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English Language Proficiency and Physical Activity among Mexican-Origin Women in South Texas and South Carolina

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Abstract

Objectives—To examine the relationship between English language proficiency (ELP), physical activity and physical activity-related psychosocial measures (i.e. exercise self-efficacy, exercise social support, perceptions of environmental supports) among Mexican-origin women in South Carolina and Texas.

Design—Adjusted robust regression and interaction modeling to evaluate baseline questionnaire data on self-reported ELP with CHAMPS leisure-time moderate-to-vigorous physical activity (MVPA), accelerometry data, Physical Activity Self-Efficacy, Physical Activity Social Support and Environmental Support for Physical Activity in 118 Mexican-origin women.

Results—The adjusted regression revealed a significant association between ELP and perceived physical activity self-efficacy ($\beta = 234.2$, $p = .004$), but not with physical activity social support. In South Carolina, CHAMPS leisure-time MVPA (411.4 versus 114.3 minutes, $p < .05$) was significantly different between women in the high ELP quartile and those in the very low quartile. Among high ELP Mexican-origin women, participants in Texas reported significantly higher MVPA measured by accelerometry ($p = .042$) than those in South Carolina.

Conclusion—Our findings indicate that ELP was associated with physical activity and that contextual factors may also play a role.

Keywords

Physical activity; Mexican-origin; Hispanics; Latinas; acculturation; English language proficiency; immigration; women

The diabetes and obesity prevalence rates among Mexican-origin Hispanics, both native and foreign-born, are rising dramatically and are higher than other Hispanic subgroups in the United States (U.S.).^{1,2} Health researchers, practitioners, and policymakers recognize the role of regular physical activity in the prevention and control of diabetes, obesity, cardiovascular disease and certain cancers.^{3,4} Given the potential health benefits of regular physical activity, one approach to curbing the current trajectories of metabolic diseases among Mexican Americans is the implementation of low-cost, culturally and linguistically appropriate interventions aimed at increasing regular physical activity and improving psychosocial-related physical activity outcomes such as efficacy, better social support and perceived environmental support. In designing and implementing behavioral health interventions for Hispanics, planners must consider linguistic, socioeconomic, geographic, cultural, and educational diversity within and across subgroups, such as Mexican Americans. Language proficiency, use, and preference may be directly associated with individual education level, nativity, or immigration status, but also may reflect geographic, cultural, and socio-economic context and indicate the level of social interaction within and across groups or communities.⁵

Language proficiency, use, and preference

Language is an essential component of human social life, communication, and culture. One-fifth of the U.S. population aged 5 and older speaks a language other than English at home; of those 55.4 million individuals, 62% are Spanish speakers.⁶ Proficiency refers to the ability to speak, read, and understand a language and may or may not be directly associated with language utilization and preference. For example, an individual may prefer to communicate in one language but be required in certain circumstances to use another language. English language proficiency (ELP) is a strong indicator of functional integration into the U.S. mainstream.⁷ Language preference, on the other hand, is a reflection of cultural affiliation.^{8,9} Although language use is related to both proficiency and preference, it also reflects context and may vary across settings (e.g., home, employment, community). It is important to note that language is but one component of acculturation, a very complex, dynamic, multidimensional and multidirectional process that is very difficult to measure.^{5,8} However, in the immigrant health literature, language and acculturation are often conflated, with language use serving as a proxy for acculturation.^{10,11} A conceptual limitation of this approach is that level of language ability or usage does not necessarily correlate with adoption of a specific set of cultural beliefs. In the U.S., research indicates certain patterns of English language use, preference, and proficiency may reflect immigration or generation status. According to Pew Hispanic Center (a non-governmental Hispanic policy think tank) data¹², among the broader U.S. Hispanic population, the clear majority of second-generation Hispanic adults (e.g., U.S.-born of immigrant parents) and most highly educated first-generation Hispanic immigrants (e.g., those who arrived in the U.S. as children or have lived in the country for an extended period), considered themselves proficient in English language skills.¹² In contrast, only 23% of Hispanic immigrants indicated they were able to speak or read English “very well.” The Children of Immigrants Longitudinal Survey examined language assimilation processes among various subgroups of second-generation Hispanics (i.e., Mexican, Puerto Rican, Cuban, Dominican, Central American South American, and

Other Hispanic).¹³ Findings indicated that as a group, Mexican Americans were the least proficient in English and most proficient in Spanish. Interestingly, Spanish utilization in the home and in school did not have an effect on English acquisition, but did significantly promote Spanish language retention, supporting the notion that language proficiency, use, and preference are distinctly different. As Alegria¹¹ noted, ELP among immigrant children may be important for integration into school and community social networks, but if accompanied by limited native language proficiency, may contribute to conflict or decreased communication with parents or extended family.

