

Research Article

## **Correlates of Physical Activity among Mexican-Americans using a Path Model**

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### **Abstract**

This cross-sectional study was designed to examine correlates of physical activity (PA) using levels of acculturation, age, marital status, gender, Body Mass Index, social support, fatalism, motivation, barriers, knowledge of importance of PA (KIPA), and belief in importance of PA (BIPA). A convenience sample of 208 healthy Mexican-Americans was recruited through faith-based organizations. Acculturation was measured by the Acculturation Rating Scale for Mexican-Americans (ARSMA), PA by Rapid Assessment of Physical Activity (RAPA), social support by the Multidimensional Scale of Perceived Social Support (MSPSS), fatalism, motivation, barriers, and KIPA were measured by 2, 7, 5, and 2 questions, respectively. Structural Equation Modeling (SEM) was used to assess the adequacy of the model. Fatalism, gender, marital status, motivation, KIPA, and BIPA exhibited the strongest effects on PA. BIPA and motivation for PA mediated the relationship between KIPA and activity level. The indexes of fit for the model indicated a good fit; the predictors accounted for 61% of the variance in PA. KIPA, BIPA, and motivation for PA play a role in activity level that can be influenced by educators. Further, the transition period of women from single to married may be an opportune time for trying interventions in this ethnic group.

**Keywords:** mexican americans, acculturation, gender, structural equation modeling, physical activity

### **Introduction**

Regular physical activity (PA) prevents chronic diseases such as diabetes, hypertension, and cardiovascular disease (CVD) [1]. Furthermore, PA and a healthy diet are most likely to mediate overweight and obesity [2]. The public health challenge caused by the twin epidemics of obesity and type 2 diabetes necessitates an improvement in regular patterns of PA and is of interest to health and physical educators [3].

According to both National and Hispanic Health and Nutrition Examination Surveys, Mexican-Americans are experiencing an increase in overweight and obesity, similar to other ethnic groups in the United States [4]. Physical inactivity and poor eating habits are significant contributors to this trend [5]. Acculturation effects the attitudes and lifestyles of immigrants [6,7]. One cultural attitude, fatalism, is particularly difficult to modify since many Latinos believe it 'beyond their control' and hence very difficult to make dietary changes and lose weight on their own [8]. Because Mexican-Americans account for the largest subgroup of the Hispanic/Latino population, the fastest growing ethnic group in the United States [9], this study was designed to investigate correlates of PA (the

influence of acculturation, both proxy and multidimensional, on the knowledge, beliefs, and PA) among Mexican-Americans.

Knowledge of the importance of PA (KIPA), belief in the importance of PA (BIPA), and social support positively impact PA while perceived barriers, fatalism and extrinsic motivators have a negative impact. Additional factors which impact PA include; age, gender, marital status, body mass index (BMI) [10-13] and level of acculturation [12]. Hence, a measurement model (Figure 1) was derived using these listed factors. The theoretical determinants and directions in the proposed model were based on The Health Belief Model (HBM) [14], the Theory of Planned Behavior (TPB) [15,16], and the Transtheoretical Model of Behavior Change (TTM) [17,18].

Culture is a major determinant of lifestyles and corresponding health outcomes [19]. Acculturation, defined as the process by which immigrants adopt the customs, beliefs and behaviors of a new culture [20], is complex and multidimensional. A linear approach excludes the behavioral, cognitive, and affective domains that contribute to its complexity [12,21]. Although acculturation is difficult to quantify, researchers often use simple proxy measures such as birthplace, language use, or number of years lived in the United States [12].

Various proxy measures have yielded dramatically different relationships between acculturation and PA. For example, among adult Latinas (mostly of Mexican heritage), higher English language scores and immigration at a younger age correlated with higher levels of PA due to attitudinal changes that result from increased KI PA [7]. Acculturation was also positively associated with PA among Latino women [12]. However, the length of residence in the U.S., another indicator of acculturation, was not associated with PA [7]. The combined influence of environment and acculturation reduce lifestyle PA among adult Hispanics possibly due to reduced walking and/or biking for daily chores. Consequently, acculturation may have less of an effect on daily PA in more acculturated Latino adults but may result in an increase in leisure time PA [22]. Hence, both a proxy measure i.e., number of years in the U.S. and a latent measure of acculturation were used in this model.

Family and friends facilitate lifestyle change and strong evidence exists for the influence of relationships that provide support for PA [18,23,24]. Specifically, peer support, self-efficacy, and activity levels during childhood were positively related to vigorous activity among Latino adults [25]. Higher levels of social support, either from friends or family, correlated with less sedentary behavior among middle and older minority women [26]. Likewise, a subjective norm (the perception that relevant others would approve of the behavior) is similar to social support and can influence adherence behaviors [15]. Adherence to an exercise rehabilitation protocol was found to be facilitated by subjective norms in both men and women [27].

