ACCULTURATION AND ITS ASSOCIATION WITH PHYSICAL ACTIVITY AMONG LATINAS IN SAN DIEGO, CALIFORNIA

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DEDICATION

This thesis is dedicated to my sisters—Akshaya Ganesh, Simrit Warring, Rachel Naik, Anchal Singhal, Priyal Upadhyay, Pooja Mehta, Natasha Malhotra, and Ankeeta Sharma—for their constant encouragement and support through this Master’s program. Without their unconditional love and belief in me, this thesis would not have been possible. I love you all.
ABSTRACT OF THE THESIS

Acculturation and its Association With Physical Activity Among Latinas in San Diego, California
by
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Acculturation appears to have a relationship to physical activity participation among Latinos, yet studies are inconsistent on the directionality of this relationship. The objective of this study was to understand how acculturation is related to leisure time moderate-to-vigorous physical activity (MVPA) participation among Latina women.

Data were drawn from the Familias Sanas y Activas II study, restricted to bilingual (or monolingual Spanish) Latinas aged 18-69 (n=414). Acculturation was assessed by proxy measures and an acculturation scale: generation status, years of residence in the U.S., age of arrival in the U.S., and Marín & Gamba’s Bidimensional Acculturation Scale. Leisure time MVPA was defined as at least 10 minute bouts of physical activity that increase the heart rate during sports, fitness, and recreational activities, and was measured through self-reported metabolic equivalent task (MET) minutes per week using the Global Physical Activity Questionnaire. Spearman’s correlations were performed to identify potential confounders.

Of the Latinas studied, 82.9% were first generation immigrants. The mean years of residence was 15.1 years and the mean age of arrival was at 24.4 years of age. Sixty two percent of the women were classified as traditional and 37.4% were classified as bicultural based on the acculturation scale. An independent samples t-test indicated that women who arrived in the U.S. prior to age 25 engaged in more MET minutes of leisure time MVPA compared to women who arrived in the U.S. after age 25 (p < .05). Generation status, years of residence in the U.S., and acculturation domains were not significantly related to physical activity.

Findings suggest that future public health interventions that aim to increase physical activity among Latino immigrants should target those who arrive in the U.S. as adults. Worksite or community-based interventions may be key to achieving this aim.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT ................................................................. v</td>
</tr>
<tr>
<td>LIST OF TABLES .......................................................... viii</td>
</tr>
<tr>
<td>LIST OF FIGURES ....................................................... ix</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS .................................................... x</td>
</tr>
<tr>
<td>CHAPTER</td>
</tr>
<tr>
<td>1 INTRODUCTION .......................................................... 1</td>
</tr>
<tr>
<td>Recommended Physical Activity Levels ................................................................. 2</td>
</tr>
<tr>
<td>Benefits of Physical Activity .............................................................................. 3</td>
</tr>
<tr>
<td>Current Physical Activity Levels ........................................................................ 4</td>
</tr>
<tr>
<td>Factors Affecting Physical Activity ................................................................. 5</td>
</tr>
<tr>
<td>Acculturation ......................................................................................................... 8</td>
</tr>
<tr>
<td>Acculturation and Theory ..................................................................................... 10</td>
</tr>
<tr>
<td>Acculturation and Physical Activity ................................................................. 11</td>
</tr>
<tr>
<td>Purpose of the Study .......................................................................................... 16</td>
</tr>
<tr>
<td>Hypotheses ........................................................................................................... 16</td>
</tr>
<tr>
<td>2 METHODS ................................................................. 17</td>
</tr>
<tr>
<td>Study Design ................................................................................................. 17</td>
</tr>
<tr>
<td>Setting ........................................................................................................... 17</td>
</tr>
<tr>
<td>Recruitment and Eligibility .............................................................................. 18</td>
</tr>
<tr>
<td>Data Collection ............................................................................................... 19</td>
</tr>
<tr>
<td>Physical Activity ............................................................................................... 19</td>
</tr>
<tr>
<td>Acculturation ..................................................................................................... 20</td>
</tr>
<tr>
<td>Generation status ............................................................................................ 20</td>
</tr>
<tr>
<td>Acculturation Domains .................................................................................... 21</td>
</tr>
<tr>
<td>Years of Residence in the U.S. ......................................................................... 22</td>
</tr>
</tbody>
</table>
3 RESULTS ....................................................................................................................26
   Description of Participants .....................................................................................26
   Generation Status and Total Leisure Time MVPA ................................................27
   Acculturation and Total Leisure Time MVPA ......................................................28
   Years of Residence in the U.S. and Total Leisure Time MVPA ...........................29
   Age of Arrival in U.S. and Total Leisure Time MVPA .........................................30
   Identifying Covariates for Multivariate Models ....................................................31
   Multivariate Model ................................................................................................32

4 DISCUSSION ..............................................................................................................34
   Summary of Findings .............................................................................................34
      Generation Status .............................................................................................35
      Acculturation Domains ....................................................................................35
      Years of Residence in the U.S. ........................................................................36
      Age of Arrival in the U.S. ................................................................................36
      Multivariate Model ..........................................................................................37
   Study Strengths ......................................................................................................37
   Study Limitations ...................................................................................................39
   Implications for Research ......................................................................................41
   Implications for Practice ........................................................................................42