English language and physical activity among Hispanics

Research findings on language and physical activity among Hispanics in general, and more specifically among those of Mexican-origin indicate that the association between English language use, preference, and proficiency and leisure-time physical activity is complex.¹⁴ The findings suggest either multidirectional relationships between language, acculturation, and physical activity, and/or variation due to measurement or context. For example, an analysis of National Health and Nutrition Examination Survey (NHANES) data indicated English language use was associated with greater leisure-time physical activity in Mexican American adults.¹⁵ However, findings from a study of Hispanic men employed in small businesses in Massachusetts indicated English language use was inversely associated with occupation-related physical activity.¹⁶

Some evidence exists that variation occurs in relation to language use and leisure-time physical activity in Mexican Americans.^{7, 17} Using two items to measure language use (e.g., language spoken at home and language of interview), Afable-Munsuz and colleagues¹⁷ examined the role of immigrant generation and leisure-time physical activity among Mexican adults from California. They reported later generation and bilingualism were positively associated with physical activity, but residence in a neighborhood with a high concentration of English speakers had an adverse effect. In contrast, among a sample of predominantly Mexican-origin, Spanish-dominant Latino adults from Hidalgo County on the Texas-Mexico border, Guinn and colleagues⁷ reported no difference in current physical activity level and language use and preference (e.g., language used for reading, speaking, and thinking; language used at home; language spoken with friends). A study of Hispanics living on the U.S.-Mexico border region reported English language use was associated with higher levels of self-reported physical activity.¹⁸ This research included Hispanics of diverse origins in Arizona, California, New Mexico, and Texas counties with wide variation in rates of Hispanic population density (29–95%) and prevalence of speaking a language other than English at home (28–92%). Among Mexican immigrant communities in North Carolina, Latinas who had greater ELP had greater levels of physical activity, but length of U.S. residency did not account for this relationship.¹⁹ These mixed results point to the importance of geographic (e.g., proximity to the country of origin) and cultural contexts (e.g., exposure or interaction with host culture) in understanding possible relationships between physical activity, psychosocial-related measures and language use, proficiency, and preference in the development of health promotion efforts.^{20,21}

Despite the breadth of research on the relationship between English language use and physical activity among diverse groups of Hispanics, to our knowledge, the relationship of ELP, physical activity and physical activity-related psychosocial measures (i.e. exercise self-efficacy, exercise social support, perceptions of environmental supports) among Mexican-origin U.S. Hispanics across distinct geographic regions and settlement contexts has yet to be explored. Our research examined the relationship between ELP, physical activity and physical activity-related psychosocial measures among Mexican-origin women residing in two different geographic and Hispanic settlement contexts—the South Carolina Midlands and the Texas-Mexico border. The research team had ongoing, active community-campus partnerships in both locations. Given the geographic, cultural, and linguistic differences in the two locations, ELP is a relevant measure of interaction with the English-speaking mainstream. By comparing the relationship between ELP, physical activity and physical activity-related psychosocial measures in a Mexican dominant cultural and bilingual environment (Texas) and a new-immigrant, English-dominant destination community (South Carolina), this analysis contributes to current understanding of language, health behaviors, and broader social determinants of health and health disparities, which are differences in health status linked to specific racial/ethnic, social, economic, and/or environmental disadvantages.²³

Methods

Study design

The *Enlace* (Spanish word meaning to link, connect or be joined) pilot study was a group randomized trial with repeated measures designed to evaluate the effect of a community-based intervention to increase moderate-intensity leisure-time physical activity among Mexican-origin women in Texas and South Carolina.^{21,22} The University of Texas Health Science Center at San Antonio Institutional Review Board approved the research.

The physical activity intervention was a community-based, Spanish-language program delivered by *promotoras*, the Spanish term for female lay health advisors or community health workers.^{24,25} The program included instruction in physical activity behavioral skills (e.g., self-monitoring, goal setting, time management and problem solving) and exposed participants to locally available, culturally appropriate, low-cost activities (e.g., walking groups, resistance bands, Zumba® videos). The *promotoras* scheduled the 8 weekly intervention sessions to accommodate women's care-giving and work obligations and transportation barriers. At the end of the program the *promotoras* encouraged the women to continue participating in volunteer-led walking groups.

