



## Physical activity, acculturation, and immigrant status of Asian Indian women living in the United States



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### 1. Introduction

Acculturation to the American lifestyle can have deleterious health effects (Allen et al., 2014), especially in ethnic minorities in the United States (U.S.) (Commodore-Mensah, Ukonu, Cooper, Agyemang, & Himmelfarb, 2018), including those related to physical activity (Taverno Ross, Larson, Graham, & Neumark-Sztainer, 2014). Acculturation involves the integration of values, attitudes, beliefs, and cultural practices of the host society into the lives of immigrants through immersion in the host culture over time (Abraido-Lanza, Armbrister, Florez, & Aguirre, 2006). Acculturation to the American lifestyle increases the risk of obesity and associated chronic diseases (Palaniappan et al., 2010). An inverse relation between acculturation and physical activity in immigrant groups has been associated with poor health outcomes (Abraido-Lanza, Echeverria, & Florez, 2016).

As with other female immigrants, Asian Indian women experience stress when adapting to cultural differences. Specific cultural barriers of religious modesty, avoidance of mixed-gender activities, and fear of going outside alone (Srisantharajah & Kai, 2007) can adversely impact physical activity. Such cultural barriers, and time pressures associated with family caregiving responsibilities, may explain why Asian Indian women generally have lower levels of physical activity than men (Daniel, Wilbur, Marquez, & Farran, 2013). Asian Indian cultural norms dictate that women are the primary transmitters of tradition, values, and culture to their families (Mann, Roberts, & Montgomery, 2017; Yoshihama, Blazevski, & Bybee, 2014), and these cultural priorities are likely to influence family members to focus on educational and family activities (Chadda & Deb, 2013) at the expense of leisure time physical activity.

Association of physical activity with acculturation level and immigrant status has not been well studied in Asian Indian women. Leisure time physical activity is positively correlated with acculturation of Asian Indian immigrants to a westernized society (Kolt, Schofield,

Rush, Oliver, & Chadha, 2007). Occupational and household activity have largely been ignored in research (Daniel et al., 2013); these types of physical activity may promote physical fitness in immigrant populations and open opportunities for interventions to increase physical activity. Gender differences ( $p < .01$ ) in types of physical activity performed by Latino immigrants in the U. S. showed that men have higher levels of occupational activity and women higher levels of household activity, but no significant gender difference in leisure time physical activity (Marquez & McAuley, 2006). Acculturation was inversely related to occupational ( $r = -0.21$ ,  $p < .05$ ) and total ( $r = -0.23$ ,  $p < .01$ ) physical activity in the Latino immigrants.

In the present study, we sought to determine the types of physical activity by acculturation and immigrant status of Asian Indian women so that future physical activity interventions can be tailored to the woman's lifestyle. The first author previously assessed the relationship between physical activity and acculturation in Asian Indian women in Houston, Texas (Mathew, 2014). Study results indicated higher levels of occupational physical activity than other types of activity, and that acculturation was directly associated with leisure time activity and sedentary behavior. Therefore, the data were reanalyzed to exam types of physical activity and sedentary behavior by acculturation and immigrant status. We hypothesized that more highly acculturated Asian Indian women would have higher levels of leisure time physical activity and sedentary behavior and lower levels of occupational and household physical activity than their less acculturated counterparts. Acculturation level was assumed to be related to immigrant status, with non-immigrants having a higher acculturation level than immigrants.

A social-ecological framework (Sallis & Owen, 1999) provided structure for examination of whether acculturation level and immigrant status affect physical activity in Asian Indian women living in Houston. Individual behavior is often a function of the larger social context (Breslow, 1996; Emmons, 2000), and a socio-ecological approach to health guides researchers and public health practitioners to address

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acculturation for its importance in the design of interventions to change and sustain healthy behaviors. Understanding the influence of acculturation and immigrant status on physical activity is important for the development of culturally appropriate physical activity programs.

## 2. Research methods

### 2.1. Participants and data collection

The database from a cross-sectional study to assess relationships between physical activity and acculturation in 262 Asian Indian women living in the Houston, Texas, metropolitan area (Mathew, 2014) was used to examine the relationships among physical activity, acculturation, and immigrant status across three domains of physical activity (occupational, household, and leisure) and sedentary behavior. The study was reviewed and approved by the University of Texas Medical Branch Institutional Review Board. Participation was voluntary; completion of the questionnaires implied consent.