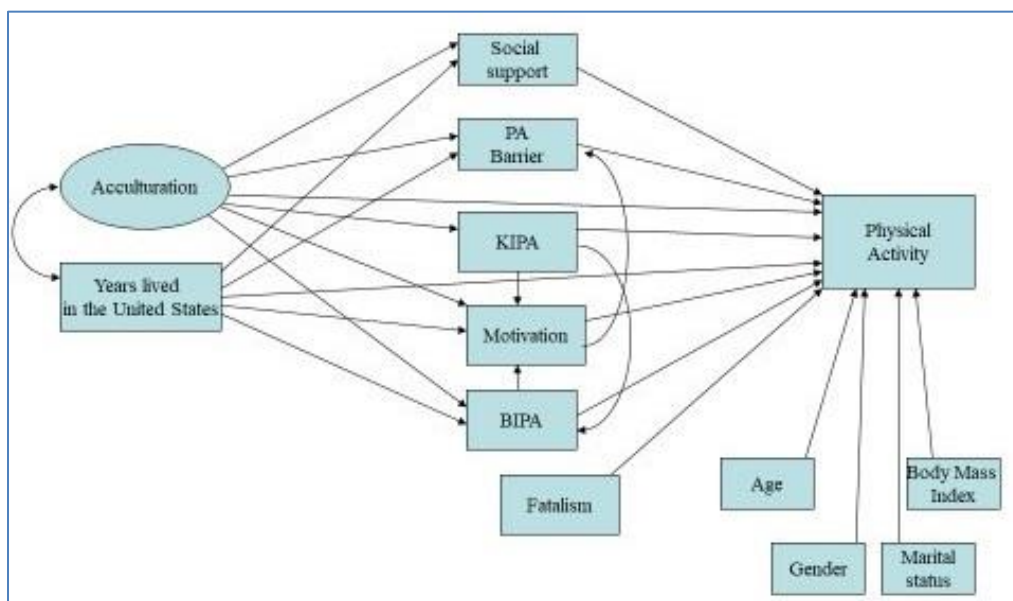
According to the HBM perceived barriers are the most important component impacting health behaviors [28]. Activity levels can be positive when the environment is perceived to be aesthetic, convenient, and safe, or negative when the environment is unsafe, inconvenient or undesirable [13,29-32]. In addition to unsafe environments, a variety of other barriers have been identified for the Hispanic population – lack of time, social support, language proficiency, access to facilities conducive to recreational or leisure time PA, and perceptions of discrimination [31,33].

In the HBM, a knowledge of health risks is a precondition for change [14,28]. Increased knowledge of the importance of a new behavior, and belief in the importance of the behavior led to behavior change [34-37]. However, Jantz and Becker concluded that the HBM is most influential for primary prevention and usually does not involve lifestyle change [28]. Since increased PA requires lifestyle change, investigating the strength of association between KIPA and BIPA with PA behaviors can improve our understanding of motivation and sustained change.

According to SDT, individuals are intrinsically motivated for PA behaviors if they enjoy it or strive to win a competition [38]. Lack of motivation or the need for more extrinsic motivators negatively impact on PA. For exercisers, extrinsic motivation or payoff from PA might be weight loss, or improved health. A high need for extrinsic motivation can result in lower adherence to PA [38].

Fatalism, a belief that one’s life is controlled by a higher being, can likewise have a negative impact on PA. Latina immigrants believed that their health was mostly in “God’s hands” and that prayer could help them stay healthy [7]. Fatalism is not influenced by acculturation and may result in fewer influences on PA in the model. Furthermore, since individuals who are not married, younger, and male have higher levels of PA and/or lower BMIs [20,39-42], marital status, age, gender and BMI were included as covariates in the model.

We hypothesized that Mexican-Americans who are younger, male, single, acculturated, and have lived in the United States for longer periods of time will have higher levels of PA. Fatalism is a confounding factor of acculturation in the proposed model and higher levels of it are likely to have a negative effect on PA. Further, those who have higher KIPA, BIPA, and have social support will have higher levels of PA, while perceived barriers and those needing a higher number of extrinsic motivators for PA will have lower PA.



**Figure 1:** Measurement model. **Note:** Acculturation = Levels of acculturation; Years lived in the United States = Total number of years lived in the United States; KIPA= knowledge of importance of physical activity; Social support = social support (general); PA Barrier = perceived barriers to physical activity; Physical Activity = level of physical activity; Motivation = motivators identified for physical activity; BIPA= belief in importance of physical activity.