Settings

The contrasting settings were Hidalgo County, an area of high Mexican-origin ethnic concentration located in the Lower Rio Grande Valley along the South Texas/Mexico border and the South Carolina Midlands counties of Richland and Lexington, a new-Hispanic immigrant destination. The population of Hidalgo County is primarily Hispanic (89.4%) of Mexican-origin (88%), of which the majority is U.S.-born (68.9%). Hidalgo County Hispanics tend to speak a language other than English in the home (92%), experience high

poverty levels (33.6% of families) and low high school graduation rates (55.9%).⁶ In contrast, in South Carolina Hispanics constitute only 5.1% of the population in Richland and Lexington Counties and are more diverse, with 45% of the Hispanic population being Mexican-origin, 28.7% Puerto Rican, 3.3% Cuban, and 24.9% Other Hispanic.⁶ Spanish is not widely spoken in Richland County, South Carolina with only 7.6% of the population speaking a language other than English in the home.⁶ These contrasting social and cultural environments provided the opportunity for comparative research on language proficiency and physical activity among Mexican-origin Hispanics.

Sample

At both sites, two *promotoras* each screened and recruited two distinct groups of 15 Mexican-origin women from her local community networks (n=8 groups) to participate in the *Enlace* pilot study. Inclusion criteria were women 18 years and older, self-identification as Mexican-origin, residence in the study area with the intent to stay over the entire study period, verbal fluency in Spanish, and not meeting current national physical activity guidelines.²⁶ We excluded women that were pregnant, diabetic, had uncontrolled hypertension, or were undergoing therapy for life-threatening illnesses (chemotherapy or radiation therapy), and those who provided positive (risk) responses on the Physical Activity Readiness Questionnaire (PAR-Q) and subsequent physician disapproval on the Physical Activity Readiness Medical Examination.²⁷ The sample included 118 Mexican-origin women aged 19 to 56 years (mean 34. 4 years; 59 in each state- Texas and South Carolina).

Procedures

Trained bilingual research staff at each site collected data in Spanish. All participants completed an interviewer-administered questionnaire, anthropometric measures, and wore an accelerometer for 1 week. We describe the demographic, language, physical activity, and psychosocial measures below.

Demographic and linguistic measures

Study participants provided demographic information regarding birthplace, age, educational level, marital status, employment status, and residency status. Age, age at immigration (for foreign-born) and years of education were measured as continuous variables. Marital status was dichotomous (married/common law = 1; divorced, never married, widowed = 0). Residence was either Texas or South Carolina.

We based our measure of self-assessed ELP on the bi-dimensional acculturation scale for Hispanics.²⁸ Participants rated their ability to speak, read, and write English and to comprehend oral English (e.g., TV and radio programs and music). The response format ranged from 1 (very poorly) to 4 (very well). We created categorical variables based on the quartiles of summed scores, labeled very low, low, medium, and high ELP.

Physical activity measures

We measured levels of physical activity through both self-report and recorded movement.

Self-report—We used the 41-item Community Health Activities Model Program for Seniors (CHAMPS) physical activity questionnaire to measure self-reported minutes-per-week of physical activity.²⁹ Developed for underactive populations and originally tested primarily among older adults, CHAMPS also has been used with younger and racially/ethnically diverse populations (see Resnicow et al 2003, Wilcox, 2007, Parra-Medina 2011 in comments). The instrument covers activities undertaken for exercise, physical-in-nature activities undertaken in the course of the day, and physically active recreational activities undertaken during “a typical week in the past 4 weeks.” Activity frequency was assessed in hours per week. Duration was classified using six categories ranging from “less than 1 hour per week” to “9 or more hours per week.” Minutes per week spent in total activity (light, moderate and vigorous) and moderate to vigorous physical activity (MVPA) was calculated for analyses. Because our study emphasized purposeful physical activity or exercise, we also computed hours per week spent in MVPA during leisure time (excluding activities related to gardening and housework). CHAMPS has strong psychometric properties, including demonstrated validity,³⁰ test-retest reliability,³⁰ and sensitivity to change.^{29, 31–33} In addition, we were confident that it was sensitive enough to capture the behavioral changes were targeting with our interventions.

Accelerometry—We measured movement with the Actigraph GT3x accelerometer (Actigraph, Pensacola, FL). Study participants wore the accelerometer on a flexible elastic belt around the waist, in the right mid-axillary line and level with the iliac crest for 7 consecutive days. Data were collected in one-minute epochs. Data were downloaded immediately following completion of the protocol using the Actilife software version 4. 4. 1 (Actigraph, Pensacola, FL). For compliance, a valid hour was defined as <30 consecutive “zero”-intensity counts and a valid day contained 8 hours. Accelerometry data were analyzed for women who wore the accelerometer for a minimum of 8 valid hours per day for 4 valid days. Data were scored using MeterPlus version 4.2.1 software (Santech, Inc., San Diego, CA). Time spent in physical activity by intensity level was based on application of existing count-based intensity thresholds developed by Freedson, Melanson and Sirard³⁴ as follows: sedentary (<100 counts per minute [cpm]), light (101–1952 cpm), moderate (1953–5724 cpm), and vigorous (> 5725 cpm). Outcomes are presented for sedentary, light and moderate physical activity in minutes per week.

