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The Effects of Gender and Country of Origin on Acculturation, Psychological Factors, Lifestyle Factors, and Diabetes-Related Physiological Outcomes Among Mexican Americans: The Starr County Diabetes Prevention Initiative

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Abstract

Objectives: Examine acculturation and psychological, lifestyle, and physiological factors based on gender and country of origin (U.S. vs. Mexico).

Methods: Baseline data from the Starr County diabetes prevention study (*N*=300) were analyzed — acculturation (*language*), psychological factors (*depression*), lifestyle factors (*sedentary behaviors*), and diabetes-related physiological outcomes (*insulin resistance*). MANOVA and linear regression were used to examine variable relationships based on gender and country of origin and identify predictors of depression and insulin resistance.

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Ethical approval: Ethical approval for the study was obtained from the Institutional Review Boards of both participating universities — IRB #2016120040 and IRB #HSC-SPH-03-056.

Informed Consent: Written informed consent was obtained from all subjects before the study.

Results: Participants were: predominantly female (73%); 51 years of age, on average; born in Mexico (71%); and Spanish-speaking. Individuals spent 11 of their waking hours (range=0–18 hours) in sedentary activities. Compared to females, more males spoke English and reported fewer hours in sedentary activities. Compared to participants born in Mexico, those born in the U.S. were more likely to: speak English; report depressive symptoms; and exhibit elevated BMI and insulin resistance rates. Two distinct models significantly predicted *depression* (R^2=14.5%) and *insulin resistance* (R^2=26.8%), with acculturation-language entering into both models.

Discussion: Significant gender and country-of-origin differences were found. Future research on diabetes prevention should examine other Hispanic subgroups and strategies for addressing individual differences, while employing cost-effective group interventions that incorporate these differences and reach more at-risk individuals.

Trial Registration: ClinicalTrials.gov: NCT03208010

https://clinicaltrials.gov/ct2/show/NCT03208010

Keywords

Prediabetes; gender; acculturation; depression; Hispanics

Introduction

For more than 30 years, the Starr County Border Health Initiative has designed and tested diabetes self-management education and support interventions (DSMES) culturally tailored for Mexican Americans along the Texas-Mexico border. Starr County, the site of this work, is designated as a Health Professional Shortage/Medically Underserved Area.[1] Residents have significant financial and literacy challenges and most speak Spanish only.[2] An epidemic of type 2 diabetes mellitus (T2DM) along the border has been documented since 1983.[3] Diabetes rates will increase substantially if effective strategies are not found to reverse this trajectory.[4]

The major precursor to T2DM is abdominal obesity, which is associated with insulin resistance, elevated cholesterol, hypertension, cardiovascular events, and premature deaths.[5–7] Obesity rates are exacerbated in Mexican Americans.[8–10] Lifestyle changes sufficient to reduce obesity are difficult and even more challenging among impoverished populations, not only in Starr County or similar U.S.-Mexico border settings, but also in comparable communities throughout the U.S. The National Diabetes Prevention Program (DPP)[11] demonstrated that moderate activity and losing ≥7% of body weight resulted in the largest reduction in diabetes risk (58%) in persons with impaired glucose tolerance (IGT). The lifestyle arm of the DPP included only 173 Hispanics recruited from large urban areas.[12] In contrast, Starr County is typical of many poor, rural U.S.-Mexico border communities that cumulatively represent a substantial portion of the U.S. Hispanic population.

Recent Starr County work found an annual diabetes incidence of 1.79%; in individuals with verified *prediabetes*, the rate was 3.48%.[13] All untoward conditions associated with T2DM — obesity, hypertension, left ventricular hypertrophy, endothelial dysfunction, aortic stiffness — are already elevated in persons with prediabetes.[13] Thus, prediabetes represents a target where prevention can slow the transition to overt diabetes and delay/prevent development of comorbidities.[14]

Few diabetes prevention programs have been tested in rural and/or U.S.-Mexico border settings, so we developed the Rio Grande Valley Diabetes Prevention Program (RGV-DPP). Such programs must incorporate the cultural values of the targeted population. For Spanish-speaking Mexican Americans, programs must emphasize positive social interactions, cultural food choices, and language preferences.[15] Without prevention, an even greater diabetes burden is anticipated in this rapidly growing ethnic group that by 2060 is expected to comprise 31% of the U.S. population.[16]

