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Border Hispanics' Physical Activity Improvement In A Chronic Disease Prevention Program

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Border Hispanics' Physical Activity Improvement

In A Chronic Disease Prevention Program

A Thesis

by

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Border Hispanics' Physical Activity Improvement

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ABSTRACT

Lu Xu, Border Hispanics' Physical Activity Improvement In A Chronic Disease Prevention Program. Master of Science (MS), May, 2012, 49 pp., 8 tables, 3 figures, 38 references, 28 titles.

In seeking of effective prevention programs to improve physical activities, we want to examine the factors related to physical activities improvement in Alliance for a Healthy Border, a chronic disease prevention program with pre-post-post evaluations through 12 federally qualified community health centers serving primarily Hispanics in communities along the U.S.-Mexico border. Logistic regression was performed to examine the association between physical activity and twenty predictors at baseline. Multinomial regression was used to examine the determinants of physical activities improvement at two time points: program end and post six-months. Socio-demographic, baseline health condition factors, and determination of doing physical activity were also included in the model. We found that factors affecting physical activities improvement were gender, number of children at home, employment status, general health status, smoking, baseline BMI, hypertension, cardiovascular disease, group/individual-based program, program duration, limits by problems, and determination of doing physical activity.

Keywords: Physical activity improvement, Hispanics

DEDICATION

The completion of my master's studies would not have been possible without the love and support of my family. My mom and my dad wholeheartedly inspired and motivated me by all means to accomplish this degree. Thank you for your love and patience.

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CHAPTER I

INTRODUCTION

There is now convincing evidence for the beneficial effects of participation in physical activities. Physical activities, maybe by improving body management and glycemic control, reduce the risk of diabetes (Zhao et al, 2011; Bassuk and Manson, 2005). A 2002 review of prospective studies published between 1990 and 2000 concluded that the reduction in the risk of type 2 diabetes associated with a physically active, compared with a sedentary, lifestyle is 30–50% (Bassuk and Manson, 2005). In particular, moderate intense activity reduced the risk of type 2 diabetes by about 30%, and the reduction remained considerable after adjustment for BMI. For example, walking, a type of moderate intensity physical activity, is highly accessible, readily adopted, and relatively safe, and is the most popular physical activities among senior people (Hu et al., 1999).

However, the prevalence of participation in physical activities among people with diabetes or cardiovascular diseases has remained relatively low. Individuals with a history of diabetes or cardiovascular disease were no more likely to adhere to a healthy lifestyle than people without these conditions (King et al., 2009). In the United States, adults with diabetes were significantly less likely to participate in physical activities than people without diabetes (Zhao et al. 2011; Zhao et al., 2008). And correspondingly, people with diabetes were less likely to meet recommendations for physical activities than people without diabetes (Zhao et al. 2011;

Zhao et al., 2008). In addition, among older adults with diabetes, having coronary heart disease was associated with less likelihood of meeting physical activity recommendations (Zhao et al. 2011). Probably the biggest concern is that, from 1996 to 2005, the prevalence of physical activity participation in people with diabetes did not vary much while was linearly increasing in people without diabetes (Zhao et al., 2008). Hispanics, disproportionately affected by diabetes, are the most physically inactivity racial/ethnic group in the United States (CDC, 2004). Data from the Third National Health and Nutrition Examination Survey showed that, during 1988-1994, 46% of Hispanic women reported no leisure-time activity compared with 40% of African American women, 23% of white women, 33% of Hispanic men, and 24% of African-American men (Voorhees and Young, 2003).

Evidences have shown that personal factors including age (Zhao et al. 2011; Zhao et al., 2008; Wilbur et al., 2003; Ortiz-Hernandez and Ramos-Ibanez, 2010), sex (Zhao et al. 2011; Zhao et al., 2008; Morrato et al., 2003; Kavouras et al., 2007), race or ethnicity (Zhao et al. 2011; Zhao et al., 2008; Morrato et al., 2003), education (Zhao et al. 2011; Zhao et al., 2008; Morrato et al., 2003; Jurkowski et al., 2010; Evenson et al., 2003), income (Zhao et al., 2008; Morrato et al., 2003), marital status (Wilbur et al., 2003), general health (Kelly et al., 2003), self-efficacy (Wilbur et al., 2003), and BMI (Zhao et al., 2008; Morrato et al., 2007) are associated with physical activities. Hispanics reported lower prevalence of leisure time activity than their counterparts across variables, including education, family income, occupation, employment, poverty and marital status (Wen et al., 2002). It has also been reported that Hispanics, compared to non-Hispanic whites and African Americans, have higher rates of physical inactivity (Dutton et al., 2009). This could be attributed to their high rates of obesity, low income levels, low education levels, and low levels of health conditions. Among Hispanics, females are less likely

to participate in leisure time physical activities than males (CDC, 2005). Moreover, evidence showed that physical activity level was higher among Hispanic women who were younger (Wilbur et al., 2003), married (Wilbur et al., 2003), and who had attended at least some college (Voorhees et al., 2003; Evenson et al., 2003; Giardina et al., 2009).

There has been a growing interest in setting up programs that aim to increase physical activity level. Previous studies showed that physical activities can be promoted by three main types of interventions: information-based, behavioral and social, and environmental and policy interventions (Kahn et al., 2002). Understanding that there were many various barriers to physical activities, researchers pointed out that multi-strategic health promotion programs were necessary to achieve improvements in a population (Wen et al., 2002). For instance, 'Concord, a Great Place to be Active' was such a community-based multi-strategic demonstration research project which led to 6.4% reduction of sedentary women (Wen et al., 2002). However, researchers are still going to identify effective programs for different populations.

Alliance for a Healthy Border (AHB), a chronic disease prevention program from 2006 to 2008, provided resources for 12 federally-qualified community health centers that aim to improve nutrition, increase physical activities among the areas of the U.S.-Mexico border in Texas, New Mexico, Arizona, and California. The goals of AHB included reducing modifiable risk factors associated with diabetes and cardiovascular disease; establishing or modifying existing prevention programs which were targeted at the Hispanic and Latino population; and identifying and promoting best practices in the prevention of these diseases.

The AHB programs were implemented and assessed using a pre-post-post study design. In this study, we aimed to check whether the AHB program improved physical activities among border Hispanics. Further, we examined the determinants of physical activity levels at baseline.

At last, we examined the determinants of physical activity improvements among participants in the AHB program.

CHAPTER II

CONCEPTUAL FRAMEWORK

2.1 The theory of planned behavior

To modify behavior, it is necessary to identify predictors of performing behavior. One of the most widely used theoretical frameworks for understanding health behaviors is the theory of planned behavior (TPB) (Godin & Kok, 1996), which was developed by Ajzen (1985) from the theory of reasoned action.

The TPB explains why people perform certain behaviors. This theory consists of five components: attitude, subjective norm, perceived behavioral control, behavior intention, and behavior. On the one hand, the TPB indicates that the intension of a person to perform an action is the best predictor of the actual action he or she will perform (Ajzen, 1988). On the other hand, the TPB suggests that attitude toward a behavior, subjective norms and perceived behavioral control are three independent determinants of behavior intension. Therefore, a more positive attitude, together with a more supportive subjective norm and a higher the perceived behavioral control, lead to a stronger intention to perform the behavior and subsequently a more likelihood of the behavior will be performed.

The TPB was applied in a wide range of health-related areas, including physical activity (Presseau et al., 2010), weight control (McConnon, et al., 2012), and healthy eating (Conner et al., 2002). By the antecedent of TPB, a study review related to physical activity indicated that

this model contributed to 27% of the variance in behavior intension and behavior (Fishbein and Ajzen, 1975). In our study, we represented our model in fig.1.