## Materials and Methods

### Design

The study design was a cross-sectional study of Mexican-Americans in Texas with varying levels of acculturation. The institutional review board of a large southern university in the US approved the study. Informed consent was obtained from all subjects who volunteered.

**Sample and Data Collection:** A convenience sample of 208 Mexican-Americans signed up through faith-based organizations in various southern communities Texas. Participants were interviewed face to face by trained bilingual Mexican-American interviewers. Spanish translations of the survey instrument and forms were reviewed by

three Spanish-speaking reviewers for accuracy. The survey was pilot tested and took approximately 30 minutes to complete.

## Measures

*Physical Activity* was measured by the Rapid Assessment Physical Activity Scale (RAPA) [43]. The RAPA includes 9 yes/no items assessing the type and amount of PA in which adults engage and is available in both English and Spanish. The scale was developed and validated for primary care settings and compares well with longer scales enabling respondents to visualize differences in activity intensity with pictures and examples that are culturally relevant. The Pearson correlations among the items ranged from moderate to high (0.23 to 0.63). Confirmatory factor analysis indicated the nine variables loaded on one factor (56% of the variance). Both the inter-item correlations and the factor analysis supported the summing of the questions into one composite score (range 1-9); Cronbach's  $\alpha$  was .80. Higher scores indicated a higher level of PA among respondents.

*Acculturation* was measured by the Acculturation Rating Scale for Mexican-Americans (ARSMA -II) [44] which addresses language familiarity and usage, ethnic interaction, ethnic pride and identity, cultural heritage, and generational proximity. Response options ranged from not at all (1) to almost always (5). Using the ARSMA-II scale a Mexican orientation subscale (MOS) and an Anglo orientation subscale (AOS) were identified. The MOS was subtracted from the AOS to derive a score on a scale of 1-5, with 1 representing very Mexican and 5 representing very assimilated.

*Number of years* lived in the United States was identified on the survey.

*KIPA* for the prevention of chronic diseases such as diabetes and CVD were determined by two questions. Respondent's received a score of "1" if they checked physical inactivity as a risk factor for diabetes and/or CVD, and 0 for no check. The two questions were summed to obtain a total score (range 0-2); a higher score indicated higher KIPA.

*Motivation* for PA was measured by 7 different motivators to increase PA among the respondents - e.g., to lose weight, if my boyfriend or girlfriend/significant other asked me, to become a better role model, having a membership to a gym, to look better (image), being diagnosed with a disease or illness, and having someone to exercise with. Response format was yes (1) or no (0). Factor analysis showed all items loaded on the motivation factor and 57% of the variance was explained by the items. All the items were summed for a motivation score (range 0-7); a higher score indicated more factors necessary to motivate the individual for PA. Cronbach's  $\alpha$  was 0.83.

*BIPA* was measured by a question that asked how important it is to you personally to exercise regularly. Response options were very important (3), somewhat important (2) and not important (1). A higher score indicated respondents considered PA as important.

*Social support* was measured by using the Multidimensional Scale of Perceived Social Support (MSPSS) [45] which assessed perceived social support from family members, friends and significant others. Twelve questions were formatted using a 7-point Likert scale ranging from very strongly disagree (1) to very strongly agree (7). The items were summed for a total score; higher scores represented higher social support. Cronbach's  $\alpha$  was 0.95.

*Fatalism* was determined by two questions. Respondents were asked if they believed that getting diabetes or CVD was due to God's will. Response format was no (0), don't know (1), and yes (2). Higher scores indicated higher fatalism; Cronbach's  $\alpha$  was 0.88.

*Perceived barriers* were identified by asking respondents the main reasons for not getting more exercise. Five barriers to PA commonly identified in the literature were used to measure this construct: I get home too late, I do not have anyone to exercise with, my neighborhood is not safe, I can't afford to join a gym, and I don't have time. A

point was scored for each barrier marked by the respondent and summed to get a PA barrier score (range 0-5). Higher scores represented more barriers to PA. Cronbach's  $\alpha$  was 0.77.

*Marital status* was determined by a check list of possible marital states including married, divorced, widowed, separated, never been married, and a member of an unmarried couple. The question was recoded with a response format currently married (0) and not currently married (1). A higher score represented any unmarried state.

*BMI* was calculated using height and weight measures.