Analyses here document the baseline health status of Mexican Americans with prediabetes participating in the RGV-DPP to identify those characteristics critical to designing culturally-tailored prevention programs. The purpose of this paper is three-fold: 1) describe the demographic characteristics of study participants and their acculturation, psychological and lifestyle factors, and diabetes-related physiological outcomes; 2) examine the degree to which gender and country of origin (i.e., birthplace, U.S. vs. Mexico) affect acculturation, psychological factors, lifestyle factors, and diabetes-related physiological outcomes; and 3) identify predictors of psychological (*depression*) and diabetes-related physiological health (*insulin resistance*). (Figure 1)

Methods

This study involved analyses of baseline data (N=300) collected between March 2018 and September 2019. A Research Field Office located in Rio Grande City, the county seat, served as the operations center for this and all previous investigations. Rio Grande City, current population of 14,408, is surrounded by *colonias;* unincorporated settlements along the border characterized by poverty, pollution, and deprivation. The 2019 average per capita income in Starr County was $14,179; 32.5% of the 64,633 residents live in poverty and 96.4% of the population is Mexican American, compared to 39.7% for the rest of Texas.[2,17]

RGV-DPP participants were recruited from *colonias* and population centers of Starr County if they: 1) were between 25 and 55 years old; 2) reported no prior diabetes diagnosis (except gestational); and 3) had verified prediabetes, defined as a) impaired fasting glucose (≥100 and <126 mg/dL), b) impaired glucose tolerance (≥140 and <200 mg/dL on 2-hour post-load glucose), and/or c) HbA1C ≥5.7% and <6.5%. Persons were excluded if they: 1) were diagnosed with diabetes at baseline; 2) ever used a hypoglycemic medication (except during pregnancy); 3) were currently pregnant or within 3 months postpartum; or 4) had medical conditions for which changes in diet and/or physical activity would be contraindicated (e.g., heart failure or renal disease requiring special diets and/or restricted physical activity).

Ethical approval for the study was obtained from the Institutional Review Boards of The University of Texas at Austin (IRB #2016120040) and the University of Texas Health Science Center at Houston (IRB #HSC-SPH-03–056). Spanish or English consent forms were signed by all participants. Since literacy was a potential problem, trained bilingual staff read consent forms aloud in Spanish, as needed, and responded to questions.

Figure 1 depicts the measures selected for each of the four constructs included in these analyses. For *acculturation*, preferences for language and food were measured — higher scores indicated greater use of English and American foods, respectively. Additionally, data were collected on country of origin (i.e., birthplace) and years of residence in Starr County. For *psychological factors*, the Patient Health Questionnaire-9 (PHQ-9) was used to screen for potential depression, a factor known to be associated with diabetes; higher scores indicated more depressive symptoms.[18,19] A PHQ-9 score of ≥10 has been reported to have both sensitivity and specificity of 88% for diagnosing major depression.[19] The Weight Efficacy Lifestyle Questionnaire-Short Form (WEL-SF, Spanish language version) was used to measure confidence in the ability to make healthy dietary choices for weight control; lower scores indicated higher levels of self-efficacy. Spanish and English versions of the WEL-SF are easily administered and psychometrically valid.[20] *Lifestyle factors* included measures related to dietary intake (Fat Avoidance Scale [FAS]) and hours per day of sedentary activity, e.g., watching TV or sitting at a computer, excluding hours spent sleeping. Also measured were smoking behaviors (pack years) and alcohol intake (grams per week). The Fat Avoidance Scale (FAS), a brief 7-item fat intake scale developed specifically for Spanish-speaking Mexican Americans, was used to determine the degree to which individuals employed healthier fats in their diet.[21] Questions are specific to Mexican-American foods, e.g., "When you eat refried beans, what type of fat are they made with?" Scores on the FAS range from 0 to 1; higher scores indicate avoidance of higher dietary fat intake. Sedentary behavior was selected as a measure of activity due to its relationship with the development of T2DM.[22] For *diabetes-related physiological outcomes*, six key indicators of overweight/obesity and metabolic factors were measured — insulin resistance (HOMA-IR), fasting and two-hour post-load glucose (YSI Biochemistry Analyzer, Yellow Springs, OH, average of 2 separate measurements), glycosylated hemoglobin (HbA1c, Siemens DCA Vantage, Malvern, PA), Body Mass Index (kg/m^2), and Visceral Adiposity Index (VAI, based on waist circumference, BMI, triglycerides, and HDL cholesterol). The homeostasis model assessment (HOMA-IR) is a reliable indicator of insulin resistance that has been validated for Mexican Americans.[23] The VAI is a mathematical index associated with insulin sensitivity and cardiovascular risk.[24]