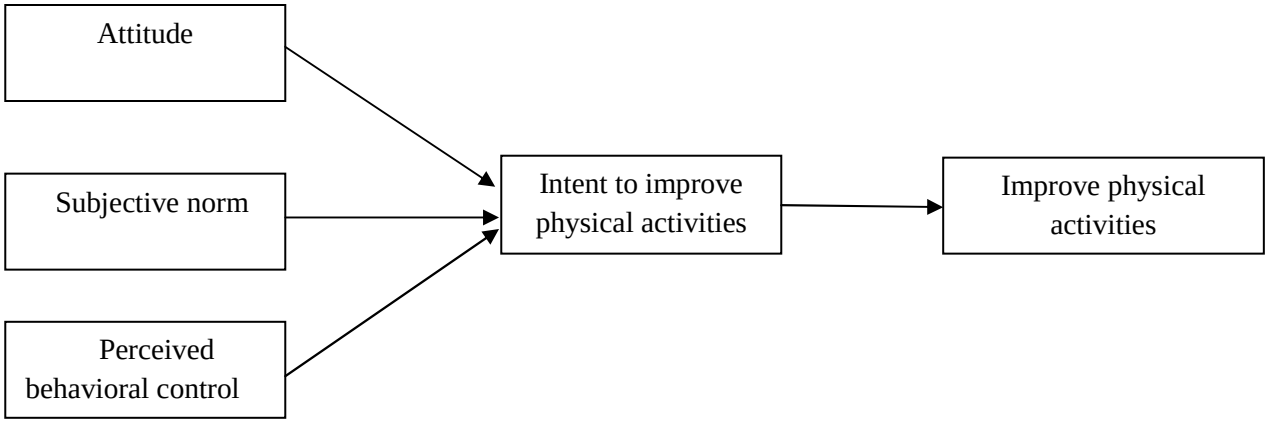

Fig 1: Model based on TPB

2.2 Attitude

The first important predictor of behavioral intention is attitude. Ajzen (1991, p. 188) explained the attitude toward a behavior as “the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question”. So the attitude is determined by the person’s evaluation of the behavior outcomes. In our study, participants could perceive performing physical activity as a healthy, advantage experience. Thus, people probably would like to improve physical activity if they had any kind of health care coverage, had good health condition, with normal BMI, with HbA1c less than six, without diseases including diabetes, hypertension or cardiovascular, or if they don’t smoke, choose longer program duration, determined to do PA.

2.3 Subjective norm

The TPB proposed subjective norm as a second determinant of behavioral intention, which could be described as “the perceived social pressure to perform or not to perform the

behavior" (Ajzen, 1991, p.188). In specific, subjective norm is the perceived opinion from others who could significantly influence the person's decision by approving or disapproving him or her performing the behavior. Those important salient referents could be individuals or groups such as the person's parents, spouse, relatives, partner, classmates, and close friends. Thus, in our context, factors may predict subjective norm are marital status, birth country, employment status, education, language, overall program quality, group/individual-based program and family history of diabetes.

2.4 Perceived behavioral control

The TPB assumes perceived behavioral control is the third determinant of behavioral intention. Ajzen (1991) defined perceived behavioral control as "the perceived ease or difficulty of performing the behavior" (p. 122). Studies have shown that self-confidence in their ability to do physical activity is positively associated with physical activity. Therefore, in our study, one of the factors that determine perceived behavioral control is having any limits to do physical activity.

CHAPTER III

METHODOLOGY

3.1 Survey Instrument and Measurement

Based on questions from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System and the Community Tracking Study Household Survey, survey instruments were used at the beginning of the intervention, at program end and at six-month post program end. Pre-and post- program physical activities status were also collected.

We analyzed a sample where the majority of people were Hispanics who lived in the U.S.-Mexico border region. The independent variables were twenty predictors, which were combined into four types of factors: demographic factors, social-economic factors, baseline health factors and other factors. And the dependent variable included physical activities status at baseline and physical activities improvement at the program end and post six months.

At baseline, we included twenty predictor variables in our study that were categorized into demographic factors, social-economic factors, baseline health factors, and other factors. For demographic factors, gender, age, marital status, and birth country were considered. For social-economic factors, we included employment status (categorized into four groups: employed for wages or self-employed; unemployed, students or those unable to work; homemakers; retired), education level, income, health insurance coverage status (yes: if respondents had any kind of

health insurance coverage e.g., private health insurance, prepaid plans such as HMOs, or government plans such as Medicare), number of children at home, and language. For baseline health factors, we considered general health status, diabetes, baseline BMI (normal: $18.5 \leq$ BMI<25; overweight: $25 \leq$ BMI<30; obese: BMI ≥ 30), baseline HbA1c (HbA1c<6; HbA1c>=6), smoking, hypertension, cardiovascular disease. And there are other factors, including family history of diabetes (parents, siblings, and/or children), limits by problems (categorized as "yes" if respondents reported any limits in any activities because of physical, mental, or emotional problems), determination of doing physical activities (determined & doing physical activities(PA): participants reported to use PA to lose or maintain weight; determined or doing PA: participants either tried to lose or maintain their weight without doing PA, or did PA without trying to lose or maintain weight; neither determined nor PA: participants neither tried to lose or maintain weight nor did PA).

At the end of the program and six months after the program, together with the previous twenty factors, we also considered center/program characteristic factors which were: an overall program quality (high versus low), session type (group versus individual education sessions), program duration in weeks, and curriculum (adapted versus developed).

Physical activity improvements were categorized as failure (if participants did not meet physical activities recommendations at the end of the program or at six-month post program end), minor success (if participants meeting physical activity recommendations at baseline maintained the same status at the end of the program or at six-month post program end), and success (if participants meeting physical activity recommendations at program end or at six-month post program end while they did not at baseline).

3.2 Sample

We conducted our analyses from data collected during Phase I of the Alliance for a healthy border (AHB), from January 2006 to December 2007. There were 2,466 participants took baseline surveys with the program interview and outcome measurements; 1,530 completed the end-of-program interview with outcome measurements; and 1,180 finished the post-six-month interview and outcome measurement. Table 1 lists the rates of enrollment and completion by demographic factors, social-economic factors, baseline health factors and other factors at baseline, the program end and at the post six months. We included participants in our analysis if their data complete for the outcome and the corresponding predictors. Therefore, the sample sizes were 1020 at the end of the program and 744 at the post six months.

3.3 Statistical Analysis

First of all, descriptive statistics are reported for measurements in the survey. Secondly, we explored pair-wise chi-square tests to assess the association of each predictor and the corresponding outcomes at the three time points: at baseline, at the end of the program, and at program post six months. Thirdly, logistic regression analysis was used to identify predictors of physical activity levels at baseline. Finally, multinomial logistic regression was performed to study effects of predictors on physical activity improvements.

3.4 Statistical Model

3.4.1Binary logistic regression

Binary logistic regression is well suited for testing hypotheses about association of a binary categorical outcome variable and one or more categorical or continuous predictor

variables, so we used this model to analyze the effect of the twenty predictors on physical activities status at baseline.

Notice the dependent variable Y_i (binary) is physical activities status, and the independent variables $X_1, X_2, \ldots, X_{20}$ (categorical) are the predictors. Because Y_i is assumed to follow a Bernoulli distribution with parameter p_i, and we used logit link function to model its linear relationship with predictors, we have

$$Y_i|X_i \sim \text{Bernoulli}(p_i),$$

$$logit(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_{20} X_{20i} \quad (1)$$

where p_i is the probability of Y_i taking value of 1 (i.e. meet the physical activity recommendations), β_0 is the intercept and $\beta_1, \beta_2, \ldots, \beta_{20}$ are the regression coefficients of the corresponding predictors.