REFERENCES ........................................................................................................................44
**LIST OF TABLES**

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>United States Census Bureau Poverty Thresholds for 2014</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>Descriptive Statistics On The Sample (N=414)</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
<td>Descriptive Statistics on Acculturation &amp; Physical Activity Measures (N=414)</td>
<td>27</td>
</tr>
<tr>
<td>4</td>
<td>Spearman’s Rank-order Correlation Coefficient of Covariates With Total Leisure Time MVPA Among Foreign Born Women (N=343)</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>Sequential Multiple Regression Predicting Total Leisure Time MVPA From Years of Residence in the U.S. and Age of Arrival in the U.S., Controlling for Employment Status (N=343)</td>
<td>33</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Association between generation status and total leisure-time MVPA.</td>
<td>28</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Association between acculturation groups and total leisure-time MVPA.</td>
<td>29</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Association between years of residence in the U.S. and total leisure-time MVPA.</td>
<td>30</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Association between age of arrival in the U.S. and total leisure-time MVPA.</td>
<td>31</td>
</tr>
</tbody>
</table>
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CHAPTER 1

INTRODUCTION

Latinos, the largest racial/ethnic minority population in the United States, comprise 17% of the total U.S. population (United States Census Bureau [USCB], 2014a). Of these 54 million Latinos, 14.7 million reside in California, making it the most Latino-dense state in the nation (USCB, 2014b). The number of Latinos in California requires a thorough understanding of this ethnic minority’s current health status and their needs, concerns, and disparities to promote and ensure the high quality health of this population, especially among Latino individuals living along the U.S.-Mexico border.

The Latino population has the second highest rate of obesity among U.S. adults; roughly 42% of Latino adults are considered obese (Ogden, Carroll, Kit, & Flegal, 2014). The risks and negative consequences associated with obesity are many. Obese individuals have increased risk of developing poor health outcomes, such as diabetes mellitus, cardiovascular disease, hypertension, and cancer (Reilly et al., 2003). A sedentary lifestyle and poor diet lead to obesity and, consequently, secondary illnesses such as cardiovascular diseases (Lakka & Bouchard, 2005). Obesity and sedentary lifestyles result in over 300,000 premature deaths per year in the United States (Manson, Skerrett, Greenland, & VanItallie, 2004).

In 2010, the leading cause of death in Latinos was cancer, followed by cardiovascular disease (Heron, 2013). Stroke and diabetes were also prominent causes of death in this population (Heron, 2013). Obesity does not solely affect overall health, however, and the effects of obesity on our nation’s economy are growing. Among U.S. adults, the costs associated with obesity were estimated to be 147 billion dollars in 2008 (Finkelstein, Trogdon, Cohen, & Dietz, 2009). This is a 68.5 billion dollar increase since 1998, indicating that the prevalence of obesity in our nation is increasing at rapid rates, thereby increasing medical costs (Finkelstein et al., 2009).
Exercising consistently decreases body fat and concurrently decreases the risk of developing negative health outcomes (Lakka & Bouchard, 2005). Increasing physical activity is critical for the treatment of obese individuals and preventing them from further weight gain (Wareham, 2007). Recent evidence supports that more physical activity is necessary to prevent weight regain after weight loss, and should therefore be implemented as a lifestyle change rather than a temporary solution for weight loss (Donnelly et al., 2009). To better understand the high prevalence of obesity in the Latino population, it is critical to look at physical activity patterns in the context of the culture and practices of the Latino community.

Acculturation is a process in which an individual, usually an immigrant, learns and embodies aspects of his/her host culture, but may still preserve the culture, practices, and beliefs of the home country (Ayala et al., 2004; Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005). Acculturation may be a slow and gradual process that involves the individual combining elements of the host culture and culture of origin (Thomson & Hoffman-Goetz, 2009). Acculturation is associated with physical activity participation among Latinos, and has been studied in this population with respect to years of residence in the U.S., birth place, language preference, and other variables that aim to define acculturation levels (Ayala et al., 2004; Barcenas et al., 2007). However, findings are inconsistent on the relationship between acculturation and physical activity (Barcenas et al., 2007). This may be due to the use of different acculturation and physical activity measurement approaches. These inconsistencies suggest that further examination is required to better understand the relationship between acculturation and physical activity in this vulnerable population.

**Recommended Physical Activity Levels**

The World Health Organization defines physical activity as “any bodily movement…that requires energy expenditure” (World Health Organization [WHO], 2014). According to the WHO guidelines, adults ages 18 years and older are recommended to engage in 150 minutes of moderate-intensity physical activity per week (WHO, 2014). The CDC has categorized the recommended physical activity for adults into two types: (1) aerobic activity for at least 150 minutes per week and (2) muscle-strengthening activities at least twice a week (Centers for Disease Control and Prevention [CDC], 2014).
The American College of Sports Medicine (ACSM) classifies aerobic activity into three types. Light intensity activities that require little energy expenditure are classified as Group I activities, such as brisk walking or light cycling (Kravitz & Vella, 2015). Group II activities, or moderate intensity aerobic activities, require greater energy expenditure and increase the heart rate (CDC, 2014; Kravitz & Vella, 2015). Such activities may include water aerobics, light jogging, dancing, or hiking (CDC, 2014; Kravitz & Vella, 2015). Group III activities are categorized as vigorous intensity aerobic activity, such as running, swimming laps, playing basketball, or any other movement that increases the heart rate significantly and may cause the individual to perspire (CDC, 2014; Kravitz & Vella, 2015). According to the CDC, muscle-strengthening activities target the major muscles of the body (legs, hips, back, chest, abdomen, shoulders, and arms; CDC, 2014). These activities can be achieved through weight lifting, utilizing resistance bands or the individual’s body weight during exercise, or yoga (CDC, 2014). It is important to note that all forms of physical activity must be performed for a minimum of 10-minute bouts of consistent movement without breaks in order to be beneficial (WHO, 2014).