### **Statistical analysis**

Prior to the structural equation model (SEM) analysis, means, standard deviations, and Pearson's correlation were computed for acculturation, number of years lived in the United States, social support, knowledge, motivation, barriers, fatalism, and PA. Chi-square tests measured associations between gender and marital status, employment, educational level, generation of Mexican-American, or born in the United States. Student *t*-tests examined differences in number of years lived in the United States, age, and study variables by gender. In addition, SEM was used to assess the adequacy of the model and model parameters according to our hypothesis. SEM techniques are useful for estimating simultaneous multiple regression equations on latent variables, while controlling for other variables in models. Correlations among predictor variables and covariates are modeled to account for collinearity and to provide estimates of independent effects. The term predictor is used to describe statistical relationships and is not meant to imply causality or direction. The extent to which our hypothesized model provided an acceptable fit to the data was evaluated using the following widely accepted relative fit indices: [46] Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), Normed Fit Index (NFI), and the Root Mean Square Error of Approximation (RMSEA), using a 90% confidence limit. In addition to these indices,  $\chi^2$  tests were used to examine if changes to the models resulted in a significant decrease in fit. The statistical significance of the individual model parameters was determined by critical ratios and standard error. Significance of the  $\beta$ -coefficients of the model parameters were calculated using a bootstrap procedure.

This investigation examined whether: (1) demographic variables such as age, gender, marital status, and BMI influenced PA among respondents, (2) changes in PA occurred with acculturation (proxy and latent measure), and (3) mediating effects of social support, KIPA, BIPA, barriers, and motivation for PA impacted PA behaviors. Mediation effects of social support, KIPA, BIPA, barriers, and motivation for PA were tested using the guidelines set forth by Baron and Kenny [47,48] i.e., antecedent variables (acculturation and years lived in the US) were directly associated with PA, psychosocial variables in the model (social support, KIPA, BIPA, motivation, and fatalism) were significantly associated with PA, and the impact of acculturation on PA was less after controlling for the mediating (psychosocial) variables in the model [47]. The proposed model was fit to the total sample.

Model refinement and assessment were carried out iteratively by adding or deleting paths and variables that were not significantly correlated to PA. Although age and BMI were included in the initial model, they were not significantly associated with PA. The final model met the following standards: (1) the p-value associated with the goodness-of-fit test was greater than 0.05; (2) individual path coefficients were significantly different from zero based on the *t*-test; (3) standardized path coefficients were not trivial (absolute values exceed 0.05); and (4) a substantial proportion of PA variance was explained by the model parameters. Hence, the model provided a reasonable description of the data.

Data analysis was performed using the Statistical Package for Social Science (SPSS) software (version 15.0) and SEM with analysis of moment structures (AMOS 4.0) [49,50].

## Results

### Sample characteristics

Mean age of the respondents was  $44.5 \pm 13.36$  years (range 18-80 years) and average number of years lived in the United States was  $13.5 \pm 9.93$  years. The majority of the respondents were females (57%), not born in the United States (79%), currently married (72%), had a high school education or less (86%), and employed for wages (38%) (Table 1). Three-fourths (72%) of the respondents were considered very Mexican and only 8% were considered acculturated based on the ARSMA measure; respondents who had lower education levels were less acculturated ( $r=0.47$ ,  $p<0.001$ ). The respondents were primarily 1st generation, 78%, having been born in Mexico or another country, 7% were 2nd generation with one or both parents born in Mexico or another country, 2% were 3rd generation with both parents born in the United States and all grandparents born in Mexico or another country, and approximately 2% were either 4<sup>th</sup> or 5<sup>th</sup> generation having parents and grandparents born in the United States, and only one grandparent possibly born in Mexico or another country. Approximately half (48%) were overweight (BMI between 25 and 30) and 29% were obese (BMI  $\geq 30$ ).

### Physical activity

PA level among the respondents was low. The majority (57%) of respondents reported never doing any PA; 55% performing irregular light and/or moderate PA; 52% completing light physical activities every week; 40% participating in moderate PA less than 5 times per week; 42% performing vigorous PA less than 3 times per week; 28% reporting 30 minutes or more/day of moderate physical activities 5 or more days per week; 27% completed 20 minutes or more/day of vigorous PA 3 or more days per week; only 16% reported activities that increase muscle strength such as lifting weights or calisthenics at least once a week; and 25% reported doing activities to improve flexibility, such as stretching or yoga, at least once a week.

Demographic and socioeconomic characteristics by gender showed no significant difference except for BMI and employment. Males were significantly more likely to be employed and females overweight/obese (Table 1). There were no significant differences in the study variables by gender (Table 2).