To get probability from logit, we take the log out of both sides of the equation (1) as follows:

$$\frac{p_i}{1-p_i} = e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}$$

Therefore,

$$p_i = \frac{e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}}{1+e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}} \quad (2)$$

The maximum likelihood method, which is designed to maximize the likelihood of reproducing the data given the parameter estimates, is adopted to estimate βs. Given the above model and n independent observations (Y_i, X_i),

$$L\,(\beta_0, \beta_1, \ldots \beta_{20}|\mathrm{Y}, \mathrm{X}) = \prod_{i=1}^{n} {p_i}^{Y_i}(1-p_i)^{1-Y_i}$$

$$= \prod_{i=1}^{n}\left(\frac{e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}}{1+e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}}\right)^{Y_i}\left(\frac{1}{1+e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}}\right)^{1-Y_i} \quad (3)$$

Taking log of both sides of equation (3), we have

$$l\,(\beta_0, \beta_1, \ldots \beta_{20}|\mathrm{Y}, \mathrm{X}) =$$

$$\sum_{\mathrm{i}=1}^{\mathrm{n}}\left[Y_i \log\left(\frac{e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}}{1+e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}}\right) + (1-Y_i)\log\left(\frac{1}{1+e^{\beta_0+\beta_1 X_{1i}+\beta_2 X_{2i}+\cdots+\beta_{20} X_{20i}}}\right)\right] \quad (4)$$

Taking derivatives of this function for each β to be zero, we obtain each β.

To test significance of above model, one can use the null hypothesis stating that all βs equal zero. And a rejection of this null hypothesis implies that a linear relationship exists between Xs and the logit of Y. The value of the coefficients βs determine the direction of the relationship between Xs and the logit of Y. When $\beta_i < 0$, Y tends to be smaller at higher values of X_i; when $\beta_i > 0$, Y tends to be larger at higher values of X_i. Odds ratio is used when researchers interpret the effect of predictors.

$$odds\ ratio = \frac{odd_1}{odd_2} = \frac{p_1}{1-p_1} \Big/ \frac{p_2}{1-p_2} \quad (5)$$

The odds ratio (OR) is calculated by raising e, the natural logarithm base, to the exponent of the slope β_i (e^{β_i}).

When OR is greater than 1, the risk of the outcome falling in the comparison group increases as the variable increases. When OR is less than 1, the comparison outcome is less

likely. When OR equals 1, there is no relationship between dependent variable and independent variable.

For example, our study showed that one logistic coefficient of the predictor age was -0.79. When raising e to the power β_i , we have

$$\text{OR}=e^{\beta_i} = e^{-0.79} = \frac{p_1}{1-p_1} / \frac{p_2}{1-p_2} = 0.45$$

Where p_1 represents the probability of people aged 65 or older meeting physical activities recommendations, and p_2 represents the probability of people aged 44 or younger. Therefore, this result implied people aged 65 or older were less likely to meet physical activities recommendations than those aged 44 or younger.

Besides, we used Hosmer and Lemeshow Test to check goodness of fit. Since p-value was greater than 0.05, we failed to reject the null hypothesis that there was no difference between observed and model-predicted values, thus, the model adequately fit the data. In addition, Nagelkerke's R^2 was used to measure effect size of the dependent variable. To detect outliers, standardized residual (AResid) was used.

3.4.2 Multinomial logistic regression

Multinomial logistic regression, which can be easily extended from binary logistic regression, handles outcomes with unordered multiple categories. Notice that physical activities improvement was divided into three levels, it was one of the best fitting models to analyze the relationship between physical activities improvement and the twenty predictors. Multinomial logistic is less restrictive than cumulative logit model which is proper for ordered multiple-

category dependent variable and requires proportional odds assumption. In our situation, the assumption was violated, therefore, we utilized multinomial logistic regression.

Consider the dependent variable Y is 3-category physical activities improvement and the independent variables *X* are the predictors. Because Y is assumed to follow a multinomial distribution, it can be written as

$$Y \sim Multinomial\ (p_1, p_2, \ldots, p_J),$$

where p_j (j=1, …, *J*) is the probability that Y takes the j^{th} value and $\sum p_i = 1$.

Let Y take on categories 1, 2,…J, and taking K as the reference category, then it can be modeled as follows:

$$\ln\left(\frac{p_{ij}}{p_{ik}}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_m X_m \qquad (6)$$

In our study, J is 3, and m is 20, so the model becomes

$$\ln\left(\frac{p_{i2}}{p_{i1}}\right) = \beta_{02} + \beta_{12} X_1 + \beta_{22} X_2 + \cdots + \beta_{202} X_{20} \qquad (7)$$

$$\ln\left(\frac{p_{i3}}{p_{i1}}\right) = \beta_{03} + \beta_{13} X_1 + \beta_{23} X_2 + \cdots + \beta_{203} X_{20} \qquad (8)$$

The conditional probabilities for each outcome category are:

$$p_{i2} = \frac{\exp({x_i}^T \beta_{i2})}{1+\exp({x_i}^T \beta_{i2})+exp({x_i}^T \beta_{i3})} \qquad (9)$$

$$p_{i3} = \frac{\exp({x_i}^T \beta_{i3})}{1+\exp({x_i}^T \beta_{i2})+exp({x_i}^T \beta_{i3})} \qquad (10)$$

We still used the maximum likelihood method to estimate the regression coefficients βs.

The increase in log-odds of falling into category *j* versus category *k* results from a one-unit increase in the g^{th} variable, holding the other variables constant.

For example, at the program end, our result showed that the odds ratio of gender was 1.71. That indicated that when compared success to failure, males were more likely to be successful than females when holding other factors the constant.

We used Pearson chi-square test to check the goodness of fit. In addition, Nagelkerke's R^2 was used to measure effect size of the dependent variable. And standardized residual (AResid) was performed to detect outliers.

CHAPTER IV

RESULTS

4.1 Descriptive statistics

Table 1 lists rates of enrollment and completion by twenty factors. Total N is the number of participants who had both survey and outcome measurements at that time and previous time point(s).Among the 2466 participants who took baseline survey and complete baseline measurements, almost 80% were born in Mexico and nearly 50% use Spanish only. 85.4% of them were overweight or obese. 42.1% people had annual income less than $10,000. 44.8% of the respondents had education less than high school. 60.2% of the population reported their general health status as fair or poor.

4.1.1. Proportions of physical activities levels

Figure 1 represents the proportions of respondents meet the physical activities recommendation of Healthy People 2010.