**Benefits of Physical Activity**

There is strong evidence that consistent physical activity, defined as 150 minutes of moderate intensity or 75 minutes of vigorous intensity physical activity per week, has numerous health benefits in both healthy individuals and those who are at risk or suffer from chronic health conditions (Troiano et al., 2007; United States Department of Health and Human Services [HHS], 2008). Failure to participate in consistent physical activity not only increases the risk of developing coronary heart disease, type 2 diabetes, and osteoporosis, but also has adverse effects on mental health, such as depression and decreased cognitive ability (Paluska & Schwenk, 2000). Individuals who participate in 150 minutes a week of moderate intensity physical activity of any type have a reduced risk of developing heart disease, diabetes, breast cancer, and colon cancer (Lee et al., 2012). Brain function is enhanced with recommended levels of physical activity, and increases brain plasticity by 27% and metabolic function of the brain by 24% (Cotman & Berchtold, 2002). Conversely, engaging in no physical activity inhibits the functional capacity of the individual, which decreases their ability to engage in daily activities necessary for living (Cotman & Berchtold, 2002). As a
result, physical inactivity causes 6% of all deaths globally (WHO, 2014). According to the
World Health Organization (2014), those who are not physically active have a 20% to 30%
higher mortality risk compared to those who participate in at least 30 minutes a day of Group
II physical activity throughout the week. Among the one in three obese individuals in the
United States, there is a greater prevalence of obesity among middle-aged adults than
younger adults (Ogden et al., 2014). A cross sectional study using data from the National
Health Interview Survey studied the changes in physical activity patterns in the United States
by age. Regular, vigorous physical activity was defined as 20 minute bouts of any activity
performed at a minimum of 50% of the individual’s maximum cardiorespiratory capacity at
least 3 times a week. Results showed that regular, vigorous physical activity declined
consistently between the ages of 12 and 29, and stabilized between the ages of 30 and 64
(Caspersen, Pereira, & Curran, 2000). Thirty nine percent of obese individuals in the United
States are between the ages of 40-59, which further suggests that that physical activity tends
to decrease with age (Ogden et al., 2014).

Engaging in recommended levels of moderate and vigorous intensity physical activity
of any type improves muscular and cardiorespiratory function, increases bone health, reduces
the risk of developing chronic illnesses, and reduces the risk of fractures from falls (Troiano
et al., 2007). Participating in recommended levels of moderate intensity physical activity also
prevents weight gain, and has been proven to be a more efficient method for long-term
weight control than solely dieting (Fogelholm & Kukkonen-Harjula, 2001). There is
moderate evidence that strength-training types of exercise, including weight lifting, improves
sleep quality, strength, depression, and overall quality of life (Singh, Clements, & Fiatarone,
1997).

**CURRENT PHYSICAL ACTIVITY LEVELS**

The 2008 *Physical Activity Guidelines* (PAG) were created by the U.S. Department of
Health and Human Services to describe the importance of physical activity and
recommendations to lead a healthy lifestyle (HHS, 2008). The PAG recommend that adults
participate in at least 150 minutes a week of moderate intensity physical activity or 75
minutes of vigorous intensity physical activity of any type in order to receive health benefits.
Tucker, Welk, and Beyler (2011) were the first researchers to use the PAG to assess the self-
reported physical activity in U.S. adults (n=4773). The study used NHANES data from 2005-2006 to gather self-report data, and objectively measured physical activity levels using an accelerometer that participants wore for one week. Accelerometer data showed that less than 10% of U.S. adults met the PAG, and these objective measures were not consistent with self-reported physical activity levels ($r=0.27$, $p > .05$; Tucker, Welk, & Beyler, 2011).

According to Healthy People 2020, more than 80% of U.S. adolescents and adults do not meet the PAG (HHS, 2008), which is consistent with the previous findings of Tucker et al. (2011). Latino adults are less likely to meet the PAG than non-Latino white adults (Troiano et al., 2007). According to the American Heart Association, when adjusting for age, Latino adults were more likely to be inactive than non-Latino white adults, and 42.2% of Latino adults were inactive compared with non-Latino white adults (27.7%; Go et al., 2013). Women are particularly at risk for not meeting recommended physical activity levels, as they are more likely to be sedentary than their male counterparts (Crespo, Smit, Carter-Pokras, & Andersen, 2001; Troiano et al., 2007). One study showed that Latina women primarily participate in occupational physical activity including vigorous intensity physical activity involving housework and caregiving, which contrasts with the types of physical activity of non-Latino white women (Slattery et al., 2006). As age increases, Latina women become less physically active compared to non-Latino white women (Slattery et al., 2006). At age 50, non-Latino white women engaged in higher rates of vigorous intensity leisure-time physical activity than Latina women (non-Latino white $M = 1.9$ hours, Latina $M = 1.0$ hours, $p < 0.01$; Slattery et al., 2006). Various studies have shown that a prominent factor that may influence physical activity levels among Latina women is the acculturation process (Ayala et al. 2004; Crespo et al., 2001; Evenson, Sarmiento, & Ayala, 2004).