Physical activity-related psychosocial measures

The physical activity-related psychosocial measures were self-efficacy, social support, and environmental support, benefits, and barriers.

Exercise self-efficacy—The Exercise Self-Efficacy Questionnaire consists of 14 items to rate confidence in one’s ability to engage in exercise (ranging from 0% to 100%) when faced with common barriers (e.g., when tired, during bad weather). Ratings were averaged to form a composite scale score. The research literature contains reports of the measure’s construct, criterion-related, and convergent validity and high internal consistency reliability (>.90) across age, race, gender, and education subgroups; significant and positive association with physical activity level; and ability to predict exercise behavior over time in the context of an intervention.^{35–37}

Exercise social support—We used a modified version of the Social Support and Exercise Survey.³⁸ We asked participants to think about the most recent time they tried to get more exercise and rate how often “family members, friends, co-workers, or anyone else close to you” engaged in 10 supportive behaviors. The response format was a 5-point scale, with 5=Very Often and 1=Never.

Perceptions of Environmental Supports—We adapted 10 items from the International Physical Activity Prevalence Study (IPS) Self-Administered Environmental Module³⁹ to assess physical activity-related environmental supports, benefits, and barriers. Participants indicated their level of agreement with 10 statements about opportunities for walking and bicycling in their neighborhood, with response options from 1 = Strongly disagree to 4 = Strongly agree.

Anthropometric measures

We instructed participants to wear light clothing and remove their shoes for anthropometric assessments. We measured weight to the nearest 0.1 kilogram using a Seca scale (Seca, Hanover MD). We measured height (to the nearest 0.1 centimeter) with a Seca stadiometer (Seca, Hanover, MD). We computed body mass index (BMI) by dividing the body weight in kg by height in m².⁴⁰ With participants standing, we used a cloth tape measure with a spring-loaded handle (Seca, Hanover, MD) to measure waist circumference (to the nearest 0.1 cm) at the midway point between the iliac crest and the lower ribs.⁴¹ All measurements were repeated twice and averaged.

Statistical methods

We conducted analysis to determine normal distribution of the physical activity and psychosocial outcome measures and did not detect skewness in these variables. To evaluate for potential demographic confounders by site, we conducted a bivariate analysis. We performed mean and ANOVA tests for the continuous variables (e.g., age, education, age at immigration). In cases where demographic characteristics were categorical, we performed Chi-Squared tests. We also conducted a bivariate analysis to evaluate significant variance in English proficiency by demographic characteristics within site. Mean and ANOVA tests assessed the difference between English proficiency quartile and demographic characteristics measured continuously (e.g., age, education, age at immigration). Chi-Squared tested assessed differences between language proficiency quartiles and categorical demographic variables.

We employed adjusted regression modeling using ELP proficiency to explain CHAMPS leisure-time MVPA, moderate activity measured by accelerometry, Physical Activity Self-Efficacy, Physical Activity Social Support and Environmental Support for Physical Activity as outcome measures. We then conducted adjusted interaction models between English proficiency and site for the same outcomes to detect state-specific effects. Due to the small sample size, we conducted a robust regression analysis using “rreg” in STATA 11 SE.⁴² Robust regression analysis is useful when working with smaller samples because it can adjust for outliers that are often problematic when dealing with fewer cases.⁴³ Regardless of the size of the sample, most datasets have issues with outliers, but smaller samples are more

sensitive to them. Therefore the robust regression analysis offsets susceptibility to this effect.

Results

The majority of participants at both sites had less than a high school diploma, a monthly family income between \$1,000 and \$1,500, and no health insurance (Table 1). Significant differences between the Texas and South Carolina samples existed for average age (36.7 years in Texas versus 32.0 years in South Carolina), marital status (women in South Carolina were more likely to be in common law relationships than married), employment status (women in South Carolina were more likely to work for wages), age at immigration (21.7 years in Texas versus 23.8 years in South Carolina) and English proficiency (South Carolina women were more likely to be in the very low or low quartiles).