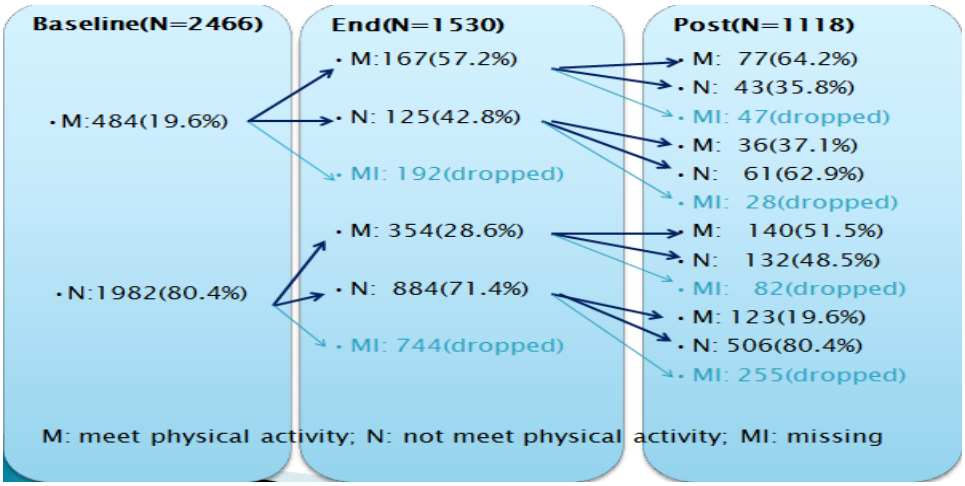

Fig 2: Proportions of respondents meet the physical activities recommendation

We found that only 19.6% participants met physical activities recommendations at baseline. Among those people, 57.2% of the remaining ones kept the same status at the end program. After 6 months of the program, among the people meeting PA recommendations at previous two time points, 64.2% of the remaining ones kept the same PA level. Among those meeting PA recommendations at baseline but did not at the end program, the rate of engaging in PA at recommendation level was 37.1% versus the rate of not 62.9%. Since we aimed to find out the improvement in PA, we focus on the group did not meet PA recommendations at baseline. On the one hand, we found that 28.6% of the remaining participants improved their PA at recommendation level at the end program. After six months, the percentage of keeping PA at the same status increased to 51.5%. On the other hand, there were 19.6% participants improved their PA at recommendation levels at post six months even though they did not at program end. In the next, for the participants who completed all the three times surveys and outcome measures, we will further find out the distribution of their PA status.

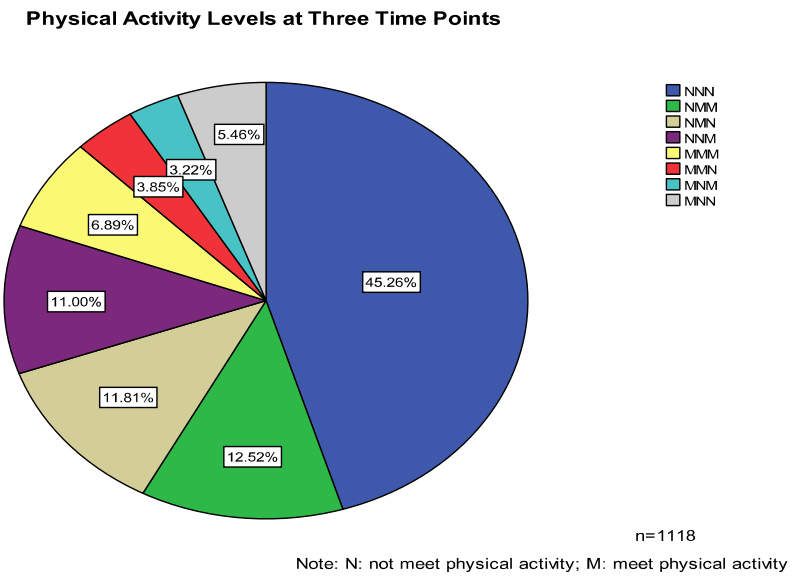

Fig 3: Physical activities level at three time points

According to the physical activities status at the three time points, we divided participants into eight groups: NNN, NMM, NMN, NNM, MMM, MMN, MNM, MNN. For example, we labeled MMM if respondent met Healthy People 2010 physical activities recommendations at the three time points. Figure 2 showed the distribution of the eight categories. We found that up to six months post of program, even though 45.26% the respondents did not meet PA recommendations all the time, there were 35.33% participants improved their PA in some extent. And NMM, NMN, NNM took 12.5%, 11.8%, and 11.0% representatively. Also, it was observed that 6.89% the participants kept engaging in PA at recommendation level. Notice that there were only 3.8% and 3.2% percentage for MMN and MNM.

4.1.2. Pair-wise exploration results

4.1.2.1 Physical activities levels at baseline with all predictors. Table 2 shows the distribution of twenty factors based on the physical activities levels at baseline. We found that

for demographic factors, females have lower rate of meeting physical activities recommendations. For social-economic factors, employed and self-employed people and people without any insurance reported lower rates of meeting physical activities recommendations. For baseline health factors, rates of meeting physical activities were higher among those who reported good, very good and excellent health, with normal BMI, and with hypertension. For other factors, higher rate of meeting PA recommendations was among people with determined to do physical activities. In section 4.2, we will identify the significant predictors of engaging in physical activities at recommendation level and study their effects using all twenty independent factors in a logistic regression model.

4.1.2.2 Physical activity improvements with all predictors. Overall, the AHB program demonstrated success in physical activities improvement. Table 4 shows the percentages for success, minor success and failure of physical activity improvements. Numbers of valid cases in the analysis are also listed. At the end program, 22.5% (95%CI: 20.0%-25.1%) participants improved their physical activities, and 10.7% (95%CI: 8.8%-12.6%) participants maintained their status at meeting physical activities recommendations. At the post six months of the program, it produced 23.4% (95%CI: 20.4%-26.4%) success rate and 9.8% (95%CI: 7.7%-11.9%) minor success rate.

Table 6 and table 8 summarize distributions of all predictors and their association with improvement of physical activities at the end of program and six months after. For demographic factors, males have higher rate of improving physical activities. For social-economic factors, successful participants were unemployed & unable to work, having some health insurances. For baseline health factors, success rates were higher if they were in good, very good and excellent

health status, and if they were current smokers, former smokers, without cardiovascular diseases. For center characteristics factors, success rates were higher among respondents who took participant in group-based program, and/or programs lasting nine to ten weeks. For other factors, rates of improving physical activities were higher among those people who did not feel their physical, mental or emotional health have limited them in anyway, and who did physical activities with determination were more likely to improve physical activities. In section 4.3, we will identify the significant predictors of success in physical activities improvement and study their effects using all twenty independent factors in a multivariate logistic regression model.

4.2 Results on baseline physical activity levels

Table 3 summarizes distributions of twenty factors and their association with physical activity levels at baseline. The effect size for the logistic regression model with twenty hypothesized factors was 0.229, implying that the model explained 22.9% of the variation of meeting physical activities recommendations. Table 2 shows that the hypothesized factors 82.7% correctly predicted rate of physical activities levels (LR $\chi^2(68)=151.852$, $p<0.001$). We present the results from logistic regression for physical activity levels in table 3. For demographic factors, when holding other factors constant, we found that people aged 65 or older were 0.45 (95% CI, 0.23-0.88) times less likely to meet PA recommendations than those aged 44 or younger. Compared to employed and self-employed people, those retired (OR=2.43; 95%CI, 1.36-4.35) were more likely to meet PA recommendations. For baseline health factors, the rate of meeting PA recommendations was higher among participants reported good, very good and excellent health (OR=2.05; 95%CI, 1.12-3.76) than those reported poor general health condition. Compared to normal participants, people with obese BMI (OR=0.53; 95%CI, 0.32-0.89) were

associated with less likelihood of engaging in PA at recommendation levels. Surprisingly, people with hypertension (OR=0.67; 95%CI, 0.49-0.94) were less likely to meet PA recommendations than those without. And people with cardiovascular diseases (OR=1.75; 95%CI, 1.02-3.22) were more likely to meet physical activities recommendations than those who do not. For other factors, when controlling other factors, determined to do physical activities (OR=7.45; 95%CI, 3.63-15.29) were significantly more likely to engage in PA at recommendation levels than those neither determined nor doing physical activities.