A Microsoft Excel computer database was created for data management.[25] Data were double entered and checked for accuracy, completeness, and range of values; then imported into SPSS Statistics Version 26.0 for analyses.[26] Alpha levels were adjusted to p=.01 to correct for repeated significance testing.[27] Descriptive statistics (e.g., frequencies, means) were used to describe participants on categorical and continuous measures. MANOVA was used to examine the main and interaction effects of gender and country of origin. Benefits of MANOVA include enhanced statistical power and fewer statistical tests since multiple independent variables can be included simultaneously.[28] Forward stepwise multiple linear regression was used to determine the best predictors of two key health indicators, psychological status (*depression*) and diabetes-related physiological health (*insulin resistance*). The forward stepwise option was selected since there was no *a priori* hierarchy suggesting a specific variable entry order.

Power analyses for the parent study indicated that a total sample of 300 provided a power of 86.6% based on the priority health outcome of weight loss. For this sub-study, the power equals or exceeds 80%, the desired minimum level, for both the MANOVA and regression analyses.[29]

Results

Characteristics of Study Participants

Table 1 depicts the overall characteristics of enrollees (N=300). Individuals were predominantly female (73%) and averaged 51 years of age (SD=7.9, range=35–69 years); mean years of education was 10 (SD=3.7, range=0–20 years). A majority was born in Mexico (71%); individuals reported residing in Starr County for 32.9 years, on average (SD=11.9, range=5–65 years). Participants were predominantly Spanish-speaking and tended to eat both Mexican and American foods. They scored relatively low on the depression scale (M=2.6) and marginally on eating self-efficacy (M=3.0). However, 17 (5.7%) individuals had a PHQ-9 score of ≥10, which could indicate potential major clinical depression. Scores on fat avoidance were low, suggesting that individuals were not using recommended strategies to reduce fat intake. On average, individuals spent most of their waking hours (M=11.1 hours, median=12 hours) in sitting activities; sedentary behaviors ranged from 0 to 18 hours per day. Approximately 27% of the participants were current or former smokers, reporting 11 pack years on average; and 35% reported drinking alcohol. For those drinking alcohol (n=105), weekly intake averaged 84 grams (median=22.7 grams). Eighty grams of alcohol per week is equivalent to 1 liter of wine, 8 standard sized beers, or ½ pint of hard liquor. Among drinkers, a wide range (2.6–938 grams per week) was observed. Body Mass Index (M=32.5) indicated an obese sample in general with a Visceral Adiposity Index (VAI) of 6.0, which is considered high.[30] Participants had significant insulin resistance consistent with their prediabetes.

Differences Based on Gender and Country of Origin/Birthplace

Table 2 shows results of analyses based on gender and country of origin. Both measures consistently correlate with other model variables (Figure 1) and are potential influencing factors to be considered when designing future lifestyle programs.

For *Acculturation* variables, males were significantly more likely to prefer English (p=.008), including preferring media in English (p=.01), compared to females. There were significant country-of-origin differences for language preference (p=<.001) and preferred media language (p=<.001). A gender by country-of-origin interaction was statistically significant for language preference (p=.002) and for preferred media language (p=.008). For both language-based variables, males and females born in Mexico scored low on acculturation-language variables, i.e., spoke Spanish solely; whereas gender differences existed in acculturation-language for individuals born in the U.S., with males being more likely to speak English or use English-language media than females. As expected, significant language acculturation differences were found between those who lived in Starr County longer compared to more recent immigrants (p=<.001).