**FACTORS AFFECTING PHYSICAL ACTIVITY**

Urie Bronfenbrenner introduced the Social Ecological Model (SEM) in the 1970s to explain behavior in the context of the ecological system (Bronfenbrenner, 1994). The SEM provides a framework to better understand the variety of factors that affect physical activity participation in Latina women. In this framework, the environments that influence behavior are within the microsystem, mesosystem, exosystem, and macrosystem of the individual (Bronfenbrenner, 1994). Seefeldt, Malina, and Clark (2002) argue that the individual factors
that influence engagement in physical activity include age, sex, ethnicity, and self-efficacy. To engage in physical activity, the individual must have the resources, skills, and abilities to perform the behavior (Giles-Corti & Donovan, 2002b). Individual attitudes that inhibit physical activity participation include lack of motivation, viewing exercise as inconvenient or boring, and low perceived self-efficacy (Seefeldt et al., 2002). These negative attitudes are among the strongest predictors of engagement in physical activity (Giles-Corti & Donovan, 2002b).

The microsystem is the immediate environment surrounding the individual, such as his/her family or peers from school, friends, or social networks (Bronfenbrenner, 1994). This level involves the influences of family members or referent individuals. By having positive attitudes towards engaging in physical activity, building the self-efficacy of the individual, and providing social support, family members and friends can motivate behavior change within the individual. Studies show that social support influences physical activity, and an increased social support network will increase the self-efficacy of the individual to exercise, which in turn may increase physical activity levels (Anderson, Wojcik, Winett, & Williams, 2006).

The mesosystem is a combination of two or more microsystems that interact with each other to influence behavior (Bronfenbrenner, 1994). The mesosystem is comprised of the physical and social environments. The physical environment relevant to physical activity is shaped by (1) accessibility of facilities to partake in physical activity, such as availability of gymnasiums, parks, and sidewalks, (2) opportunities to engage in physical activity, such as intramural sports teams within the community, and (3) the appropriate weather conditions (Humpel, Owen, & Leslie, 2002). The social environment is shaped by the individual’s perception of the social norms, the support he/she receives for being active, and the safety of his/her environment (Humpel et al., 2002; McNeill, Kreuter, & Subramanian, 2006). Giles-Corti and Donovan (2002a) found that individuals living in low socioeconomic status areas were 36% less likely to engage in vigorous intensity physical activity. This was due to their perception of their physical and social environments, as they perceived their community to have a high flow of traffic, making it less safe and less supportive of walking (Giles-Corti & Donovan, 2002a).
Among ethnic minorities in particular, barriers to physical activity engagement include elements comprising the mesosystem and exosystem, such as lack of childcare, expensive facilities, fear of violence and crime, and fear for safety (Seefeldt et al., 2002). Exosystems are comprised of indirect influences of behavior, such as mass media and policies (Bronfenbrenner, 1994). In the context of physical activity engagement, this includes the promotion of physical activity through commercials or advertisements on local television, radio, newspapers, etc. Local policies that decrease barriers to physical activity engagement, such as more affordable gymnasium memberships for low socioeconomic status residents or joint use agreements with schools, may also be considered a community level influence on physical activity (Lafleur et al., 2013).

Lastly, the macrosystem is composed of the society’s cultural values, practices, and laws (Bronfenbrenner, 1994). National laws that mandate safer physical and social environments (influences on the mesosystem) promote physical activity engagement. In a cross sectional study of U.S. adults from 1999-2000, researchers showed high levels of support among participants for health policy-related measures that create environmental changes promoting physical activity (Brownson, Baker, Housemann, Brennan, & Bacak, 2001).

The influence of acculturation on physical activity engagement fits into all levels of the SEM. On an individual level, the ethnicity of the individual may influence physical activity engagement. Neighbors, Marquez, and Marcus (2008) showed that physical activity engagement differs among Latino subgroups (Mexican American, Puerto Rican, Mexican, Cuban, Dominican, and Central or South American), with Mexican Americans having the highest prevalence of physical activity. At the microsystem, the individual’s willingness to accept the influences of referent peers who are more or less acculturated to the host culture may influence his/her physical activity engagement. At the mesosystem, physical activity engagement of the individual may be affected by the perceived safety of the host country’s environment to engage in these behaviors. For example, if the individual is not accustomed to the cultural norms of the society, such as exercising in public areas, the individual may be less likely to engage in physical activity. Acculturation has a profound effect on the exosystem and macrosystem, and immigrants who arrive in the U.S. at an earlier age are likely more exposed to English language mass media than immigrants who arrive at a later
Acculturation has been studied for its association with physical activity, and Crespo et al. (2001) argue that less acculturated Latinos confront greater barriers to physical activity, such as lack of access to facilities and safe recreational areas, than other ethnicities with similar levels of acculturation. To better understand the true association of acculturation on physical activity, additional research is needed.