4.3 Results on improvements of physical activity

Many variables showed significantly relationships with physical activities improvement. Table 6 represents the distributions of predictors and their association with physical activity improvements at the end of program. The effect size for the multinomial regression model with twenty hypothesized factors was 0.229, indicating that the model explained 22.9% of the variation of success in physical activities improvement. Table 5 shows that the hypothesized factors were found to jointly predict success of physical activities improvement (LR $\chi^2(82)=182.425$, $p<0.001$) with correct prediction rate of 67.3%. Compared to failure, people who retired (OR=2.77; 95%CI, 1.16-6.61), people were more likely to gain minor success than those who reported employed & self-employed. Obese participants (OR=0.44; 95%CI, 0.20-0.97) were less likely to be minor successful than normal ones. We also found that participants who did not report hypertension (OR=0.56; 95%CI, 0.34-0.95) were less likely to gain minor success than those did. When holding other factors the constant, we found that people doing physical activities with determination (OR=14.07; 95%CI, 3.24-61.17) are significantly more likely to be minor successful than those neither determined nor doing physical activities. Compared to

failure, we found males are more likely to be successful than females (OR=1.80; 95%CI, 1.16-2.82). People did not report hypertension (OR=0.67; 95%CI, 0.47-0.95) were less likely than those reported hypertension to achieve success. And participants in program lasting 10 weeks (OR=0.47; 95%CI, 0.23-0.98) were less likely to succeed than those in program lasting eight weeks. Compared to minor success, people doing PA with determination (OR=0.08; 95%CI, 0.02-0.37) were less likely to be successful than people neither determined nor doing PA.

Table 8 shows the distributions of predictors and their association with physical activity improvements after six months of the program end. The effect size for the multivariate logistic regression was 0.284, indicating 28.4% variation of the success in physical activities improvement could be explained by this model. Table 7 lists that the hypothesized factors were found to jointly predict success of physical activities improvement (LR $\chi^2(80)=195.193$, $p<0.001$) with correct prediction rate of 67.9%. Compared to failure, for baseline health factors, those reported health status as good, very good and excellent (OR=4.97; 95%CI, 1.13-21.76) were more likely to gain minor success compared to those reported poor health condition. And former smokers (OR=0.32; 95%CI, 0.12-0.88) were less likely to achieve minor success than non-smokers. And people who had some cardiovascular diseases (OR=3.52; 95%CI, 1.38-9.00) were more likely to be pseudo successful than those without any cardiovascular diseases. And for other factors, those doing physical activities with determination (OR=8.62; 95%CI, 1.92-38.63) were more likely to gain pseudo success than people neither determined nor doing physical activities. Compared to failure, when holding other factors constants, for social-economic factors, participants with one children at home (OR=0.46; 95%CI, 0.25-0.84) were less likely to achieve success than those without. For center characteristics, participants in group-based programs (OR=2.26; 95%CI, 1.18-4.31) were more likely to succeed in physical activities improvement,

compared to those participating in individual-based programs. For other factors, people were less likely to be successful if they have some limits problems (OR=0.57; 95%CI, 0.34-0.95). Compared to minor success, for baseline health factors, former smokers (OR=4.30; 95%CI, 1.52-12.14) were more likely to achieve success than non-smokers. Participants were less likely to succeed if they reported obese (OR=3.10; 95%CI, 1.03-9.38) and cardiovascular diseases (OR=0.34; 95%CI, 0.12-0.96). For other factors, participants with some limits by problems (OR=0.43; 95%CI, 0.20-0.95) were less likely than those without any limits to be successful. And people reported doing PA with determination (OR=0.17; 95%CI, 0.03-0.85) were less likely to succeed than those reported neither determined nor doing some PA.

CHAPTER V

CONCLUSIONS AND DISCUSSIONS

This study described the physical activities levels and correlates of it among the border Hispanic population, and then examined the predictors of success in physical activity improvements at both program end and post six months follow-up. Since there is now adequate literatures on why Hispanics report less engage in physical activities and its improvement, our results are useful in designing and modifying programs related to activity.

We found that 80.6% participants did not meet physical activities recommendation at baseline, indicating it is really necessary to encourage people doing physical activities. However, the prevalence of activity is lower than other studies, probably because the different of definition of recommendation guidelines or the different populations. In generally, variables associated with physical activities status at baseline are consistent with the ones associated with physical activities improvement. For example, participants who reported good, very good and excellent health were more likely to meet physical activities recommendation. Correspondingly, those people were more likely to improve physical activities than their counterpart groups.

For demographic factors, our findings showed that the oldest people (older than 65) were less likely to meet the physical activities recommendation of Healthy People 2010. However, age was not a significant correlate of activity improvement. Agreeing with existing findings focus on Hispanics, we also found that females were less likely to do activity than males. Reasonably,

improvement of PA among females was lower than males in this study. That leads us to consider about the barriers for females to do physical activities. The common barriers reported in our similar groups Latina included lack of time, motivation, not enough energy (Voorhees and Young, 2003). We also found that American-born people were less likely to achieve success than Mexico-born participants. Probably because the majority of the participants in our sample were born in Mexico, they were educated to promote physical activities. In this respect, we concluded that AHB program was useful to encourage their improvement in physical activities.

For social-economic factors, some studies indicated that higher social-economic status was associated with higher probability of engaging in leisure-time physical activities. Furthermore, low social-economic status may cause decreased physical activities because of personal frustration and stress. And evidences also showed that individuals with some college education were more likely to do activities than those with lower education. However, there was no significant association with education in our study. Surprisingly, individuals with annual income more than $ 30,000 were less likely to promote physical activities than those with annual income less than $10,000. We speculate that among the border Hispanic population, adults with the very low income had more free time to do exercises. Compared to persons without any kids at home, those had one kid had lower probability of increasing physical activities. We considered that probably since the majority of the sample was women, they spent more time taking care of kid, which reduced physical activities.

For baseline health factors, it is reasonable that persons reported their general health status as good, very good and excellent got more likely to achieve minor success than people reported poor health condition. On the one hand, physical activities improves body management,

including BMI (Hu et al., 2004; Hu et al., 2003; Herbst et al., 2006; Kavouras et al., 2007; Dwyer et al., 2006), weight (Tuomilehto et al., 2001; Dengel et al., 1998), waist-to-hip ratio (Kavouras et al., 2007), and waist circumference .(Tuomilehto et al., 2001; Kavouras et al., 2007; Dwyer et al., 2006). In particular, an increased level of exercise is negatively related with BMI (Thompson et al., 2004). It was observed that physical activities reduced BMI among people with (Hu et al., 2004) or without type 2 diabetes (Kavouras et al., 2007). And increasing exercise in frequency (Herbst et al., 2006) or duration (Tiruneh, 2009) also reduced BMI. On the other hand, we found that obese participants were associated with higher probability of meeting PA recommendations and improvement in PA. Cardiovascular diseases, the world's largest killers, claim 17.1 million lives a year according to the data from the World Health Organization. Despite it's beneficial for patients with cardiovascular disease to have a lifestyle including physical activities, healthy diet, moderate alcohol use, not smoking, and maintaining a healthy weight, only a small proportion of adults follow this healthy lifestyle pattern(Stampfer et al., 2000; Chiuve et al., 2006; Reeves and Rafferty, 2000) However, in this study, individuals with cardiovascular diseases were more likely to meet physical activities recommendations and promote their physical activities level. It is probably because they were educated by AHB program and so decided to change.

For other factors, limits by problems, determination of doing physical activity were the two significant predictors affecting on physical activities improvement. We found that individuals who did physical activities with determination were more likely to increase physical activities to recommendations level. We found that almost half of the participants were classified to this group. It is likely because that the majority of the participants were women, and women concern their image and health status.

In conclusion, AHB was successful in improving physical activities. Our results suggest that preventive practices can be modified according to the aforementioned factors. In further, for demographic factors, the determinant of physical activity improvement gender was gender. For social-economic factors, number of children and employment status were determinants. For baseline health factors, determinants of improving physical activities were general health status, smoking, baseline BMI, hypertension and cardiovascular disease. For center characteristic, success in physical activity improvements were determined by group/individual-based program, program duration. For Other factors, the determinants were limits by problems and determination of doing physical activity.