**Table 1: Demographic and Socioeconomic Characteristics of Sample\***. SD: Standard Deviation; BMI: Body Mass Index; PA: Physical Activity

Variables	Total Mean (SD)	Male Mean (SD)	Female Mean (SD)	p-value
<b>N (sample size)</b>	208	90	118	
<b>Age, years</b>	44.52 yrs (13.36)	42.07 yrs (12.94)	45.00 yrs (14.09)	0.126
<b>BMI</b>	28.47 (5.39)	27.30 (4.02)	29.30 (6.06)	<0.001
Normal Weight	47 (22.6)	27 (30)	19 (16.2)	
Overweight	100 (48.1)	49 (54.4)	51 (43.6)	
Obese	61 (29.3)	14 (15.6)	47 (40.2)	
	<b>Frequency (%)</b>	<b>Frequency (%)</b>	<b>Frequency (%)</b>	
<b>Born in the United States</b>				
Yes	24 (11.6)	7 (7.8)	16 (13.7)	0.209
No	165 (79.3)	75 (83.3)	90 (76.9)	
<b>Employment</b>				
Employed for Wages	78 (37.72)	44 (48.9)	34 (29.1)	<0.001

Self-Employed	27 (13.00)	17 (18.9)	10 (8.5)	
Homemaker	49 (23.73)	1 (1.1)	48 (41.0)	
Not Employed	33 (16.00)	19 (21.1)	14 (12.0)	
<b>Marital Status</b>				
Currently Married	149 (71.6)	72 (79.1)	77 (65.8)	0.03
Not Currently Married	57 (27.4)	18 (19.8)	39 (33.3)	
<b>Education</b>				
Grade 1-8	112 (59.0)	51 (56.7)	61 (52.1)	0.096
Grade 9-11	29 (15.5)	14 (15.6)	15 (12.8)	
Grade 12 or GED	21 (11.2)	4 (4.4)	17 (14.5)	
College 1-3 years	16 (8.5)	9 (10.0)	7 (6.0)	
College 4+ years	5 (2.6)	1 (1.1)	4 (3.4)	
Post Graduate	4 (2.0)	3 (3.3)	1 (0.9)	
<b>Generation Mexican-American</b>				
1 <sup>st</sup> generation	163 (78.4)	73 (81.1)	90 (76.9)	0.502
2 <sup>nd</sup> generation	15 (7.2)	6 (6.7)	9 (7.7)	
3 <sup>rd</sup> generation	5 (2.4)	1 (1.1)	4 (3.4)	
4 <sup>th</sup> /5 <sup>th</sup> generation	4 (1.9)	2 (2.2)	2 (1.7)	
<b>Physical Activity</b>				
No PA	79 (30.8)	41 (45.6)	38 (32.5)	0.165
Some light or mod PA	98 (47.1)	47 (52.2)	51 (43.6)	
Light PA/wk	90 (43.3)	43 (47.8)	47 (40.2)	
Mod PA <5x/wk	69 (32.2)	32 (35.6)	37 (31.6)	
Vigorous PA <3x/wk	41 (19.7)	20 (22.2)	21 (17.9)	
Mod PA ≥5x/wk	49 (23.6)	29 (32.2)	20 (17.1)	
Vigorous PA ≥3x/wk	46 (22.1)	21 (23.3)	25 (21.4)	
Strength training	28 (13.5)	18 (20.0)	10 (8.5)	
Flexibility e.g. yoga	43 (20.7)	20 (22.2)	23 (19.7)	
*Frequency/percent do not add up to 208/100% due to missing values.				