For the *Psychological Factors* of depression and eating self-efficacy, the only significant effects were found for country of origin; U.S.-born individuals scored higher on the depression scale compared to those born in Mexico (p=<.001). No significant gender:country-of-origin interaction effects were detected.

For *Lifestyle Factors* of fat avoidance, sedentary behaviors, smoking, and alcohol use, no main effects for country of origin were found. Statistically significant gender effects were found for fat avoidance (p=<.001), hours of sedentary behaviors (p=.006), and alcohol intake (p=<.001). Compared to males, females were significantly more likely to use fat avoidance dietary strategies (p=<.001), and reported more sedentary behaviors (p=<.006), but lower rates of smoking and alcohol intake (p=<.001). A significant gender by country-of-origin interaction was found only for sedentary behaviors (p=.01). Males and females born in the U.S. reported similar sedentary behavior levels (approximately 11 hours per day, a large portion of their waking hours), while significant gender differences existed for individuals born in Mexico; males reported lower levels of sedentary behaviors than females, approximately 9.9 vs. 11.5 hours per day, respectively. To examine sedentary behaviors further, an exploratory correlational analysis was conducted. A significant bivariate inverse correlation was found between sedentary behavior and the nature of job held, r=−.24, p=.001, with higher sedentary hours negatively associated with holding a job (ordinal scale) requiring less physical activity.

For *Physiological Outcomes* (BMI, VAI, fasting insulin, HOMA-IR, fasting plasma glucose, two-hour post-load glucose, HbA1c), statistically significant gender effects were found for fasting insulin (p=.009) and HOMA-IR (p=.01), with females having lower mean values than males. Significant country-of-origin effects were found for BMI, fasting insulin, and HOMA-IR, with U.S. born persons showing higher levels of all three measures. A significant gender by country-of-origin interaction was detected for BMI (p=.01). For individuals born in the U.S., males had higher BMI levels than females, approximately 36 vs. 33, respectively. For those born in Mexico, however, females had higher BMI levels than males although the gender gap was less, approximately 32 vs. 31, respectively.

Predictors of Depression and Insulin Resistance

Depression and insulin resistance were selected as dependent variables in regression analyses based on their importance to the health of persons with prediabetes and potential role in future conversion to T2DM (Tables 3 and 4).[31,32] For *Depression*, three variables contributed significantly to the predictive model (p=<.001) — acculturation (language), eating self-efficacy, and gender; in this model, 14.5% (adjusted R^2) of the variability in the depression scale was explained by the combination of these three variables. For *Insulin Resistance*, three variables contributed significantly to the predictive model (p=<.001) — Visceral Adiposity Index (VAI), acculturation (language), and fat avoidance; 26.8% (adjusted R^2) of the variability in insulin resistance was explained by these three variables. Note the importance of acculturation (language) in its effects on both *depression* and *insulin resistance*.

Discussion

The purpose was to characterize a growing Mexican-American population with verified prediabetes; examine acculturation, psychological and lifestyle factors, and physiological health outcomes according to gender and country of origin (U.S. vs. Mexico); and determine significant predictors of depression and insulin resistance that influence future conversion to T2DM.[31,32]

Participants were, on average, 51 years old, female, and obese. Visceral Adiposity Index (VAI) was high, indicating cardiometabolic risk, regardless of whether individuals eventually develop T2DM.[33] Depression scores were relatively low, on average, and scores for self-confidence in making healthy dietary choices indicated moderate levels of self-confidence. Individuals reported high levels of sedentary behaviors. Glycemic indicators — insulin resistance, fasting plasma glucose, two-hour post-load glucose, and HbA1c — were consistent with study selection criteria for enrolling individuals with prediabetes.