Asian Indian women who were born in India (immigrant) or the U. S. (nonimmigrant) were recruited using convenience sampling and a snowball approach through announcements, fliers, and word-of-mouth at Indian community churches, Hindu temples, Muslim mosques, the Kumon Learning Centers, Indian cultural organizations, and the Indian American Nurses Association. Eligibility criteria for study participation were female; Asian Indian (self-identified); 21–60 years of age; able to speak, read, and write English; and no self-reported physical disabilities.

Over a 3-month period, 755 Asian Indian women were contacted face-to-face. Of 65 women who preferred paper surveys, 63 (97%) completed them, and 199 of 244 (82%) women accessed an online survey link, yielding a sample size of 262. Of the 262 women in the sample, 41 (16%) were classified as high acculturation-immigrant, 123 (47%) as low acculturation-immigrant, 97 (37%) as high acculturation-nonimmigrant, and 1 as low acculturation-nonimmigrant. The data from the low acculturation-nonimmigrant woman were removed from further analyses, yielding a final sample size of 261 Asian Indian women. Power analyses based on the final sample size indicated that a one-way analysis of variance will have 80% power when the effect size is  $f = 0.19$ . For the same sample size, a chi-square test will have 80% power when the effect size is  $w = 0.19$ . Both of these effect sizes are classified as small effects by Cohen's guidelines (Cohen, 1988).

## 2.2. Measures

### 2.2.1. Demographic data

A self-report questionnaire was administered to assess age, employment status (employed, homemaker, student, retired, disabled, other), presence of existing medical conditions (yes/no), marital status (partnered/un-partnered), gross household income, education, years in the U.S., and age at immigration.

### 2.2.2. Physical activity

Physical activity was operationally defined as scores on the International Physical Activity Questionnaire (IPAQ-long form), a 27-item instrument for estimating frequency (days/week) and duration (hours/week) of physical activities of different intensities (e.g., walking, gardening, etc.) during the previous 7 days across the domains of occupational, housework/house maintenance, leisure time, and transportation physical activity, and sedentary behavior (Craig et al., 2003). The transportation scale, which includes walking and bicycling, had a mean of 1 and a median score of 0 in the sample (Mathew, 2014; Mathew Joseph & Bishop, 2014) and, therefore, was deleted as a type of physical activity in the present analysis. Total physical activity score was computed as the sum of the occupational, household, and leisure time subscale scores. The IPAQ scoring protocol (IPAQ, 2005) was used, whereby metabolic equivalent of task (MET) – a unit for describing the

energy expenditure of a specific activity (Office of Disease Prevention and Health Promotion, 2018) – was computed and multiplied by hours spent in a given activity to yield MET hours/week. Validity and reliability estimates of the IPAQ are comparable to other physical activity self-report measures, and the instrument is applicable to a broad range of cultures (Craig et al., 2003). Adequate (Nunnally & Bernstein, 1994) concurrent validity and test-retest reliability have been estimated (Craig et al., 2003).

### 2.2.3. Acculturation level

Acculturation was operationally defined as score on the Modified Suinn-Lew Asian Identity Acculturation Scale (M-SL-ASIA). The SL-ASIA was developed as a 21-item unidimensional measure of acculturation among Asian Americans (Suinn, Ahuna, & Khoo, 1992). A mean score is computed and reflects a continuum from low acculturation/high Asian identity (1.0) to high acculturation/high Western identity (5.0). For this analysis, the acculturation score was dichotomized to produce low (1.00–2.50) and high (2.51–5.00) acculturation groups. Focus groups to assess face validity and cultural appropriateness of the SL-ASIA in Asian Indian women living in the U.S. indicated a need for minor revisions in wording to improve instrument comprehension (Kapadia, 2009), resulting in the M-SL-ASIA.

Cronbach's alpha coefficients have varied from 0.72 to 0.91 (Kodama et al., 2007; Suinn et al., 1992). High SL-ASIA scores, indicating high acculturation, were associated with age upon arrival, number of years attending high school and living in the U. S., years lived in a non-Asian neighborhood, and high self-rating of acculturation ( $r \geq 0.41$ ,  $p < .001$ ) (Suinn et al., 1992). Factorial validity was assessed with principal components analysis with oblique rotation; a priori criteria for components were eigenvalues  $> 1.0$  and component loadings  $> 0.50$ . Of the 21 items on the SL-ASIA, 17 loaded on five components: (a) reading/writing/cultural preference, (b) ethnic interaction, (c) affinity for ethnic identity and pride, (d) generational identity, and (e) food preference. In the current sample, the M-SL-ASIA demonstrated adequate internal consistency reliability, with Cronbach's alpha = 0.95.

### 2.2.4. Immigrant status

Immigrant status conceptually was defined as coming to the United States from India and living permanently in the U. S.; operationally, it was defined as immigrant (born outside of the U. S.) or nonimmigrant (born in the U. S.).