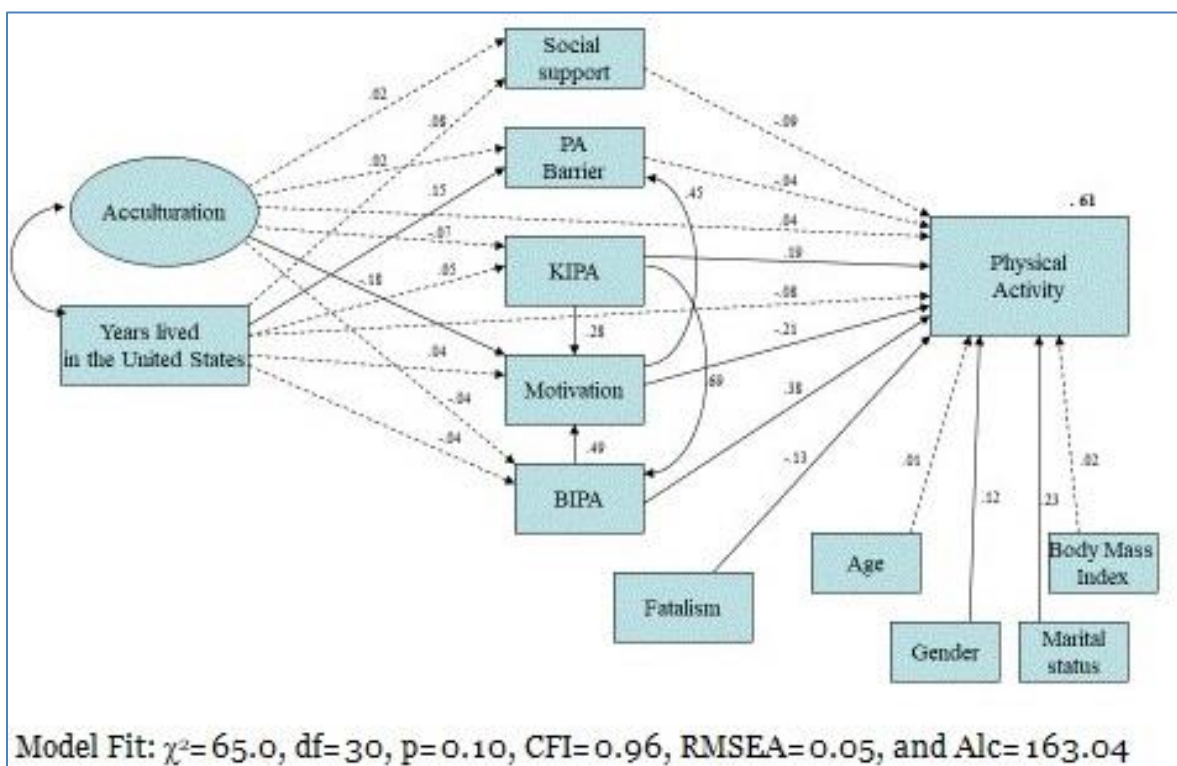
**Table 2: Differences in Study Variables by Gender.** PA: Physical Activity, SD: Standard Deviation

Study Variables	Total Sample	Male	Female	T-value	P-value
<b>N (sample size)</b>	208	90	118		
	<b>Mean ± SD</b>	<b>Mean ± SD</b>	<b>Mean ± SD</b>		
<b>Acculturation</b>	1.36 ± 0.728	1.32 ± 0.71	1.38 ± 0.74	0.65	0.516
<b>Numbers of Years Lived in the United States</b>	13.54 ± 9.93	14.28 ± 9.77	12.97 ± 10.05	-0.947	0.345
<b>Social Support</b>	5.40 ± 1.44	5.27 ± 1.52	5.50 ± 1.37	1.134	0.258
<b>Fatalism</b>	0.39 ± 0.71	0.43 ± 0.73	0.37 ± 0.69	0.612	0.542
<b>Knowledge of Importance of PA (KIPA)</b>	4.77 ± 1.27	4.79 ± 1.29	4.76 ± 1.26	-0.171	0.864

<b>Motivation</b>	3.40 ± 2.41	3.10 ± 2.36	3.64 ± 2.42	1.624	0.106
<b>Belief in Importance of PA (BIPA)</b>	3.33 ± 1.48	3.34 ± 1.49	3.32 ± 1.47	-0.118	0.906
<b>PA Barrier</b>	0.23 ± 0.21	0.21 ± 0.20	0.25 ± 0.21	1.382	0.168
<b>Physical Activity Level</b>	3.27 ± 3.30	3.65 ± 3.47	2.98 ± 3.15	-1.429	0.155

**Model**

When all the predictors and covariates were included in the predictive model, KIPA, motivation for PA, BIPA, fatalism, gender, and marital status were the only significant predictors of PA (Figure 2). Respondents who were not currently married (single/widowed/separated/ member of an unmarried couple) were more active ( $\beta=0.24$ ,  $p=0.007$ ). Furthermore, males had higher levels of PA than females ( $\beta=0.11$ ,  $p=0.29$ ). KIPA ( $\beta=0.17$ ;  $p=0.05$ ) and BIPA ( $\beta=0.38$ ,  $p<0.001$ ) were positively associated while motivation ( $\beta=-0.21$ ;  $p<0.001$ ) was negatively associated with PA and path coefficients were in the hypothesized direction. Individuals with a higher fatalistic attitude reported they were physically inactive ( $\beta=-0.13$ ;  $p=0.01$ ). The model parameters accounted for 61% of variance in PA (Figure 2). The R2 value for PA appears above its rectangle and standardized regression weights are depicted above the paths. The model predicting PA behavior in the sample demonstrated a good fit to the data as indicated by the pattern of fit indices (TLI=0.94, CFI=0.96, RMSEA=0.05, and  $\chi^2=65.00$ ,  $df=30$ ,  $p=0.10$ ).