The association between ELP and age, education, marital status, and age at immigration was significant, although level of significance was site-dependent. English proficiency varied by age in Texas but not in South Carolina (Table 2). Texas women in the low (average age 31.6, $p<.05$) and high (average age 35, $p<.01$) ELP quartiles were significantly younger than their peers in the very low ELP quartile (average age 40.8). Texas participants also differed significantly in average level of educational attainment. Compared to participants in the very low ELP quartile (7.6 years completed education), women in the low (average years completed 10.2, $p<.05$) and high (average years completed 11.5, $p<.001$) ELP quartiles had significantly higher levels of education. In contrast, among South Carolina participants, the only significant difference in average years of education was between women in the high ELP quartile (average years completed 11.8, $p<.05$) and those in the very low quartile (8.2 years).

In South Carolina, among participants in the medium ELP quartile, a smaller proportion were married or in a common law relationship compared to the very low quartile (22.9% vs. 41.7% respectively, $p<.10$). This was also the case for women in the high quartile (4.2% vs. 41.7% respectively, $p<.001$). In terms of age at immigration, South Carolina participants ranked in the medium and high proficiency quartiles were significantly younger when they immigrated to the United States (age 17.4 $p<.05$ and 21.5 $p<.05$ respectively) than women in the very low quartile (age 27). We found little variation in ELP by income, except for the marginally significant difference ($p<.10$) among the proportion of medium proficiency participants in Texas who reported monthly incomes in the \$2,000 to \$4,000 range compared to women ranked in the very low proficiency quartile.

Results of the bivariate analysis for the CHAMPS leisure-time MVPA (Table 3) indicated the only significant difference was South Carolina women in the high ELP quartile, who reported significantly greater minutes per week engaged in leisure activity than the very low quartiles (411.4 minutes versus 114.3 minutes, $p<.05$). For the psychosocial measures, differences by level of ELP were only observed in South Carolina. There was a marginally ($p<.10$) significant difference between the low (47.2) and very low (42.9) quartiles for physical activity self-efficacy in South Carolina and for physical activity social support in Texas between very low (34.2) and high (40.2).

The regression analysis (Table 4) with the full sample (Texas and South Carolina) adjusting for demographic confounders revealed significant associations between English proficiency and the psychosocial measures, but not the physical activity measures. However, the regression revealed a significant difference by site for moderate physical activity measured by accelerometers. On average, participants in the high ELP quartile reported higher perceived physical activity self-efficacy ($\beta = 234.2$, $p = .004$). However, there were no significant differences for physical activity social support. The Mexican-origin women in Texas had higher average minutes per week of accelerometer-measured MVPA ($\beta = 3.66$, $p = .010$) and lower perceived environmental support for physical activity ($\beta = -3.34$, $p = .012$) than their peers in South Carolina. Finally, variation by site for proficiency level was observed in interaction modeling (Table 5). Significant interaction effects were observed for CHAMPS MVPA and leisure-time MVPA, but not total activity. High ELP Mexican-origin women in Texas reported significantly higher MVPA ($p = .042$) than their counterparts in South Carolina.

Discussion

Our findings indicated some support for a positive association between ELP and increased engagement in leisure-time physical activity, but the variations in measures across and within sites suggest potential interactions among situational, contextual, and environmental factors related to language proficiency and health behaviors such as physical activity. Given that the majority of Mexican-origin participants South Carolina were immigrants (98%) with low or very low ELP (63%), language barriers may contribute to lack of access to physical activity information. Although not statistically significant, we found mean physical activity social support scores were lower among participants in South Carolina except among women in the medium ELP quartile. A recent study of Hispanic men and women in Nevada revealed that higher English language use and perceived neighborhood support for physical activity were associated with higher levels of physical activity.⁴⁴ In their review article, Keller and Fleury⁴⁵ noted the importance of social support among Hispanic women due to the fact that the type of physical activity they engage in often involves groups of women. The association of a higher level of MVPA with high ELP among Texas Hispanic women may reflect social networks that provide more support for physical activity or adherence to cultural norms related to physical activity among more linguistically acculturated women.

Several social and environmental factors may contribute to both lower levels of social support and physical activity among Mexican immigrant women in South Carolina. These include the recent surge of public anti-immigrant sentiment and legislative initiatives, leading immigrants to voluntarily curb their public exposure and therefore limit some options for physical activity.⁴⁶ Perceived racism and discrimination may also contribute to the fact that Latinas in South Carolina may be less inclined to go to gyms or exercise in parks.⁴⁷ In contrast, Latinas living along the Texas-Mexico border where Spanish is as dominant as English in many sectors, ELP may not contribute as strongly to social isolation and exclusion from the dominant mainstream, or to participation in community-based physical activity. Furthermore, in either setting, Hispanic women with higher levels of English proficiency may feel less socially isolated, have increased self-efficacy, and greater perceived social support for engagement in physical activity.