CHAPTER VI

LIMITATIONS AND FUTURE WORK

This study is subject to three limitations. Firstly, this study was not based on a random sample. Second, there was no control group for the AHB interventions. Third, we deleted missing data by assuming missing by random. The possible area for future research is to evaluate the AHB program success respect to awareness of health risk associated with physical inactivity, such as hypertension, high cholesterol, high blood sugar and obese.

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APPENDIX A

Table 1: Rates (%) of enrollment and completion by twenty factors. Total N is the number of participants who had both survey and outcome measurements at that time and previous time point(s).

		Start (N=2466)	Program-end(N=1530)	6-month-post(N=1118)
Demographic factors				
Gender	Male	20.2	19.7	19.0
	Female	78.0	78.4	79.2
	Missing	1.8	1.8	1.8
Age	18-44	34.8	31.2	29.2
	45-64	48.4	51.0	53.6
	65-91	16.2	17.3	17.0
	Missing	0.6	0.5	0.3
Marital Status	Married	63.3	64.8	66.4
	Single	33.1	32.0	30.4
	Missing	3.6	3.1	3.2
Birth Country	US	19.7	18.7	18.2
	Mexico	77.5	79.3	80.1
	Other	1.2	0.8	0.6
	Missing	1.6	1.2	1.1
Social-economic factors				
Employment	Employed &self-employed	32.0	29.6	29.7
	Unemployed & unable to work	22.0	21.0	18.7
	Homemaker	34.5	37.5	39.0
	Retired	10.5	11.0	11.5
	Missing	1.0	1.0	1.1
Education	Less than high school	44.8	46.1	45.4
	High school grad or some	38.5	37.1	36.9
	College (3 or 4 years)	13.7	14.2	14.8
	Missing	3.0	2.7	2.8
Income	Less than $10,000	42.1	42.0	40.8
	$10,000 to less than $20,000	31.4	32.2	32.6
	$20,000 to less than 30,000	13.5	14.5	15.2
	$30,000 and more	6.9	6.9	7.2
	Missing	6.1	4.4	4.2
Insurance	Yes	39.7	41.6	43.0
	No	55.6	55.4	54.8
	Missing	4.7	3.0	2.1

Number of children at home	0	41.0	44.4	45.6
	1	16.5	15.9	15.8
	2 or more	34.4	32.8	32.5
	Missing	8.0	6.9	6.1
	Only Spanish	47.9	50.3	50.2
Language	Equal or Spanish more than English	36.5	36.9	37.4
	otherwise	8.3	6.9	6.6
	Missing	7.3	5.9	5.8
Baseline health factors				
General health status	Good, very good and excellent	38.2	37.5	39.5
	Fair	50.2	51.4	50.4
	Poor	10.0	9.8	9.0
	Missing	1.5	1.2	1.1
Diabetes	No	60.6	58.7	58.9
	Yes	36.1	39.0	39.1
	Missing	3.3	2.4	2.1
BMI	Undernormal	0.3	0.2	0.1
	Normal	9.0	9.0	9.1
	Overweight	29.0	29.2	29.5
	Obese	56.4	59.2	59.7
	Missing	5.3	2.5	1.6
Baseline HbA1c	HbA1c<6	36.7	40.1	42.6
	HbA1c>=6	47.9	52.2	51.5
	Missing	15.3	7.7	5.9
Smoking	Non-smoker	72.8	73.3	73.1
	Former smoker	16.1	16.8	16.5
	Current smoker	9.0	8.1	8.5
	Missing	2.0	1.8	1.9
Hypertension	No	50.2	48.1	48.3
	Yes	46.4	49.4	49.9
	Missing	3.4	2.5	1.8
Cardiovascular	Yes	7.4	7.8	7.5
	No	82.6	83.7	85.4
	Unknown	7.2	6.1	5.4
	Missing	2.9	2.4	1.7
Other factors				
Family history of diabetes	With family history	58.0	58.8	59.2
	Without family history	31.1	31.3	31.3
	Unknown	8.4	7.9	7.8
	Missing	2.4	2.0	1.7
Limits by problems	Yes	25.3	25.6	24.9
	No	71.7	72.0	73.1
	Missing	3.1	2.4	2.1
Determination	Determined & PA	48.6	49.0	50.4
	Determined or PA	40.0	40.3	39.5
	Neither determined nor PA	9.7	9.6	9.1
	Missing	1.7	1.2	0.9

Table 2: The observed and the predicted frequencies for physical activity levels at baseline by logistic regression.

Observed	Did not meet PA recommendations	Predicted Met PA recommendations	% Correct
Did not meet PA recommendations	589	18	97.0
Met PA recommendations	111	26	19.0
Overall % correct			82.7

Table 3: Shows distributions of twenty factors based on physical activity status at baseline, and its logistic regression. P-values from Chi-squared tests of association are provided for those factors significantly (at 0.05 significance level) associated with the dependent variables.

	Chi-square tests		Logistic regression
	Meet physical activity recommendation	Not meet physical activity recommendation	Meet physical activity(ref: not meet)
Demographic factors			
Gender (ref: female)	P=0.010		
Male	24.7	75.3	1.41
Female	18.0	82.0	
Age (ref: 44 or younger)			
44 or younger	18.1	81.9	
45-64	19.7	80.3	0.75
65 or older	20.5	79.5	0.45* CI: 0.23-0.88 Wald: 5.40
Marital Status (ref: single)			
Married	20.2	79.8	1.06
Single	17.3	82.7	
Birth Country (ref: Mexico)			
US	16.4	83.6	0.77
Mexico	20.0	80.0	
Social-economic factors			
Employment (ref: employed & self-employed)	P=0.001		
Employed & self-employed	16.0	84.0	
Unemployed & unable to work	21.9	78.1	1.34
Homemaker	17.7	82.3	1.24
Retired	29.9	70.1	2.43* CI: 1.36-4.35 Wald: 8.98
Education (ref: College (3 or 4 years))			
Middle school or less	20.9	79.1	1.24
High School grad or some	16.4	83.6	0.88
College (3 or 4 years)	21.0	79.0	
Income (ref: less than $10,000)			
less than $10,000	19.7	80.3	
$10,000 to less than $20,000	18.8	81.2	1.07
$20,000 to less than $30,000	20.3	79.7	1.12
$30,000 and more	17.3	82.7	1.00
Insurance (ref: no)	P=0.023		

Yes	22.1		77.9	1.12
No	17.2		82.8	
Number of children at home (ref:0)				
0	20.7		79.3	
1	18.4		81.6	1.17
2 and more	17.7		82.3	1.06
Language (ref: only Spanish)				
Equal or Spanish more than English	19.0		81.0	0.86
English more than Spanish	17.2		82.8	1.20
Only Spanish	19.8		80.2	
Baseline Health Factors				
Self-reported health condition (ref: poor)		P=0.048		
good, very good and excellent health	21.9		78.1	2.05* CI: 1.12-3.76 Wald: 5.39
Fair	18.5		81.5	1.51
Poor	13.3		86.7	
Diabetes (ref: yes)				
No	18.1		81.9	0.88
Yes	21.0		79.0	
Body Mass Index (ref: normal)		P=0.016		
Normal	23.1		76.9	
Overweight	22.8		77.2	0.77
Obese	16.7		83.3	0.53* CI: 0.32-0.89 Wald: 5.87
Baseline HbA1c (ref: HbA1c>=6)				
HbA1c<6	19.4		80.6	1.08
HbA1c>=6	19.2		80.8	
Smoking (ref: non-smoker)				
Non-smoker	19.9		80.1	
Former Smoker	17.4		82.6	0.79
Current Smoker	17.6		82.4	0.96
Hypertension (ref: yes)	P=0.009			
No	16.5		83.5	0.67* CI: 0.49-0.94 Wald: 5.57
Yes	22.0		78.0	