**Figure 2:** Demographic and psychosocial factors related to physical activity. **Note:** Acculturation = Levels of acculturation; Years lived in the United States = Total number of years lived in the United States; KIPA= knowledge of importance of physical activity; Social support = social support (general); PA Barrier = perceived barriers to physical activity; Physical Activity = level of physical activity; Motivation = motivators identified for physical activity; BIPA= belief in importance of physical activity. Numbers on each arrow are standardized path coefficients. Solid lines indicate statistical significance at the 5% level. Dotted lines indicate no statistical significance. Bold indicates R2 value for physical activity.

**Direct and indirect effects**



Gender, marital status, fatalism, motivation, KIPA, and BIPA exhibited the strongest (direct) effects on PA. BIPA was strongly predictive of respondent's PA and higher levels of motivation and KIPA predicted PA (Figure 2). In other words, respondents with a higher KIPA and those who required fewer motivators had higher levels of PA. Respondents who had less fatalistic attitudes also had higher levels of PA. Barriers to PA, however, did not influence PA directly or indirectly ( $p > 0.05$ ). Similarly, acculturation (both proxy measure and multidimensional measure) was not significantly associated with PA. The direct paths from KIPA, BIPA, and motivation for PA were found to be substantially reduced in the path model from their original magnitude indicating support that motivation and BIPA mediated the relationships between KIPA, BIPA, motivation and PA. BIPA mediated the relationship between KIPA and activity level; motivation mediated the relationship between KIPA and PA. Social support did not have a significant direct or indirect effect on PA in the model ( $p > 0.05$ ).

## Discussion

Overall, the findings provided reasonable support for the path model. Sixty-one percent of the variance in PA was explained by the model parameters. Although many of our specific predictions were supported, perhaps most importantly, our analysis demonstrated no acculturation effects on PA. Both the unidimensional and multidimensional measure of acculturation did not positively impact on PA. Acculturation is associated with both health risk factors (e.g., smoking, overweight and obesity) and protective factors such as healthier diets and PA [51-55]. However, Dergance and coworkers have noted that assimilation (defined as establishment of close personal friendships with members of the host society), and not acculturation, was significantly associated with leisure time PA among older Mexican-Americans. Psychosocial and disease factors were more important mediators of PA behaviors in this group [17].

Proxy measures of acculturation such as years of stay in the United States, language spoken at home, or unilinear measures of acculturation, only assess a superficial aspect of acculturation (i.e., behaviors) [56,57]. This was substantiated by the moderate correlation ( $\beta = 0.26$ ) between ARSMA and duration of stay in the United States. Use of the multidimensional acculturation scale provided a better assessment of the link between acculturation, psychosocial constructs, and PA.

Acculturation significantly impacted the level of motivation; individuals who were more acculturated reported the need for more motivators to participate in PA suggesting a lower intrinsic motivation for more acculturated Mexican-Americans. One possible explanation for this is the loss of lifestyle PA in the United States [6]. Immigrants in the United States who adopt Anglo lifestyles depend more on the automobile for transportation and do less walking [26]. Unless poor health dictates a lifestyle change, there is less motivation to be active. Years lived in the United States however was uncorrelated with motivation suggesting the complexity of acculturation processes which are independent of duration of stay in the host country. However, duration of stay was positively correlated with PA barriers indicating a longer residency in the United States increased perceived barriers for PA. Lifestyle changes experienced by Mexican-American immigrants related to less lifestyle and transportation PA, and unsafe living environments in the United States may also account for this association. Due to major cultural barriers and lower socio-economic levels, Mexican-Americans may be at higher risk for physical inactivity as they do not have adequate access to facilities conducive to PA (e.g., gyms, safe walking areas in neighborhoods) [62].

Motivation, however, positively correlated with barriers ( $\beta = 0.45$ ). Motivation in this study was determined by various motivators that are necessary for PA. Respondents were offered a list of motivators for PA. More items selected indicated higher need for external motivators and potentially lower intrinsic motivation. Hence, the positive association between motivation and barriers suggests that Mexican-Americans in this study are not intrinsically

motivated and perceive more barriers to PA. Higher external motivation resulted in lower PA in the model ( $\beta=-0.21$ ). According to SDT [38,59,60] intrinsic motivation increases the likelihood of adherence to a behavior. However, our result has to be interpreted with caution since we are assuming that the need for more external motivators means less intrinsic motivation. Of interest is that individuals who reported BIPA were significantly less likely to report the need for external motivators for PA, likewise KIPA was positively correlated with fewer motivators needed for being physically active. These findings concur with literature and support the validity of our results.