Our findings indicated the relationship between ELP and self-reported leisure-time MVPA (measured by CHAMPS) varied by location. Women in South Carolina in the medium and high ELP quartiles reported significantly less self-reported leisure-time MVPA than women in Texas in the same quartiles. This is an unusual finding, given that South Carolina is a relatively new immigrant destination that has experienced in-migration from non-traditional sending communities in Mexico (e.g. rural areas of Veracruz and Oaxaca states), and the average length of U.S. residency among South Carolina Mexican immigrant women in this study was much shorter than among those in Texas. The difference between sites may reflect lifestyle variations. The majority of the women in South Carolina were employed outside the home, whereas participants in Texas were primarily homemakers. However, women in Texas may be less likely to have issues with residency and thus be more likely to engage in physical activity outside the home because of the lower risk of deportation and/or racism compared to women in South Carolina. In a focus group study from San Diego, immigrant women cited immigration status issues as a barrier to physical activity and were less likely to be physically active if they believed doing so risked deportation.⁴⁶ Our findings suggest that while English proficiency is associated with greater level of engagement in physical activity, factors specific to the context in which Latinas live, such as social exclusion or inaccessibility to the mainstream, may be more present in new-immigrant destinations, leading to lower levels of physical activity at the same levels of proficiency in other locations.

Critics of the underlying notion of unidirectionality in acculturation models suggest transculturalism better reflects the ongoing engagement and interaction between different cultural practices.^{49–51} According to Portes and Rivas⁴⁸, differences in modes of incorporation, class, human capital and other contextual characteristics are likely to explain variations in language assimilation among distinct immigrant groups. In this research, the distinct cultural and linguistic contexts of the two sites, the predominantly bilingual Hidalgo County, Texas, and the English-dominant Midlands of South Carolina, may result in different perceived or real opportunities, resources, availability, and psychosocial support for physical activity.

The higher levels of social isolation and exclusion among limited English proficient Hispanics in South Carolina than in the Texas border communities is an example of the interaction of context and modes of incorporation. Social exclusion is defined as “dynamic, multi-dimensional processes driven by unequal power relationships interacting across four main dimensions—economic, political, social and cultural—and at different levels including individual, household, group, community, country and global levels.”⁵² Social exclusion occurs across a continuum, in which greater degrees of exclusion reflect less access to resources, diminished capacity, and restricted rights, which are all associated with health disparities.⁵² In more socially isolated immigrant communities and new-settlement areas such as the South Carolina Midlands, language barriers may create and reinforce negative racial/ethnic perceptions and stereotypes, a lack of communication and trust, and limited access to broader social and economic networks and resources.⁴⁷ Guendelman and colleagues⁹ suggested the need for further investigation whether U.S.-born Mexican Americans’ use of Spanish rather than English reflects “differential access to health information and quality of health care, more discrimination, or obesity-related behaviors” (p.

601). Self-assessed ELP may be a better measure of the barriers to physical activity because it better reflects confidence in the ability to use English to express thoughts or ideas. Areas for future research among Hispanics include the refinement of language proficiency measures and examination of the differences across types of language measures (e.g., proficiency, usage, and preference) for both Spanish and English.

Limitations of this pilot study of a physical activity intervention for Mexican-origin women in two different socio-cultural environments include the small sample size and site-specific considerations. Because of the small sample size, there may be relationships that were insignificant due to a lack of power. The Mexican-origin women in these two distinct geographic communities may not be representative of the broader population of Mexican-origin women in the U.S. Furthermore, variations in weather and other environmental contexts between Texas and South Carolina may have been a factor influencing both physical activity and psychosocial-related physical activity outcomes in this study. Finally, variations in the built environment between the two sites could have also played a role in the differences observed. Larger-scaled studies across multiple sociocultural settings are necessary to more fully understand the relationship between ELP and health behaviors such as physical activity. Despite its limitations, this research provides novel evidence on the complex and dynamic relationships among language acquisition, acculturation processes, and engagement of health behaviors, specifically physical activity.