ACCULTURATION

Acculturation is a process in which an individual, usually an immigrant group, learns and embodies aspects of the host culture, but may still preserve the culture, practices, and beliefs of the home country (Ayala et al., 2004; Lara et al., 2005). Acculturation may be a slow and gradual process that involves the individual combining elements of the host culture and culture of origin (Thomson & Hoffman-Goetz, 2009). Integration is achieved by acquiring the cultural elements of the host culture, which includes incorporating the language, foods, and customs into the individual’s cultural norms from their home country (Lara et al., 2005). Acculturation is generally defined by language use, birth place, years of residence in the host country, and generational status (Abraído-Lanza, Armbrister, Flórez, & Aguirre, 2006; Crespo et al., 2001; Khan, Sobal, & Martorell, 1997).

The acculturation process is conceptualized into three models: unidimensional, bidimensional, and multidimensional (Lara et al., 2005). Unidimensional acculturation implies that acculturation occurs on a linear continuum where in an individual will either integrate him or herself entirely to the host culture (assimilated), or maintain his or her culture of origin (traditional; Lara et al., 2005). Bidimensional acculturation models differ from unidimensional models in that adherence to the new host culture is believed to be independent of the maintenance of the original culture (Lara et al., 2005). In other words, bidimensional acculturation models abandon the “all-or-nothing” approach of unidimensional models and explore acculturation as a complex process with multiple influences and outcomes. Bidimensional models allow for the possibility of the individual to adopt the host culture while maintaining the culture of origin (Thomson & Hoffman-Goetz, 2009). Multidimensional measures utilize different scales to understand factors that influence
acculturation, and are less commonly found in research compared to the other two measures (Thomson & Hoffman-Goetz, 2009).

There are four categories to bidimensional acculturation: assimilation, separation, integration, and marginalization (Berry, 1997; Lara et al., 2005). When the individual completely abandons the culture of origin and completely adopts the host culture, this is referred to as assimilation. Separation is the opposite, where the individual rejects the host culture and maintains their culture of origin; this is sometimes referred to as traditionalism. Integration occurs when the individual integrates aspects of the two, while marginalization is complete rejection of both cultures.

Researchers have measured acculturation through proxy measures and scales to understand this complex phenomenon (Lara et al., 2005). A commonality across several acculturation scales are the subconstructs they measure; these include the individual’s (1) engagement in culturally specific behaviors, (2) proficiency in the English or Spanish language, (3) knowledge of culturally-specific history and current events, (4) cultural identity, and (5) adoption of culturally-specific values (Lara et al., 2005). Numerous scales have been developed to measure acculturation, with two of the most commonly used scales for Mexican Americans being the Bidimensional Acculturation Scale (BAS; Marín & Gamba, 1996) and the Acculturation Rating Scale for Mexican-Americans-II (ARSMA-II; Cuellar, Arnold, & Maldondo, 1995). In the present study, the BAS was used to assess acculturation. The scale examines the subconstructs of language use, proficiency, and media exposure (Marín & Gamba, 1996).

Critics of acculturation scales state that these scales overemphasize language measures to determine acculturation status (Lara et al., 2005). To address this critique, some studies have used proxy measures to describe acculturation status, including place of birth, generational status, and age at immigration (Lara et al., 2005). While some studies only use acculturation scales to measure acculturation, more studies are utilizing these scales in addition to proxy measures to obtain the most accurate representation of acculturation in their participants. For example, a study conducted by Ayala et al. (2004) measured acculturation in their participants using the ARSMA scale in addition to the place of birth and years of residence in the U.S.
The health and behavior of Latinos and their associations with acculturation are complicated and inconsistent. For example, while some studies showed that years of residence in the U.S. provided evidence of acculturation status (Marquez, Ayala, & Wing, 2013), others found that this measure is not associated with acculturation (Evenson et al., 2004). Most studies, however, agree that more acculturated Latinos are more likely to partake in substance abuse (Vega, Alderete, Kolody, & Aguilar-Gaxiola, 1998), poor dietary consumption (Espinosa de los Monteros, Gallo, Elder, & Talavera, 2008), and suffer from negative health outcomes, such as obesity (Fuentes-Afflick & Hessol, 2008). Thus, further research is needed to determine the true association of acculturation and health among Latinos.

**ACCULTURATION AND THEORY**

The Social Impact Theory was created in 1981 by Bibb Latané to describe the effect of family, peers, and other referent individuals on an individual. The social impact of the influencing group on the individual depends on three things: (1) the strength of the influencing group, (2) the immediacy of the influencing group, and (3) the number of people in the influencing group (Latané, 1981). The strength of the influencing group is defined as the importance of the group to the target individual, and the immediacy refers to the physical proximity of the influencing group to the individual (Latané, 1981).

Acculturation involves an interchange between an influencing group and a target individual and may lead to changes in social behavior, attitudes, and customs (Berry, 1997). The interpersonal communication between these two groups is argued to be critical to the acculturation process, should the influencing group be comprised of members of a host culture and the target individual retaining aspects of his/her home country (Hsu, Grant, & Huang, 1993). For example, a newly arrived immigrant may be less acculturated to the host culture’s norms and values. After interaction with members of the influencing group who are more acculturated to the host country, this individual may be influenced by their behaviors and adopt the host country’s norms. This depends on the individual’s perception of how important his or her influencers are, how often the individual comes into contact with the influencers, and the number of influencers. The more important the individual perceives his or her influencers, the greater impact they will have on the individual’s behaviors. The closer
in proximity to the individual, the higher the frequency of interaction, and the greater the number of influencers will increase the likelihood of the individual’s behavior being impacted by the influencing group.