Fatalism had a negative impact on PA as was reported in earlier studies [8]. Respondents with a fatalistic attitude believed that changing behaviors is out of their control. Reichman in her reported that respondents answered with a dictum related to religion when asked about how they stayed healthy [61]. Although studies show that recent immigrants were more likely to stay away from addictive vices (like smoking or drinking), physical inactivity or poor dietary habits are usually not perceived to be a vice [61], which may account for the lack of significant association between fatalism and acculturation in this study.

The hypothesis that single individuals would have higher levels of PA was supported by the data. Population studies indicate that unmarried individuals tend to be more physically active [39-42]. Marital status was negatively (significantly) correlated with years of residency in the United States indicating that living longer in the United States increased the likelihood of being divorced/separated or single. While the unmarried status may not be a positive trend from a social or psychological perspective, it does have positive implications for PA. One possible explanation for the association between the unmarried status and PA could be temporal. Individuals who are unmarried may have more time to exercise or may have a higher desire to be physically attractive for potential mates as increased PA improves body shape [42]. Unmarried individuals also had higher BIPA as compared to married individuals. The belief in the importance of a particular action (in this case PA) to mediate a perceived threat is one of the factors proposed by HBM as important to the adoption of health-enhancing behaviors [14]. BIPA was, in turn, significantly correlated to PA.

Respondents' KIPA to prevent chronic diseases, such as diabetes and CVD, had a very high correlation ( $\beta=0.69$ ) to BIPA. Both KIPA and BIPA are factors from the HBM predicting PA in the model for Mexican-Americans. Hence, understanding that PA is a protective factor for chronic diseases such as diabetes and CVD and believing that PA is important are powerful intrinsic motivators for adopting PA behaviors in this ethnic group. Although Jantz & Becker noted that the HBM is strongest for primary prevention [28], our results demonstrate that some of its constructs also impact lifestyle change. Further, motivation and BIPA mediated the relationship between KIPA and PA suggesting that programs to improve PA in Mexican-Americans should be focused on improving these factors in a more culturally appropriate manner. Longer duration of living in the US did not improve KIPA or BIPA as expected. Hence, culturally appropriate PA education campaigns are necessary to improve these factors in Mexican-Americans.

Social support, identified in both TPB [15,16] and TTM [17,18], did not influence PA as hypothesized. The weak association may be due to the general nature of the social support construct used in this study. The MSPSS measures general support from friends, family and significant others and not support for PA. It is likely that the social support required for PA is quite specific e.g., encouragement for PA, help with child care, etc and not the same as the support one perceives from friends and family in general. It was predicted that fewer barriers for PA would result in higher activity levels among respondents since both TPB and TTM have shown that perceived barriers mediate behavior [15-18]. However, the path model did not support this hypothesis and differs from prior studies. Previous studies of Mexican-Americans identified unsafe neighborhoods [31,62] as a significant barrier to PA; this barrier was one of several barriers e.g., time, access, resources, that was used to create the construct in this study.

Although not shown, use of the unsafe neighborhoods construct alone in the analyses (model) did not yield any significant differences as might be expected.

Limitations of this study include the cross-sectional design, lack of validated measures for some of the constructs in the model, convenience sampling of the subjects from 2 faith-based settings, and problems associated with self-reported data (e.g., poor recall, socially desirable responses). However, these results add to the body of knowledge of predictors of PA and will aid health professionals and physical educators in developing PA programs for this minority group. Similar studies should be conducted with a larger sample and other geographical locations to determine whether these relationships are characteristic of all Mexican-Americans.

In conclusion, understanding predictors of PA is of great importance due to the connection between inactivity and obesity. KIPA and BIPA are modifiable and can be addressed by PA programmers. PA programs for Mexican-Americans need to focus on these two modifiable factors for a positive impact on this important lifestyle behavior. However, health literacy and educational levels should be taken into consideration because of the influence of fatalism when these levels are lower. Although marital status is a non-modifiable factor, optimal times for interventions in Mexican-Americans may be during transitions from married to unmarried states as noted by researchers for population-based studies [41]. Finally, gender-specific PA programs are recommended.

Further research in this area should include direct measures of activity, including use of activity monitors, pedometers, or activity observation. Since prevention of chronic diseases requires a combination of diet, PA, and behavioral change, further study must take into consideration all three areas for a total lifestyle program.

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