Statistically significant gender and country-of-origin differences that were found, mediated by the number of years residing in the U.S., should be considered when designing intervention programs for prediabetes. While most participants spoke Spanish only, males were significantly more likely to speak English. Also, males tended to report fewer hours per day spent in sedentary activities, primarily due to the physical work associated with their jobs. The most common jobs held by males were cashier/sales and construction; for females, elder care and housework. Males were more likely to smoke and drink alcohol and were more insulin resistant than women. Compared to participants born in Mexico, those born in the U.S.: were more likely to speak English; reported higher depressive symptoms; had higher rates of obesity; and were more insulin resistant. Previous research investigating depression and diabetes suggested a bidirectional relationship, i.e., depression is a precursor to, as well as a consequence of, T2DM. A meta-analysis found that depression increases the risk of T2DM by 60%.[34,35] Similar relationships between diabetes and depression in Mexico have also been reported.[36] Among the Mexican Americans with prediabetes who participated in this study, ~6% reported high enough depression-related scores to suggest potential major depression.

In comparing these individuals from Starr County who had prediabetes versus those from previous studies who were diagnosed with T2DM, individuals across all studies demonstrated a mean baseline BMI of 32, consistent with obesity. HbA1c levels aligned with prediabetes in these individuals; for previous study participants diagnosed with T2DM, mean HbA1c levels were consistently 11.7% to 11.8%. This comparison gives a general picture of what the health of these participants with prediabetes will look like in coming years, if lifestyle changes are not made to divert their diabetes trajectories. Previous intervention studies with Mexican Americans in Starr County diagnosed with T2DM clearly demonstrated the difficulties associated with improving health outcomes in impoverished, underserved communities once people develop the disease.[37,38]

The challenges of designing culturally appropriate interventions for Hispanics are significant. The Hispanic population is not monolithic; significant differences exist in language, cultural norms, food preferences, etc., across Hispanic subgroups.[39] The data reported here were collected from a population that was relatively homogeneous, Mexican Americans who were either immigrants to or born in the U.S. Despite cultural commonalities among these individuals, significant differences still exist and pose challenges to intervention design and implementation. For example, a wide range of educational backgrounds was found (0–20 years). Research activities conducted in this community over the years have suggested that some individuals do not read or write in English or in Spanish; the exact literacy rates have not been documented due to fear of embarrassing or offending individuals. Using the same diabetes prevention strategies for all of these individuals is likely to be unsuccessful, at least for some group members. Intervention strategies may need to be stratified according to gender and language preference, at a minimum, so that contextual differences can be recognized and addressed. Interestingly, study participants have commonly expressed preferences for inclusion of all individuals in group intervention sessions. They freely helped one another with language and content comprehension difficulties even though all materials, interviewers, and instructors were bilingual. So, exploiting the empathic, supportive nature of the culture might be one way to address in a cost-effective manner some of the significant differences among these individuals.

In conclusion, the information presented here can inform the design of tailored health programs aimed at diabetes prevention. Perhaps the most important aspect of these results relates to the basic characterization of this growing, high-risk Hispanic sub-group, specifically Mexican Americans. Future research on diabetes prevention should examine the differences between and within other Hispanic subgroups. Additionally, researchers should explore strategies for addressing individual differences, while employing the more cost-effective group strategy. Recent review of the research evidence on diabetes prevention found that group strategies targeting high-risk individuals continue to be a cost-effective option.[40] A strategy might be to organize an inclusive intervention group that meets together but occasionally divides into “break-out” subgroups according to gender or age. Hispanics, the most vulnerable for developing prediabetes and future T2DM, should be prioritized for diabetes prevention strategies since T2DM in this minority group is already at epidemic levels and rates are increasing.[4]