### 2.2.5. Physical functioning scale

Physical functioning was defined conceptually as the self-reported ability to perform activities of daily living independently and operationally defined as score on the physical functioning subscale (PF-10) of the RAND 36-Item Health Survey (Hays, Sherbourne, & Mazel, 1995). Assessment of physical functioning provided a way to control for factors that might affect physical activity that are unrelated to acculturation. The PF-10 scale has 10 items and a 3-point Likert-type response format, and measures the extent to which health limits physical activities such as self-care and walking. Scores are adjusted per the website instructions ([www.sf-36.org](http://www.sf-36.org)); total score of the PF-10 varies from 0 to 100, with higher scores indicating higher physical function. In the current sample, the PF-10 had acceptable evidence of internal consistency reliability (Cronbach's alpha = 0.87).

## 2.3. Data analysis

Because the premise was that physical activity scores are different based on acculturation and immigrant status, participants were categorized into four groups: high acculturation-immigrant, low acculturation-immigrant, high acculturation-nonimmigrant, and low acculturation-nonimmigrant. Data were examined for normality and homogeneity. The mean ( $\pm$  SD) is reported for normally distributed



**Table 2**  
Acculturation-immigrant group differences in physical activity (PA) (MET) and acculturation scores.

Variable	Low acculturation-immigrant (n = 123)		High acculturation-immigrant (n = 41)		High acculturation-nonimmigrant (n = 97)		H(2)
	Median	Mean rank	Median	Mean rank	Median	Mean rank	
Total PA	102.63**	152.86	34.70	107.73	38.88	113.11	19.66*
Occupational PA	59.80**	157.41	3.30	113.13	1.65	105.06	30.48*
Household PA	14.00	151.75	9.00	135.32	0.00**	102.87	24.27*
Leisure PA	0.00**	94.98	6.60**	130.94	21.90**	176.71	66.59*
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i> (2,258)
Acculturation score	2.09**	0.26	2.98**	0.44	3.61**	0.44	472.64*
Sedentary behavior	26.84	18.86	34.12	20.65	47.22**	25.05	24.20*

Abbreviations: MET, metabolic equivalent of task; H(2), Kruskal–Wallis H test; M, mean; SD, standard deviation.

\*  $p < .001$  (omnibus).

\*\*  $p \leq .01$  (post-hoc). Single value with a double asterisk (e.g., Total PA) indicates that the value is significantly different from the values of the other groups; three values with a double asterisk (e.g., Leisure PA) indicates that all values are significantly different from each other.

relate to differential engagement in various physical activities. Acculturation correlated with the level of occupational and total physical activity, as found previously in Latino immigrants (Marquez & McAuley, 2006). In contrast, immigrant status was associated with household and leisure time activities and sedentary behavior. Our findings are consistent with those of Khan and colleagues, who found that Western-acclimated immigrant South Asian Americans engaged in leisure time exercise significantly longer than less acculturated immigrant South Asian individuals (Khan, Jackson, & Momen, 2016).

In the present study, fewer highly acculturated immigrant and nonimmigrant women were employed, compared with low-acclimated immigrant women, and the median number of sedentary hours/week was higher in the highly acculturated groups. Whereas higher levels of leisure time and sedentary behaviors and lower levels of occupational physical activity might be related to unemployment, independent of acculturation, household physical activity was lower in the more acculturated groups than the less acculturated group despite no differences in household income. Because the high-acclimation groups had greater proportions of students than the low acculturation-immigrant group, our findings may be confounded by student status, independent of acculturation level and immigrant status. Nonetheless, overall sedentary behavior appears to increase with increased acculturation to a westernized society, regardless of the woman's immigration status.

The present results may reflect negative effects on physical activity of acculturation to Western norms. U.S. adults spend 42–48 h/week in sedentary behaviors (Young et al., 2016). The average amount of time spent in sedentary behaviors among the study participants overall (36 h/week) is lower than the average U. S. adult, but higher than that (22 h/week) found in a study of South Asians in Sri Lanka (Waidyatilaka et al., 2013).