Cardiovascular diseases (ref: no)			
Yes	28.0	72.0	1.75* CI: 1.02-3.22 Wald: 4.11
No	18.6	81.4	
Unknown	19.0	81.0	1.18
Other factors			
Family history of diabetes (ref: with family history)			
With family history	19.3	80.7	
Without family history	20.2	79.8	0.87
Unknown	16.2	83.8	0.80
Limits by problems (ref: no)			
Yes	18.0	82.0	1.08
No	19.8	80.2	
Determination (ref: DPA3)	P=0.000		
DPA1	32.6	67.4	7.45* CI: 3.63-15.29 Wald: 29.89
DPA2	6.1	93.9	1.03
DPA3	6.6	93.4	

Table 4: percentages for success, minor success and failure of physical activity improvements. Numbers of valid cases in the analysis are also listed. The 95% confidence intervals for success rates are reported in parentheses.

	No. of valid	Success (%)	Minor success (%)	Failure (%)
End-of-Program	1020	22.5 (20.0-25.1)	10.7 (8.8-12.6)	66.8 (63.9-69.7)
6 Months Later	744	23.4 (20.4-26.4)	9.8 (7.7-11.9)	66.8 (63.4-70.2)

Table 5: The observed and the predicted frequencies for physical activity improvement at program end by multinomial regression.

Observed	Predicted			
	Failure	Minor success	Success	% Correct
Failure	664	16	1	97.5
Minor success	89	19	1	17.4
Success	220	7	3	1.3
Overall % correct				67.3

Table 6: Results from chi-square tests and multinomial logistic regression for physical activity improvements at the end of the program.

	Chi-square tests			Multinomial regression		
				ref: failure		ref: minor success
	Success	Minor success	Failure	Minor success	Success	Success
Demographic factors						
Gender (ref: female)		P=0.015				
Male	26.9	14.7	58.4	1.50	1.80* CI: 1.16-2.82 Wald: 6.74	1.21
Female	21.5	9.7	68.8			
Age(ref: 44 or younger)						
44 or younger	23.5	10.5	66.0			
45-64	23.3	10.4	66.2	0.83	0.98	1.17
65 or older	18.3	11.8	69.8	0.56	0.63	1.14
Marital Status (ref: single)						
Married	22.9	11.9	65.3	1.40	1.07	0.77
Single	21.9	8.1	70.0			
Birth Country (ref: Mexico)						
US	21.0	7.7	71.3	0.52	0.82	1.58
Mexico	22.9	11.4	65.7			
Social-economic factors						
Employment (ref: Employed & self-employed)		P=0.025				
Employed & self-employed	22.5	10.1	67.4			
Unemployed & unable to work	23.7	8.5	67.8	0.65	1.23	1.90
Homemaker	22.8	9.5	67.8	0.77	1.30	1.68
Retired	19.6	21.6	58.8	2.77* CI: 1.16-6.61 Wald: 5.25	1.23	0.45
Education (ref: College (3 or 4 years))						
Middle school or less	22.0	10.9	67.1	0.87	0.89	1.02
High School grad or some	23.2	8.6	68.2	0.54	0.92	1.71
College (3 or 4 years)	22.9	15.0	62.1			
Income (ref: less than $10,000)						
less than $10,000	24.3	9.2	66.4			

$10,000 to less than $20,000	20.3	12.5	67.2	1.27	0.72	0.57
$20,000 to less than $30,000	23.9	11.3	64.8	1.02	0.78	0.76
$30,000 or more	19.2	9.6	71.2	0.59	0.51	0.86
Insurance (ref: no)						
Yes	22.5	12.0	65.5	0.71	1.13	1.59
No	22.6	9.7	67.7			
Number of children (ref: 0)						
0	22.5	11.2	66.3			
1	20.1	8.6	71.3	0.93	0.83	0.89
2 or more	23.8	11.0	65.2	1.55	1.02	0.66
Language (ref: Only Spanish)						
Only Spanish	22.2	10.6	67.2			
Equal or Spanish more than English	22.9	10.9	66.1	1.01	1.07	1.06
Only English or English more than Spanish	23.6	9.7	66.7	2.45	1.46	0.60
Baseline Health Factors						
Self-reported health condition (ref: poor)						
good, very good and excellent health	24.6	12.0	63.4	1.56	1.06	0.68
Fair	20.5	10.6	68.9	1.46	0.83	0.57
Poor	25.5	5.9	68.6			
Diabetes (ref: yes)						
No	22.6	10.0	67.5	0.83	1.08	1.30
Yes	22.5	11.8	65.7			
Body Mass Index (ref: normal)						
Normal	24.2	14.3	61.5			
Overweight	20.1	13.8	66.1	0.68	0.81	1.18
Obese	23.6	8.5	67.9	0.44* CI: 0.20-0.97 Wald: 4.16	0.95	2.18
Baseline HbA1c (ref: HbA1c>=6)						
HbA1c<6	23.0	9.7	67.3	0.74	1.05	1.43
HbA1c>=6	22.2	11.5	66.3			
Smoking (ref: Non-Smoker)						
Non-Smoker	22.2	11.3	66.5			
Former Smoker	22.6	9.6	67.8	0.77	0.86	1.23
Current Smoker	67.1	7.1	25.9	0.70	1.06	1.51
Hypertension (ref: yes)						
No	21.0	9.6	69.4	0.56* CI: 0.34-	0.67* CI: 0.47-	1.18

				0.95 Wald: 4.63	0.95 Wald: 5.10	
Yes	24.1	11.7	64.2			
Cardiovascular(ref : no)						
Yes	19.4	13.9	66.7	1.33	0.80	0.60
No	22.9	10.3	66.9			
Unknown	21.2	13.5	65.4	1.47	0.82	0.56
Center characteristics						
Overall program quality (ref: low quality)						
High quality	25.2	12.2	62.6	0.80	0.86	1.08
Low quality	22.2	10.5	67.3			
Group (ref: individual)						
Individual	18.7	8.8	72.5			
Grouped program	24.0	11.4	64.7	0.92	2.07	2.26
Program duration (ref: 8 weeks)		P=0.001				
5 weeks	18.6	25.6	55.8	3.80	0.64	0.17
8 weeks	22.4	11.9	65.7			
9 weeks	24.5	15.3	60.3	1.74	0.74	0.42
10 weeks	21.4	10.0	68.7	0.76	0.47* CI: 0.23-0.98 Wald: 4.07	0.62
12 weeks or longer	22.8	5.6	71.6	0.63	0.78	1.24
Curriculum (ref: adapted)						
Adapted	22.2	11.9	65.9			
Developed	23.2	8.7	68.2	0.49	0.91	1.85
Other factor						
Family history of diabetes (ref: With family history)						
With family history	23.2	9.2	67.6			
Without family history	22.4	13.7	63.9	1.50	0.99	0.66
Unknown	18.4	10.3	71.3	1.12	0.66	0.59
Limits by problems (ref: no)						
Yes	21.0	8.2	70.8	0.85	0.85	1.00
No	23.1	11.6	65.3			
Determination (ref: DPA3)		P=0.000				
DPA1	22.2	19.0	58.7	14.07* CI: 3.24-61.17 Wald: 12.43	1.14	0.08* CI: 0.02-0.37 Wald: 10.54
DPA2	22.7	2.7	74.7	1.58	0.98	0.62
DPA3	23.8	2.0	74.3			

Table 7: The observed and the predicted frequencies for physical activity improvements at post six months of the program end by multinomial regression.