Our findings suggest these relationships may also vary depending on location and social and environmental contexts and challenge assumptions that the relationships among acculturation, health behaviors, and health outcomes are linear and either a negative or positive direction. These relationships most likely depend on multiple factors and are more likely to be bi- or multi-directional and related to multiple factors at the individual, family, community and environmental levels.⁵³ This warrants further development of measures and understanding of these multiple, dynamic, and bidirectional relationships related to language, acculturation and cultural proficiency and affinity. To more fully understand the health implications of ethnicity, particularly among populations with limited proficiency, researchers and practitioners must better understand health-implications of language proficiency and the interactions among language, social and environmental context, and health. The design and implementation of physical activity interventions for Mexican origin groups should consider these social, cultural, linguistic, and environmental nuances and contexts.

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Table 1*Enlace* descriptive statistics

Variable	Texas	S. Carolina	P-value (2-tail)
Age (mean $\pm$ s.d.)	36.8 (8.5)	32.0 (8.4)	.002
Marital Status (n (%))			
Married	43(72.9)	15 (25.4)	.000
Common Law	4 (6.8)	34 (59.3)	
Divorced	3 (5.1)	2 (3.4)	
Widowed	1 (1.7)	0 (0.0)	
Separated	2 (3.4)	2 (3.4)	
Single	6 (10.2)	5 (8.5)	
Years of School (mean $\pm$ s.d.)	9.6 (3.2)	8.8 (3.8)	.243
Employment Status(n (%))			
Employed for wages	9 (15.2)	20 (33.9)	.009
Self-employed	6 (10.2)	2 (3.4)	
Out of work 1+ years	1 (1.7)	3 (5.1)	
Out of work < 1 year	0 (0.0)	5 (8.5)	
Homemaker	39 (66.1)	27 (45.8)	
Student	4 (6.8)	1 (1.7)	
Missing	0 (0.0)	1 (1.7)	
Nativity(n (%))			
United States	7 (11.9)	1 (1.7)	.028
Mexico	52 (88.1)	56 (98.3)	
Age at immigration (n=109) (mean $\pm$ s.d)	21.7 (8.8)	23.8 (8.4)	.204
English Proficiency (n (%))			
Very Low	18 (30.5)	21 (36.8)	.023
Low	9 (15.3)	15 (26.3)	
Medium	12 (20.3)	15 (26.3)	
High	20 (33.9)	6 (10.5)	
Insurance Coverage (n (%))			
No	53 (89.8)	52 (91.2)	.797
Yes	6 (10.2)	5 (8.8)	
Family Income (mean $\pm$ s.d.) (n=100)	1027.2 (652.0)	1402 (842.9)	.015

Table 2

Bivariate Analysis of Demographic Characteristics by English Language Proficiency. ^{††}

	Very Low			Low			Medium			High		
	TX	SC	TX	TX	SC	TX	TX	SC	TX	TX	SC	SC
Age (mean ± S.D.)	40.8 (7.4)	33.7 (8.1)	31.6 (5.4)**	30.5 (7.9)	37.8 (6.2)	30.2 (7.3)	35 (10.3)*	31 (11.2)				
Education (years ± S.D.)	7.6 (3.1)	8.2 (4.1)	10.2 (3.5)*	8.4 (3.4)	8.8 (2.6)	9.3 (3.1)	11.5 (2.5)***	11.8 (4.8)*				
Marital Status (n, %)	14 (29.8)	20 (41.7)	8 (17.0)	15 (31.2) [†]	10 (21.3)	11 (22.9)	15 (31.9)	2 (4.2)***				
Married/Common Law												
Employed (yes=1)	6 (40.0)	6 (28.6)	2 (13.3)	9 (42.9) [†]	4 (26.7)	3 (14.3)	3 (20.0)	3 (14.3)				
Age at Immigration (mean ± S.D.)	26.0 (9.1)	27.0 (7.8)	22.1 (5.4)	22.9 (8.0)	22.3 (4.3)	21.5 (6.4)*	16.2 (10.2)	17.4 (11.1)*				
Monthly Family Income												
\$0-1,000	12 (66.7)	7 (33.3)	5 (55.6)	3 (20.0)	6 (50.0)	7 (46.7)	7 (35.0)	1 (16.7)				
\$1,001-2,000	4 (22.2)	7 (33.3)	2 (22.2)	6 (40.0)	2 (16.7)	5 (33.3)	7 (35.0)	2 (33.3)				
\$2,001-4,000	0 (0.0)	3 (14.3)	0 (0.0)	4 (26.7)	2 (16.7) [†]	2 (13.3)	1 (5.0)	1 (16.7)				
Missing	2 (11.1)	4 (19.0)	2 (22.2)	2 (13.3)	2 (16.7)	1 (6.7)	5 (25.0)	2 (33.3)				
n (%)	18 (30.5)	21 (36.8)	9 (15.2)	15 (26.3)	12 (20.3)	15 (26.3)	20 (33.9)	6 (10.5)				