**ACCULTURATION AND PHYSICAL ACTIVITY**

There is mixed evidence for the association between acculturation and physical activity among Latinos. In studies that investigate the relationship between acculturation and physical activity, acculturation is most often measured through the proxy measures of years of residence in the U.S. (Evenson et al., 2004; Marquez et al., 2013), language preference (Crespo et al., 2001; Evenson et al., 2004; Slattery et al., 2006), and place of birth/generation status (Crespo et al., 2001; Neighbors et al., 2008).

A study conducted by Marquez et al. (2013) examined acculturation among Latina women in the United States and their weight loss strategies. This study recruited a group of self-identified Latina women in Rhode Island and used a questionnaire to assess acculturation and issues pertaining to weight loss, including whether or not the participant engaged in physical activity. The acculturation measure was years of residence in the U.S. Their results indicated that increased physical activity as a mechanism to lose weight was related to increased years of U.S. residence. Among the participants, the odds of engaging in physical activity for weight loss increased by 18% for each year of U.S. residence (Marquez et al., 2013).

Ayala et al. (2004) conducted a study in California’s border region with Mexican American women that involved a face-to-face interview. Acculturation was measured three ways: (1) length of residence in the United States, (2) place of birth, and (3) the 30-item Acculturation Rating Scale for Mexican-Americans-II (ARSMA-II; Cuellar et al., 1995). The ARSMA-II is a bidimensional scale that measures a participant’s preferred language for speaking and accessing media, and their interactions with Mexican and Anglo culture (Cuellar et al., 1995). The ARSMA-II scores the 30 responses on a 5-point type Likert-type scale and produces three scores: (1) Mexican orientation score, (2) Anglo orientation score, and (3) composite score based on the other two scores. The Mexican orientation score signifies the preference for Mexican ethnic identity and traditional behaviors, while the Anglo orientation score signifies the integration towards Anglo culture. Based on these
scores, participants were placed in one of four categories standardized by Cuellar et al. (1995) that categorizes the participants as (1) bicultural (previously referred to as integrated), (2) traditional, (3) marginalized, and (4) assimilated. The mean Mexican and Anglo orientation scores among the participants were 4.15 (SD=0.44) and 2.33 (SD=0.69) out of 5, respectively. Physical activity levels were self-reported and measured using a valid interview guide; the researchers inquired about the participants’ days of moderate intensity physical activity per week and mean days of vigorous activity for 20 minutes and mean days of moderate activity for 30 minutes and 60 minutes. Bicultural women had lived in the U.S. for more years (19.17 years, SD=12.80, p<0.001) compared to traditional women (14.42 years, SD=9.01, p<0.001). Birthplace was examined and analyzed as generation status (defined as new immigrant being 1st generation, and born in the U.S. being 2nd generation or more), and results showed that among first generation Mexican Americans, 26% were classified as bicultural and 29% were classified as traditional (p ≤ 0.01). Among second (or more) generation Mexican Americans, 61.6% were classified as bicultural and 11% were classified as traditional (p ≤ 0.01). No women fell into the marginalized category and very few women were classified as assimilated. Bicultural women reported more days of moderate and vigorous physical activity for at least 30 minutes than traditional women (p ≤ 0.05). Both years of residence in the U.S. and birthplace were not examined in relation to physical activity.

Previous studies suggested that Mexican Americans are less physically active during leisure time than non-Latino whites (Crespo, Keteyian, Heath, & Sempos, 1996). Crespo conducted another study five years later to examine the relationship between acculturation and leisure time physical inactivity in Mexican Americans. Crespo and colleagues used the Third National Health and Nutrition Examination Survey (NHANES III) from 1988-1994 to assess the acculturation variables of place of birth and language preference. Physical activity was measured through a household adult questionnaire that obtained information on leisure-time physical activity, and participants were considered physically inactive during leisure time if they responded no to the questionnaire responses and 4 open-ended questions that assessed information on physical activity. The study omitted information on the validity and reliability of this questionnaire. The study found that adults born in Mexico had a higher prevalence of physical inactivity compared to U.S.-born Mexican Americans (42% compared
to 28%). With regards to language preference, participants who preferred speaking Spanish over English were 1.5 times more likely to be inactive during leisure time than participants who preferred speaking English (OR=1.5, 95% CI: 1.1-2.0).