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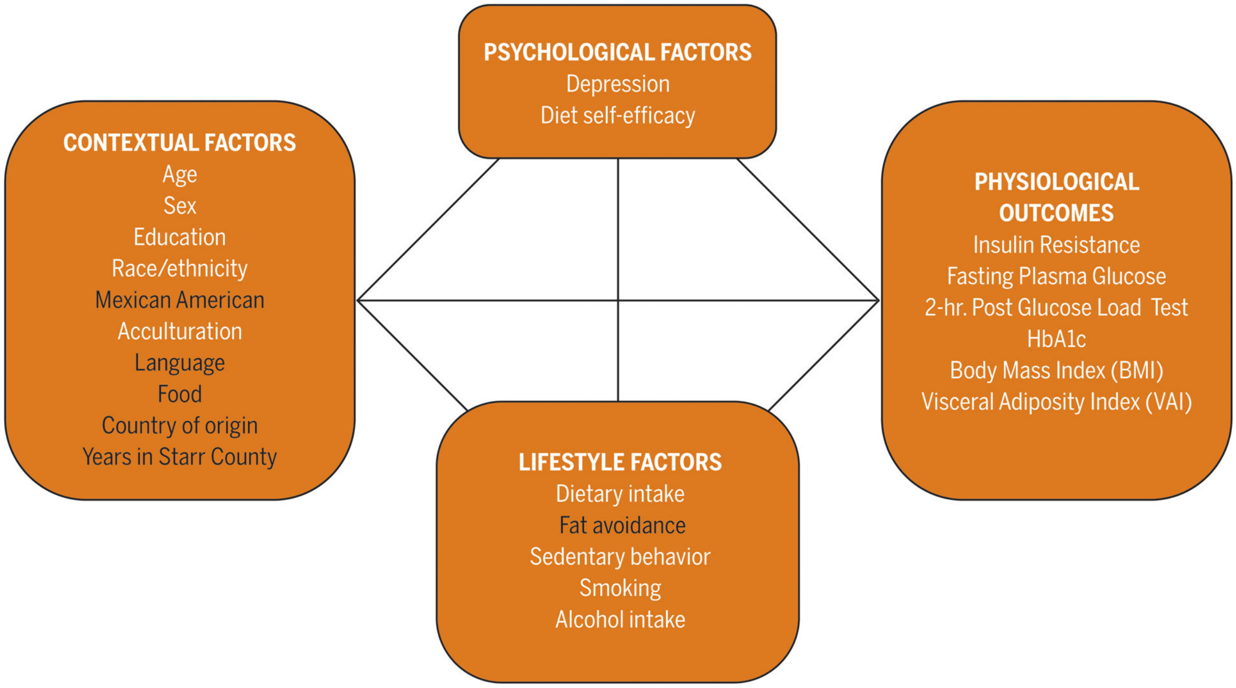

Figure 1. Theoretical Diabetes Prevention Model*

*Adapted from: Brown, S.A., Becker, B J., Garcia, A.A., Brown, A., & Ramirez, G. (2015). Model-driven meta-analysis for informing health care: A diabetes meta-analysis as an exemplar. Western Journal of *Nursing Research*, 37,517–535. Epub 19 August 2014. doi: 10.1177/0193945914548229.

Table 1.

Characteristics of Study Participants (Total Sample = 300)

Participant Characteristics	Frequency *n*	Frequency %	Mean ± SD	*n*	Range
DEMOGRAPHIC CHARACTERISTICS					
Gender					
• Females	219	73%			
• Males	81	27%			
Age (in years)			51.3±7.9	300	35…69
Years of education			9.9±3.7	296	0…20
• 1st quartile – 0 to 6 years	74				
• 2nd quartile – 7 to 10 years	80				
• 3rd quartile – 11 to 12 years	81				
• 4th quartile – 13 to 20 years	61				
Acculturation variables: *					
• Language preference			8.6±4.9	300	5…25
• Food preferences			2.6±0.7	300	1…4
• Country of origin					
-Mexico	213	71.0%			
-U.S.	87	29.0%			
• Years in Starr County			32.9±11.9	300	5…65
PSYCHOLOGICAL FACTORS					
Depression (PHQ-9) *			2.6±3.6	300	0…22
Eating self-efficacy (WEL-SF) *			3.0±1.0	300	1…7
LIFESTYLE FACTORS					
Fat Avoidance — Total Scale *			0.09±0.02	299	0.02…0.13
Sedentary behaviors (est. hrs/day) *			11.1±3.2	274	0…18
Smoking:					
Current smoker	33	11.0%			
Former smoker	48	16.0%			
Never smoker	219	73.0%			
Pack years			10.9±12.6	81	0…72
Alcohol intake (grams of ethanol/week)			29.5±95.0	300	0…937.8
PHYSIOLOGICAL OUTCOMES					
Body mass index (kg/m^2)			32.5±6.3	300	19…64
Visceral Adiposity Index (VAI) *			6.0±4.6	300	1.2…49.7
Insulin resistance: HOMA-IR			3.3±2.1	294	0.4…12.4
Fasting insulin (mIU/L)			22.3±15.2	294	3.1…98.6
Fasting plasma glucose (mg/dL)			103.5±9.6	300	81…136