Observed	Predicted			
	Failure	Minor success	Success	% Correct
Failure	459	8	30	92.4
Minor success	50	15	8	20.5
Success	137	6	31	17.8
Overall % correct				67.9

Table 8: Results from chi-square tests and multivariate logistic regression for physical activity improvements at the post time point.

	Chi-square tests			Multinomial regression		
				ref: failure		ref: minor success
	Success	Minor success	Failure	Minor success	Success	Success
Demographic factors						
Gender (ref: female)						
Male	27.5	11.6	60.9	1.66	1.55	0.93
Female	22.4	9.4	68.2			
Age(ref: 44 or younger)						
44 or younger	20.4	9.3	70.4			
45-64	26.4	9.7	63.9	0.83	1.55	1.72
65 or older	18.3	11.3	70.4	0.43	0.65	1.51
Marital Status (ref: single)						
Married	24.2	10.7	65.1	0.96	0.66	1.10
Single	21.5	7.8	70.8			
Birth Country (ref: Mexico)						
US	20.0	8.3	71.7	0.84	0.50	1.05
Mexico	24.2	10.2	65.6			
Social-economic factors						
Employment (ref: Employed & self-employed)						
Employed & self-employed	24.1	6.5	69.4			
Unemployed & unable to work	20.6	10.3	69.1	1.40	1.17	0.84
Homemaker	24.7	10.3	65.0	2.14	1.42	0.66
Retired	21.1	17.1	61.8	3.09	1.05	0.34
Education (ref: College (3 or 4 years))						
Middle school or less	22.2	10.5	67.2	1.63	0.99	0.61
High School grad or some	24.5	8.3	67.1	1.05	1.11	1.05
College (3 or 4 years)	24.1	11.2	64.7			
Income (ref: less than $10,000)						
less than $10,000	23.6	8.9	67.4			
$10,000 to less than $20,000	24.7	11.4	63.9	1.21	0.96	0.79
$20,000 to less than $30,000	24.6	10.2	65.3	1.10	0.86	0.78
$30,000 or more	13.8	6.9	79.3	0.69	0.42	0.62
Insurance (ref: no)		P=0.017				
Yes	26.1	12.4	61.5	1.38	1.55	0.76
No	21.3	7.8	70.9			

Number of children (ref: 0)						
0	26.1	10.6	63.3			
1	14.4	9.1	76.5	1.04	0.46* CI: 0.25-0.84 Wald: 6.42	0.44
2 or more	24.2	8.9	66.9	0.98	0.94	0.96
Language (ref: Only Spanish)						
Only Spanish	23.1	9.9	67.0			
Equal or Spanish more than English	25.6	10.0	64.4	0.81	1.17	1.46
Only English or English more than Spanish	13.5	7.7	78.8	0.91	0.81	0.89
Baseline Health Factors						
Self-reported health condition (ref: poor)		P=0.028				
good, very good and excellent health	27.0	12.4	60.6	4.97* CI: 1.13-21.76 Wald: 4.52	1.34	0.27
Fair	20.4	8.7	70.9	2.69	0.94	0.35
Poor	23.2	4.3	72.5			
Diabetes (ref: yes)						
No	24.5	9.6	65.9	0.93	1.43	1.53
Yes	21.8	10.1	68.1			
Body Mass Index (ref: normal)						
Normal	16.9	15.4	67.7			
Overweight	24.3	11.5	64.2	0.81	1.83	2.26
Obese	23.8	8.2	68.0	0.61	1.88	3.10* CI: 1.03-9.38 Wald: 4.02
Baseline HbA1c (ref: HbA1c>=6)						
HbA1c<6	23.5	9.5	67.1	0.98	0.92	0.93
HbA1c>=6	23.3	10.1	66.6			
Smoking (ref: Non-Smoker)		P=0.025				
Non-Smoker	21.3	11.7	67.0			
Former Smoker	29.0	4.6	66.4	0.32 * CI: 0.12-0.88 Wald: 4.94	1.39	4.30* CI: 1.52-12.14 Wald: 3.43
Current Smoker	29.7	4.7	65.6	0.41	1.51	3.64
Hypertension (ref: yes)						
No	22.7	9.8	67.5	0.99	0.92	0.93
Yes	24.1	9.8	66.1			
Cardiovascular(ref: no)		P=0.006				
Yes	22.2	22.2	55.6	3.52* CI: 1.38-9.00	1.18	0.34 CI: 0.12-0.96

				Wald: 6.94		Wald: 4.15
No	23.5	8.8	67.7			
Center characteristics						
Overall program quality (ref: low quality)						
High quality	20.3	10.9	68.8	0.17	0.63	3.78
Low quality	23.7	9.7	66.6			
Group (ref: individual)		P=0.000				
Individual	14.9	5.9	79.2			
Grouped program	26.6	11.3	62.2	1.98	2.26* CI: 1.18-4.31 Wald: 6.09	1.14
Program duration (ref: 8 weeks)		P=0.000				
5 weeks	23.7	23.7	52.6	0.49	0.46	0.94
8 weeks	13.5	5.6	80.9			
9 weeks	16.3	12.4	71.3	1.35	0.51	0.38
10 weeks	32.7	11.7	55.6	1.42	1.24	0.88
12 weeks or longer	24.7	5.8	69.5	0.31	0.56	1.81
Curriculum (ref: adapted)						
Adapted	22.0	9.9	68.1			
Developed	25.4	9.7	64.9	3.63	2.53	0.70
Other factors						
Family history of diabetes (ref: With family history)						
With family history	23.1	10.6	66.4			
Without family history	24.3	9.5	66.2	0.66	0.95	2.61
Unknown	22.4	5.2	72.4	0.36	0.95	1.44
Limits by problems (ref: no)		P=0.020				
Yes	16.1	10.4	73.6	1.33	0.57* CI: 0.34-0.95 Wald: 4.59	0.43* CI: 0.20-0.95 Wald: 4.38
No	26.0	9.6	64.4			
Determination (ref: DPA3)		P=0.000				
DPA1	24.9	17.6	57.5	8.62* CI: 1.92-38.63 Wald: 7.92	1.47	0.17* CI: 0.03-0.85 Wald: 4.69
DPA2	22.6	1.4	76.0	0.49	1.14	2.31
DPA3	17.9	3.0	79.1			

Note: DPA1: doing physical activity with determination

DPA2: doing physical activity without determination, or determined without physical activity

DPA3: neither determined nor doing physical activity

BIOGRAPHICAL SKETCH

She is ambitious to be professional in applying theoretical knowledge into practices. She completed her master's in mathematics, the University of Texas-Pan American, Edinburg, Texas, in May, 2012. During the two years in master's program, she focused on applied statistics. She obtained her bachelor's degree in Mechanical Engineering, the Zhejiang Sci-Tech University, Hangzhou, Zhejiang in June, 2010. In the area of Mechanical Engineering, she was applying comprehensive theoretical knowledge, including physics, mathematics, electronic science, and so on.

Being a teaching assistant in math department in UTPA for two years, she got good grades in teaching evaluations. She taught math 1334, intermediate algebra four sections and taught Math 2330 two sections. The greatest success is her encouragement to her students to be confident in math learning. She convinced them that math was just like an interesting language, and everyone could learn it well. Another success for her in teaching was organizing group study, and game study, which made her students learn more effectively and efficiently.

She concentrated on applied statistics. Besides doing thesis using statistical methods, she also made several presentations on the area of statistics. They were all about the physical activities among Hispanics. She can be contacted via email lxu@broncs.utpa.edu.