras
40. **Tamaño** _____
41. **Cuántas gorditas?**
1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras
42. **Tamaño** _____
43. **Cuántas tostadas?**
1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras
44. **Tamaño** _____
45. **Cuántas enchiladas?**
1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras
- 46 **Tamaño** _____
47. **Cuántas tortillas si las uso para otra cosa?**
1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras
48. **Tamaño** _____
- 49 **Comió totopos (chips) con salsa?**
1. Si
2. No
50. Si,
1. Porción completa
2. la mitad
3. otra _____
51. **Cocina con**
1. aceite
2. manteca

3. otra _____

52. En general nos puede dar una idea de cuánta manteca o aceite usa en un día promedio? (Si la persona no cocina, obtenga la información de la persona que lo hace)

53. Comió Arroz Mexicano, con salsa de tomate ayer ?

1. Si
2. No

54. Si, cuantas veces se sirvió (si comió arroz de comida y de cena apunta como total)

1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras

55. Sabe si el arroz lo prepararon en

1. Aceite
2. Manteca
3. Otra _____

56. Tamaño de porción _____

57. Ha comido arroz blanco – como el de los restaurantes chinos?

1. Si
2. No

58. Comió ensalada, vegetales, fruta fresca ayer?

1. Si
2. No

59. Si, cual?

1. Salad
2. Vegetales
3. Fruta Fresca

60. Tamaño de ensalada?

1. Pequeña (4 Oz)
2. Mediana (10 Oz)
3. Grande (18 Oz)

61. Tamaño de porción de vegetales?

1. Pequeña (4 Oz)
2. Mediana (10 Oz)
3. Grande (18 Oz)

62. Piense en la semana pasada: Comió ensaladas las semana pasada?

1. Si

- 2. No
- 63. Si, cuantas? _____
- 64. Tamaño de porción _____
- 65. Piense en la semana pasada otra vez: Comió arroz?
 - 1. Si
 - 2. No
- 66. Si, cuantas veces?
 - 1. Cada día
 - 2. días alternados
 - 3. una o dos veces por semana
 - 4. otras _____
- 67. Tamaño de porción?
 - 1. Pequeña (4 Oz)
 - 2. Mediana (10 Oz)
 - 3. Grande (18 Oz)
- 68. Comió en restaurante ayer?
 - 1. Si
 - 2. No
- 69. Si, en donde?

70. Que comió?

- 71. Que tamaño
 - 1. regular
 - 2. Extra grande - super size de mcdonalds
 - 3. Otro

- 72. Comió en restaurante la semana pasada?
 - 1. Si
 - 2. No

73. Si, en donde?

74. Que comió?

Piense en una semana normal en su vida, que toma para el desayuno? Marque todos los que aplican (circle all that apply)

75. **Tacos (de almuerzo)**
1. Papas con huevo
 2. huevos, papas y chorizo
 3. frijol y huevos
 4. barbacoa
 5. otro _____

76. **Cereal**
1. Avena
 2. Cereal de caja
 3. Hecho en casa
 4. Otro _____

77. **Leche**
1. Regular
 2. Descremada
 3. 1-2%
 4. otra _____

78. **Pan**
1. Blanco
 2. De trigo
 3. Pan dulce
 4. Donas
 5. Rolls de canela
 6. Otro _____

79. **Bebidas**
1. Café
 2. Jugo
 3. Agua
 4. Otra

80. **Otra o algo mas**
1. Huevo con tocino
 2. Salchicha
 3. Pancakes/French Toast
 4. Otra. _____

Ahora le vamos a hacer algunas preguntas sobre como se sintio en general durante la semana pasada. Es important conocer como nuestros sentimientos y emociones nos pueden afectar la manera que comemos y cuanto comemos y tambien como nos puede afectar nuestros actividades fisicas.

Durante la semana pasada, se sintio triste?

1. Nunca
2. Rara vez
3. Algunas veces

- 4. Frecuentemente
- 5. Casi todo el tiempo

Durante la semana pasada, batallo para iniciar mis actividades?

- 1. Nunca
- 2. Rara vez
- 3. Algunas veces
- 4. Frecuentemente
- 5. Casi todo el tiempo

Durante la semana pasada, sintio ganas de comer?

- 1. Siempre
- 2. Casi todo el tiempo
- 3. Frecuentemente
- 4. Rara vez
- 5. Nunca

Durante la semana pasada, se sintio deprimido/a

- 1. Nunca
- 2. Rara vez
- 3. Algunas veces
- 4. Frecuentemente
- 5. Casi todo el tiempo

Beyond Sabor Project

**Health Screening form for Beyond Sabor
to be completed by Rio Grande Regional Mobile Unite**

ID # _____ Male Female (Circle one)

Ethnicity: _____ date of Birth: _____

Measurements:

Begin with blood pressure reading

Blood Pressure will be taken three times 10 minutes apart

Blood Pressure Reading (First take) Systolic _____ Diastolic _____

Height: _____ Cm inches (Circle one)

Weight: _____ Kg pounds (Circle one)

Mid-Arm Circumference _____ Cm inches (Circle one)

Waist Circumference _____

Hip Circumference _____

Triceps Skinfold: _____ mm

Take second blood pressure reading:
Blood Pressure Reading (Second take) Systolic _____ Diastolic _____

Health Information

Are you following any special diet? Yes No
If "Yes," what type? _____
Do you have any food allergies? Yes No
If yes, to what _____