Participant Characteristics	Frequency *n*	%	Mean ± SD	*n*	Range
2-hour post glucose load (mg/dL)			134.9±32.2	274	40…200
Glycosylated hemoglobin (HbA1c)			5.7±0.3	300	4.5…6.4

*MEASURES**: Acculturation/language and food scales — language has possible scores ranging from 5–25 and food preferences range from 1–5, higher scores indicate greater use of English and American foods, respectively; depression (PHQ-9) — higher scores indicate higher levels of self-reported depression; eating self-efficacy (WEL-SF) — lower scores indicate higher levels of confidence in making healthy food choices; sedentary behaviors — higher levels indicate more time per day spent in sedentary behaviors, such as working on the computer, watching TV; Fat Avoidance — mean scores range from 0 to 1, higher levels indicate behavior associated with avoiding high fat intake in the diet; VAI is a mathematical index that is based on waist circumference, BMI, triglycerides, and HDL cholesterol

Table 2.

Acculturation, Psychological Factors, Lifestyle Factors, and Physiological Outcomes, by Gender and Country of Origin

MEASURE	Gender	N	Mean ± SD	Country of Origin	N	Mean ± SD	Main Effects: Gender		Main Effects: Country of Origin		Gender by Country of Origin Interaction	
Acculturation												
Language preference	Male	81	9.7 (5.6)	Mexico	213	6.4 (2.5)	F = 7.1	*p*=.008	F=288.8	*p*=<.001	F = 9.9	*p*=.002
	Female	219	8.2 (4.6)	U.S.	87	14.0 (5.2)						
Food preferences	Male	81	2.5 (0.8)	Mexico	213	2.6 (0.7)	F = 3.8	*p* = .05	F = 3.7	*p* = .05	F = .05	*p* = .82
	Female	219	2.7 (0.7)	U.S.	87	2.7 (0.7)						
Preferred media language	Male	81	2.6 (1.7)	Mexico	213	1.7 (1.1)	F = 6.4	*p* = .01	F=198.0	*p*=<.001	F = 7.2	*p*=.008
	Female	219	2.2 (1.4)	U.S.	87	3.8 (1.4)						
Psychological Factors												
Depression	Male	81	2.2 (3.4)	Mexico	213	2.2 (3.2)	F = 1.5	*p* = .22	F = 13.4	*p*=<.001	F = .62	*p* = .43
	Female	219	2.8 (3.7)	U.S.	87	3.7 (4.3)						
Eating Self-efficacy	Male	81	2.7 (1.0)	Mexico	213	3.0 (1.0)	F = 5.2	*p* = .02	F = .70	*p* = .40	F = .49	*p* = .49
	Female	219	3.0 (1.1)	U.S.	87	2.9 (1.1)						
Lifestyle Factors												
Fat Avoidance	Male	80	0.08 (0.02)	Mexico	213	0.09 (0.02)	F=21.0	*p*=<.001	F = 1.0	*p* = .31	F = .00	*p* = .99
	Female	219	0.09 (0.02)	U.S.	86	0.08 (0.02)						
Activity — hrs. of sedentary behavior	Male	76	9.9 (3.9)	Mexico	194	11.0 (3.2)	F=7.7	*p*=.006	F = 4.0	*p* = .05	F = 6.6	*p* = .01
	Female	198	11.5 (2.8)	U.S.	80	11.3 (3.2)						
Smoking (pack yrs.)	Male	46	12.9 (14.3)	Mexico	51	9.7 (11.1)	F = .84	*p* = .36	F = 1.5	*p* = .22	F = 2.3	*p* = .13
	Female	35	8.3 (9.5)	U.S.	30	13.0 (14.8)						
AlcoholIntake	Male	75	93.9 (167.5)	Mexico	194	24.1 (77.4)	F=49.4	*p*=<.001	F = 2.9	*p* = .09	F = 1.5	*p* = .22
	Female	198	6.7 (24.2)	U.S.	79	46.6 (135.0)						
Physiological Outcomes												
Body Mass Index (BMI)	Male	81	32.6 (7.0)	Mexico	208	32.0 (6.0)	F = 0.8	*p* = .38	F = 9.0	*p* = .003	F = 6.3	*p* = .01
	Female	213	32.5 (6.0)	U.S.	86	33.8 (6.9)						
Visceral Adiposity Index	Male	81	6.3 (5.3)	Mexico	208	5.7 (4.7)	F = 0.3	*p* = .57	F = 1.9	*p* = .17	F = .04	*p* = .84
	Female	213	5.9 (4.4)	U.S.	86	6.6 (4.5)						