Slattery et al. (2006) used data from participants in the 4-Corner’s Breast Cancer Study to compare physical activity levels and language acculturation between Latina and non-Latinas (n=2039). The study measured physical activity levels via the Cross-Cultural Activity Participation Study (CAPS) questionnaire for minority women (Ainsworth, Irwin, Addy, Whitt, & Stolarczyk, 1999). This questionnaire gathers data on reported amount, intensity, and duration of physical activity, and assigns metabolic equivalent task (MET) values to participants to obtain their physical activity levels. MET’s are defined as the energy cost of an activity (Jetté, Sidney, & Blumchen, 1990). One MET is defined as the energy cost of being at rest with little oxygen consumption due to little physical activity, and consumes 1 kcal/kg/hour (Singh & Purohit, 2011). Through the CAPS questionnaire, results indicated that housework was the predominant method to achieve physical activity among Latina women compared to non-Latina whites (38.9% compared to 29.1%; Slattery et al., 2006). Language acculturation was measured via a computerized questionnaire by asking participants questions regarding their preference for speaking and reading Spanish versus English. The study did not use a standardized scale to measure language acculturation. Results indicated that Latina women who were less acculturated to the English language had lower involvement in moderate-intensity sports (golfing, softball, volleyball, basketball, tennis, skiing) than Latina women more acculturated to the English language (p<0.01; Slattery et al., 2006). Overall, Latinas and non-Latina whites differed in preferred types of physical activity, and this differed by level of language acculturation (Slattery et al., 2006). Non-Latina whites with higher levels of language acculturation engaged in more MET-hours of physical activity per week (mean=32.7 hours) and more MET hours of vigorous intensity physical activity (mean=9.6 hours) than Latina women with lower levels of language acculturation (mean=27 hours and 6.1 hours, respectively; p <0.01; Slattery et al., 2006).

Evenson et al. (2004) studied acculturation and physical activity among first generation Latina immigrants using face-to-face interviews. The Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System Survey (BRFSS) was used to measure physical activity, and the acculturation variables measured were language
preference, years of residence in the U.S., and age of arrival in the U.S. The BRFSS survey assessed moderate and vigorous physical activity levels in the participants, and the women were grouped into three categories: those who (1) met recommendations (moderately active for at least 30 minutes a day for at least 5 days a week or vigorously active for at least 20 minutes a day for at least 3 days a week), (2) were insufficiently active (some physical activity, but did not meet recommendations), and (3) were inactive (no physical activity for at least 10 minutes at a time). The 4-item language scale developed for Latinos was used to measure language preference, and participants were given a score from 4 (less English language acculturation) to 20 (highest English language acculturation). Results indicated that women with higher English language acculturation were four times more likely to meet physical activity recommendations compared to women with lower English language acculturation (OR=4.19, 95% CI: 2.11-8.29; Evenson et al., 2004). Women who arrived in the U.S. prior to the age of 25 were twice as likely to meet physical activity recommendations than women who arrived in the U.S. at age 25 or older (OR=2.09, 95% CI: 1.18-3.72; Evenson et al., 2004). Evenson and colleagues argued that the higher rates of physical activity in those who arrived prior to the age of 25 may be due to their increased exposure to messages about the benefits and importance of exercise. Length of residence in the U.S. was not associated with physical activity (Evenson et al., 2004).

Neighbors et al. (2008) conducted a unique study in which leisure-time physical activity was measured among Latino subgroups (Mexican American, Puerto Rican, Mexican, Cuban, Dominican, and Central or South American). Physical activity was measured in the same way and by the same standards as previously described (Evenson et al., 2004). Acculturation was measured through language preference, birthplace, and years of residence in the U.S. Using data from the National Health Interview Survey from 2000 to 2003, their results showed discrepancies in physical activity levels among the different subgroups. Of the Mexican Americans in the sample, 14.2% were born outside of the U.S. compared to the 4.7% of non-Latino whites, and more Mexican Americans resided in the United States for less than 10 years compared to their non-Latino white counterparts (1.8% and 1.2%, respectively; Neighbors et al., 2008). A higher percentage of Mexican Americans spoke Spanish only during the interview compared to non-Latino whites (6.8% and 0%, respectively), indicating higher levels of English language acculturation in the non-Latino
white sample (Neighbors et al., 2008). Participants who spoke Spanish only during the interview were 0.68 times less likely to engage in physical activity than participants who exclusively spoke English during the interview (OR= 0.68, 95% CI: 0.61-0.76; Neighbors et al., 2008). Overall, Latino subgroups were generally less acculturated to the English language and less physically active than non-Latino whites in the U.S., and 47.1% of Mexican Americans in the sample reported no leisure-time physical activity (95% CI: 45.2-49.0) compared to the 35.8% of non-Latino whites engaging in no leisure-time physical activity (95% CI: 35.0-36.5; Neighbors et al., 2008).

In conclusion, there are numerous inconsistencies in the research that aims to explain an association between acculturation and physical activity. For example, while some studies show that increased years of residence in the U.S. is positively associated with increased levels of physical activity (Marquez et al., 2013), others studies show that years of residence in the U.S. is not associated with physical activity (Evenson et al., 2004). Most studies agree that place of birth, which determines generation status, is associated with higher levels of acculturation among those who are second generation or greater, and some studies showed that this is associated with greater levels of physical activity (Ayala et al., 2004; Crespo et al., 2001; Neighbors et al., 2008). Research has consistently shown, however, that language acculturation with a preference for the English language rather than the Spanish language, is associated with greater likelihood of physical activity engagement (Crespo et al., 2001; Evenson et al., 2004; Neighbors et al., 2008; Slattery et al., 2006). While some studies used validated and reliable measures of acculturation through scales such as the ARSMA-II, BAS, and the 4-item language scale, other studies did not employ scales and used proxy variables of acculturation. Different acculturation measures yielded different results, indicating that a consensus is needed on how to measure acculturation. Similarly, physical activity levels were not consistently defined and measured across all studies. While some studies employed questionnaires that were previously validated and reliable, such as the CAPS questionnaire (Slattery et al., 2006) or the BRFSS (Evenson et al., 2004), other studies assessed physical activity through several questions on an un-validated survey (Crespo et al., 2001; Neighbors et al., 2008). Thus, the association between acculturation and physical activity must be further examined.
**PURPOSE OF THE STUDY**