On a daily basis, how often do you add salt to your food? _____

Have you been told by a physician that you have a serious health condition or a condition for which you need to take regular medication or watch your diet? Yes NO

1. If "Yes", what condition? _____
2. Are you taking any medication for this condition? Yes NO
What are you taking _____
How often do you take this medication? _____
3. Are you taking any other medication for the above condition? Yes NO
If yes, what are you taking _____
How often do you take this medication? _____
4. Are you taking any other medication for this condition? Yes NO
What are you taking _____
How often do you take this medication? _____
5. Are you taking any other medication for this condition? Yes NO
What are you taking _____
How often do you take this medication? _____

Have you been told by a physician that you have another serious health condition or a condition for which you need to take regular medication or watch your diet? Yes NO

1. If "Yes", what condition? _____
2. Are you taking any medication for this condition? Yes NO
What are you taking _____
How often do you take this medication? _____
3. Are you taking any other medication for the above condition? Yes NO
If yes, what are you taking _____
How often do you take this medication? _____
4. Are you taking any other medication for this condition? Yes NO
What are you taking _____
How often do you take this medication? _____
5. Are you taking any other medication for this condition? Yes NO

Have you been told by a physician that you have another serious health condition or a condition for which you need to take regular medication or watch your diet? Yes NO

1. If "Yes", what condition? _____
2. Are you taking any medication for this condition? Yes NO
What are you taking _____
How often do you take this medication? _____
3. Are you taking any other medication for the above condition? Yes NO
If yes, what are you taking _____
How often do you take this medication? _____

4. Are you taking any other medication for this condition? Yes NO
What are you taking _____
How often do you take this medication? _____
5. Are you taking any other medication for this condition? Yes NO

Are you taking any medications or vitamin/mineral supplements? Yes No

If "Yes", type and dosage? _____

How physically active are you? On a scale of 1-10 (10 being very active exercise everyday)

1 2 3 4 5 6 7 8 9 10 (circle one)

WOMEN ONLY (in reproductive age); Are you pregnant? Yes No

If "Yes", weeks of gestation: _____

Has your doctor ever told you that you cannot engage in any physical activity? Yes
NO _____

Has he told you for example not to go upstairs or carry heavy loads or do anything that requires heavy movement? Yes _____ NO _____

Regional staff name: _____ Date: _____

VITA

RAMANDEEP KAUR

Born, Chandigarh, India

- 2004-2008 B.Sc. Nursing
Panjab University
Chandigarh, India
- 2008-2009 Clinical Instructor,
Baba Farid University of Health Sciences
Punjab, India
- 2009-2012 Master of Public Health
Kansas State University
Manhattan, Kansas
- 2012-2013 Research Fellow
Postgraduate Institute of Medical Education and Research
Chandigarh, India
- 2013-2018 Doctoral Candidate
Florida International University
Miami, Florida

PUBLICATIONS AND PRESENTATIONS

Hozman, A. Kaur, R. Bastida, E. (November, 2018). *Older age and factors influencing Mexican American participation in a community-based lifestyle modification intervention*. Abstract accepted for poster presentation at the APHA 2018 Annual Meeting and Expo, San Diego, CA.

Kaur, R. Bastida, E. (November, 2017). *Sustainable lifestyle changes improve self-efficacy and metabolic syndrome in vulnerable older adults*. Roundtable presentation at the APHA 2017 Annual Meeting and Expo, Atlanta, GA.

Kaur, R. Bastida, E. (March, 2017). *Evaluating the effectiveness of a lifestyle modification intervention on metabolic syndrome in a disadvantaged population*. Oral presentation at the Graduate Student Appreciation Week: The Scholarly Forum. Florida International University, Miami, FL.

Kaur, R. Bastida, E. (October, 2016). *Role of Mexican American grandparents as change agents for family health*. Poster presentation at the 2016 Annual meeting and Exposition of the American Public Health Association, Denver, CO. Abstract nominated for "Laurence G. Branch Doctoral Student Research Award" at Aging and Public Health Section.

Bastida-Gonzalez, E; Serna, C; Kaur, R; Ravelo, A; Barreto-Beck, C. (July, 2016). *Identifying human resources in an immigrant community: The role of natural helpers in the implementation of a community based intervention*. Oral Presentation at the 3rd ISA Forum of Sociology. Vienna, Austria.

Kaur, R. (April, 2016). *Child Opportunities: A comparison between South Florida Counties*. Poster presentation at the Florida Public Health Association Regional Conference. Florida International University, Miami FL.

Kaur, R. (March, 2016). *Immigration and Health inequities: Call for Social Justice*. Oral presentation at the Graduate Student Appreciation Week: The Scholarly Forum. Florida International University, Miami, FL.

Kaur, R. Bastida, E., Ibrahimou, B., Rojas, P., Shaw, M., Himburg, S. P. *Metabolic Syndrome Severity Reduction among Mexican American Adults: Results from a Culturally-tailored Lifestyle Modification*. To be submitted to *The Journal of Preventive Medicine*.

Kaur, R. Bastida, E., Rojas, P., Shaw, M., Ibrahimou, B., Himburg, S. P. *Increased Self Efficacy in a Sample of Mexican American Food Bank Clients: Results from a Community-embedded Lifestyle Intervention*. To be submitted to *Health Promotion and Practice*.