South Asians in Scotland averaged 40 h/week of sedentary time, which was associated with increased 2-hour glucose concentrations, independent of age, gender, or self-reported physical activity (Gill et al., 2011). Although glucose levels were not measured, BMI was assessed in the present sample, as reported elsewhere (Mathew, 2014; Mathew Joseph & Bishop, 2014); 46% of the Asian Indian women were overweight or obese. For this paper, BMI was compared across the acculturation-immigrant groups; mean BMI varied little (24–25 kg/m<sup>2</sup>) across groups, and met the most recent BMI criteria for Asians defined by WHO as overweight (BMI 23–25 kg/m<sup>2</sup>) (WHO Expert Consultation, 2004; World Health Organization. Regional Office for the Western Pacific, 2000), which suggests the need for targeted preventive measures, independent of acculturation level or immigrant status. In a longitudinal study, sedentary behavior significantly increased predictors of cardiovascular disease mortality in men, but higher levels of physical activity and normal weight were related to lower rates of cardiovascular disease, even in the presence of higher levels of sedentary behavior (Warren et al., 2010). If those findings are shown to apply

to Asian Indian women, it would be important to encourage health promotion efforts for physically inactive Asian Indian women that both reduce sedentary activity and body weight and increase regular physical activity.

Use of the long version of the IPAQ permitted assessment of three physical activity domains and sedentary behavior in Asian Indian women living in Houston, Texas. However, wide variability of IPAQ scores across countries has raised concerns over the concepts of physical activity underlying the measurements. For instance, walking and cycling are common forms of transportation in Europe, where cities are not optimized for vehicular transportation, mass transportation is readily available, and neighborhoods are configured for local shopping and resource access. In American cities, with a few exceptions, people rely primarily on automotive transportation, and neighborhoods are more distant from work, shopping, and other resources. Of the five IPAQ physical activity domains, the transportation activity scale may be irrelevant for American culture; instead, walking and cycling may be more appropriately considered as leisure physical activities.

The physical functioning score was lowest in the low acculturation-immigrant group. Albeit middle-aged, these participants were older than those in the high acculturation groups. Higher physical activity MET scores in the low acculturation-immigrant women, despite lower PF-10 scores and older age, compared with the high-acclimation groups, strengthens the argument for acculturation level, and not physical limitations, as an explanation for higher physical activity. Because PF-10 score did not differ significantly between the high acculturation-immigrant and high acculturation-nonimmigrant groups, immigrant status does not appear to relate to physical activity MET scores.

Although the study findings provide evidence of physical activity behaviors of immigrant and nonimmigrant groups of Asian Indian women that corroborates findings in other immigrant minority groups (Abraido-Lanza et al., 2016; Afaible-Munsuz, Ponce, Rodriguez, & Perez-Stable, 2010), several limitations are noted. In addition to reducing generalizability of results, convenience sampling produced unequal representation across the distribution of key variables; only one woman met the criteria for assignment to the low acculturation-nonimmigrant group, limiting a full comparison of acculturation and immigrant status. The relatively small sample size in each group reduces the statistical power to detect modest but meaningful differences or associations as statistically significant. Detailed information on occupation was not collected, which limits implications of study results related to occupational physical activity. Finally, we collected only the gross income of participants, and could not compute the poverty income ratio (based on family size).

## 5. Conclusions

Asian Indian women living in the Houston metropolitan area have

different physical activity patterns according to their level of acculturation and immigrant status: low acculturation-immigrant women have high levels of occupational and total physical activity, and highly acculturated women, regardless of immigrant status, have high levels of leisure physical activity and sedentary behavior. Thus, the level of acculturation of Asian Indian women to the American lifestyle is associated with the types of physical activity in which they engage.

Appreciation of cultural differences in physical activity patterns may help healthcare providers develop culturally appropriate counseling and intervention to prevent chronic diseases associated with physical inactivity, improve quality of life and health outcomes, and reduce health disparities in high-risk immigrant populations. The findings also may influence the planning and implementation of community health promotion programs to increase physical activity among Asian Indian women within the context of their cultural values and beliefs. The development of culturally sensitive and effective physical activity interventions may positively affect the U.S. health care system by reducing healthcare costs. Although interventions would need to be evaluated in Asian Indian immigrant women, ones that might work well are those that can be done as a family unit. Many Asian Indian women engage in spiritual activities such as yoga and meditation for their well-being and healing. Therefore, physical activity affiliated with religious facilities and yoga may be effective.

Regional patterns of culture, climate, and topography may affect physical activity, and it is unknown if the relationships among physical activity, acculturation, and immigrant status reported here would be reproducible in other regions of the United States or other westernized countries. Future studies should include a national sample of Asian Indian women that is balanced for the distribution of immigrant status and occupational role. It would be interesting to determine the caloric expenditure of occupational and leisure physical activity to determine whether they have different health effects; stress may affect occupational physical activity benefits, whereas leisure physical activity may have stress reduction benefits. Interventions to increase physical activity in Asian Indian women need to be tested for their long-term effectiveness in preventing chronic diseases associated with physical inactivity.

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