^{††} Reference category is Very Low English Language Use.[†] p<.10,

* p<.05,

** p<.01,

*** p<.001

Table 3
Average Physical Activity and Psychosocial Measures for the *Enlace* Sample (mean [$\pm$ S.D.])^{††}

	Very Low			Low			Medium			High		
	TX	SC		TX	SC		TX	SC		TX	SC	
CHAMPS Leisure Time	140 (123.5)	114.3 (155.2)		120 (140.7)	104 (177.8)		110 (116.8)	172 (178.4)		150 (184.2)	411.4 (296.8) [*]	
MVPA (Minutes per week)												
Accelerometer (Minutes per week)												
Sedentary	415.4 (53.5)	347.4 (62.4)		417.8 (78.0)	337.3 (73.4)		393.1 (104.4)	370.4 (69.6)		451.8 (94.5)	414.4 (115.3)	
Light	296.4 (60.3)	329.0 (68.6)		343.3 (63.1)	369.0 (105.9)		314.8 (70.7)	281.5 (94.1)		290.9 (71.3)	303.4 (57.9)	
Moderate	13.2 (7.7)	12.7 (13.7)		14.3 (11.8)	14.4 (13.7)		17.0 (13.4)	9.5 (11.4)		13.4 (12.3)	9.6 (6.5)	
Physical Activity Self Efficacy (0–100)	48.7 (18.1)	42.9 (17.5)		50.5 (17.6)	47.2 (20.1) [‡]		47.2 (20.1)	52.0 (20.0)		53.0 (19.9)	60.4 (22.4)	
Physical Activity Social Support (range = 19–62)	34.2 (6.9)	32.1 (8.1)		40.3 (13.9)	34.5 (11.6)		30.4 (7.9)	34.5 (7.8)		40.2 (8.0) [‡]	32.6 (11.7)	
Environmental Support for Physical Activity (range = 11–37)	22.1 (3.9)	24 (6.2)		20.8 (6.5)	23.3 (6.9)		23.3 (6.9)	24.9 (5.4)		23.2 (5.8)	27.3 (8.1)	

^{††} Reference category is Very Low English Language Use.

[‡] $p < .10$.

^{*} $p < .05$.

^{***} $p < .01$.

Robust Regression Analysis for Physical Activity and Psychosocial Measures by English Proficiency and Site for the *Enlace* Sample[†]**Table 4**

	CHAMPS Leisure Time MVPA		Accelerometer		Physical Activity Self Efficacy		Physical Activity Social Support		Environmental Support for Physical Activity	
	β	p-value	β	p-value	β	p-value	β	p-value	β	p-value
English Proficiency (Very Low- ref cat.)										
Low	-45.6	.208	-.929	.608	106.7	.171	3.06	.384	-.87	.613
Medium	13.0	.696	-1.83	.274	63.1	.378	-.493	.873	1.35	.394
High	2.45	.947	-1.52	.411	234.3	.004	6.10	.068	2.19	.213
Site (Texas = ref. cat.)	14.4	.602	3.66	.010	-5.00	.933	1.67	.504	-3.34	.012

[†] Adjusted for age, income, country of birth, marital status, and employment status.

Table 5

Robust Regression Analysis with Interaction Effects for Physical Activity and Psychosocial Measures by English Proficiency and Site [†]

	CHAMPS Leisure Time MVPA		Accelerometer		Physical Activity Self Efficacy		Physical Activity Social Support		Environmental Support for Physical Activity	
	β	p-value	β	p-value	β	p-value	β	p-value	β	p-value
Main Effects										
English Proficiency (Very Low=ref cat.)										
Low	-48.9	.240	.038	.987	163.6	.099	2.23	.624	.020	.993
Medium	57.3	.165	-1.95	.413	154.6	.115	3.77	.372	1.48	.496
High	107.0	.066	-1.18	.734	386.9	.006	1.29	.811	4.50	.143
Site (Texas = ref. cat.)	66.2	.105	4.22	.076	110.7	.252	3.14	.477	-2.48	.248
Interaction Effects State* English Proficiency										
English Proficiency (Very Low= ref cat.)										
Low	.939	.988	-2.19	.557	-130.3	.396	2.96	.660	-1.76	.606
Medium	-106.5	.086	.342	.923	-193.9	.186	-8.61	.160	.030	.993
High	-143.3	.042	-.603	.887	-.244.3	.142	5.47	.414	-3.08	.404

[†] Adjusted for age, income, country of birth, marital status, and employment status, β = beta coefficient.