MEASURE	Gender	N	Mean ± SD	Country of Origin	N	Mean ± SD	Main Effects: Gender		Main Effects: Country of Origin		Gender by Country of Origin Interaction	
Fasting Insulin	Male	81	25.6 (20.1)	Mexico	208	20.9 (14.0)	F = 7.0	*p* = .009	F = 7.1	*p* = .008	F = 2.8	*p* = .10
	Female	213	21.0 (12.6)	U.S.	86	25.5 (17.4)						
HOMA Insulin Resistance	Male	81	3.7 (2.7)	Mexico	208	3.1 (1.9)	F = 6.5	*p* = .01	F = 7.4	*p* = .007	F = 2.6	*p* = .11
	Female	213	3.1 (1.8)	U.S.	86	3.7 (2.4)						
Fasting PlasmaGlucose	Male	81	105.7 (8.1)	Mexico	208	103.3 (9.0)	F = 4.9	*p* = .03	F = 0.2	*p* = .64	F = .02	*p* = .90
	Female	213	102.7 (10.0)	U.S.	86	104.1 (11.1)						
2-hr. Post Glucose Load	Male	76	129.5 (36.2)	Mexico	194	135.0 (32.6)	F = 2.6	*p* = .11	F = .001	*p* = .98	F=.001	*p* = .97
	Female	198	137.0 (30.5)	U.S.	80	134.6 (31.5)						
HbA1c	Male	81	5.7 (0.3)	Mexico	208	5.7 (0.3)	F=.002	*p* = .96	F = .11	*p* = .74	F = 1.0	*p* = .32
	Female	213	5.7 (0.3)	U.S.	86	5.7 (0.4)						

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Table 3.

Predictors of *Depression* in Mexican Americans with Prediabetes

Model*	Predictor(s)	R	Adjusted R^2	Standardized Beta Weights	F	Significance
1	Acculturation – language (English preference)	.271	.070	.271	20.745	<.001
2	Acculturation – language (English preference)	.372	.132	.294	20.917	<.001
	Eating self-efficacy			.256		
3	Acculturation – language (English preference)	.393	.145	.307	15.757	<.001
	Eating self-efficacy			.235		
	Gender**			.128		

*Variables excluded from the models: Visceral Fat Index, country of origin, sedentary behavior, education, fat avoidance, insulin resistance (HOMA-IR)

**Gender code: 1=male, 2=female

Table 4.

Predictors of *Insulin Resistance* (HOMA-IR) in Mexican Americans with Prediabetes

Model*	Predictor(s)	R	Adjusted R^2	Standardized Beta Weights	F	Significance
1	Visceral Adiposity Index	.478	.226	.478	77.478	<.001
2	Visceral Adiposity Index	.510	.254	.459	45.701	<.001
	Acculturation – language (English preference)			.178		
3	Visceral Adiposity Index	.526	.268	.457	32.946	<.001
	Acculturation – language (English preference)			.168		
	Fat Avoidance			−.127		

*Variables excluded from the models: gender, eating self-efficacy, country of origin, sedentary behavior, education, depression