The purpose of this study was to examine the relationship between acculturation and leisure-time MVPA among Latina women by comparing four different measures of acculturation: (1) generational status based on a participant’s birthplace and a participant’s parents’ birthplace, (2) cultural dominance using the Marin Bi-dimensional acculturation scale (Marín & Gamba, 1996), (3) years of residence in the U.S., and (4) age when participant first arrived in the U.S. to reside. Leisure-time physical activity was examined using the Global Physical Activity Questionnaire (GPAQ; Bull, Maslin, & Armstrong, 2009).

**HYPOTHESES**

This study used data from the Familias Sanas y Activas-II (FSA-II) baseline survey to test the following directional research hypotheses:

Hypothesis 1: Those who are 2nd generation and beyond will engage in more MET minutes of MVPA during leisure-time than Latina immigrants (i.e., first generation).

Hypothesis 2: Women who are considered bicultural according to the BAS will report greater MET minutes of leisure-time MVPA than those who are considered traditional.

Hypothesis 3: Among foreign born women, those who have resided in the U.S. for 15 years or greater will report greater MET minutes of leisure-time MVPA compared to those who have resided in the U.S. for less than 15 years.

Hypothesis 4: Those who arrived in the U.S. prior to age 25 will engage in more MET minutes of leisure-time MVPA than those who arrived in the U.S. at age 25 or older.

Hypothesis 5: After controlling for covariates, those with greater years of residence in the U.S. and who arrived in the U.S. at an earlier age will engage in more MET minutes of leisure-time MVPA compared to those with fewer years of residence in the U.S. and who arrived in the U.S. later in life.
This is a cross-sectional study using baseline data to examine the relationship between different measures of acculturation and women’s leisure-time moderate-to-vigorous physical activity (MVPA) levels.

**STUDY DESIGN**

To examine acculturation and its association with leisure-time MVPA level, four models of acculturation were examined: generation status, length of residence in the U.S., age of arrival in the U.S., and language preference. Language preference was measured using the Marin Bi-dimensional Acculturation Scale (Marín & Gamba, 1996). The source of data was “Familias Sanas y Activas 2” (FSA-II), an intervention by the San Diego Prevention Research Center (SDPRC) funded by the Centers for Disease Control and Prevention. Data were gathered from women in four communities in South San Diego County. The purpose of the intervention was to improve the health and well-being of the Latino community in the U.S.-Mexico border region by increasing leisure-time MVPA and reducing obesity. All protocols were approved by the Institutional Review board at San Diego State University.

**SETTING**

Women were recruited from four communities in South San Diego County, including San Ysidro, Chula Vista, Imperial Beach, and Bonita. These four communities, located near the U.S.-Mexico border, exhibit similar characteristics that make them unique from other communities within greater San Diego County. According to the County of San Diego Health & Human Services Agency (CSDHHSA; 2013), South San Diego County is comprised of over 450,000 people with almost 59.9% identifying as Latino, compared to 38.4% Latinos in California (USCB, 2014b). Almost half of the population is married, 77.0% completed high school or higher, 50.2% are female, 68% are between the ages 15 and 64 years, and 89.9%
were employed in 2011 (CSDHHSA, 2013). Twenty five percent of the population in South San Diego County has a household income of below $35,000 (CSDHHSA, 2013). These demographics are similar to that of the state with the exception of ethnicity, with 81.2% completing high school or higher education level, 50.3% female, 63.6% between the ages of 18 and 64 years, and 93% employment (Employment Development Department, 2015; USCB, 2014b). Thus, South San Diego residents are less educated, more likely to be Latino, and more likely to be between 18 and 64 years of age.

Importantly, South San Diego County has a higher rate of foreign born individuals compared to the state of California (32.0% compared to 27.0%), possibly because of its close proximity to Mexico. The higher rates of foreign born persons in this region of the county will allow for a more novel study on the association of acculturation with leisure-time MVPA in this population.

**RECRUITMENT AND ELIGIBILITY**

Participants were recruited by research associates of the SDPRC for this non-experimental study using convenience sampling through word of mouth, flyer distribution, and presentations in the community. When potential participants showed interest, eligibility criteria were used to determine if the participants were qualified for the study:

- Between 18 to 69 years of age
- Identify as Latino
- Resident of South San Diego County (San Ysidro, Chula Vista, Bonita, Imperial Beach)
- Either bilingual in English and Spanish, or monolingual Spanish
- Eligible to participate in physical activity per the Physical Activity Readiness Questionnaire (PAR-Q), a screening questionnaire that determines the individual’s safety or possible risk of engaging in exercise (Warburton, Jamnik, Bredin, & Gledhill, 2011)
- Obtained physician’s permission to participate in the study if male >40 years old or female >50 years old

Exclusion criteria included:

- Was a participant of another physical activity study: Academia Fit or Fé en Acción
- Participant planned on moving outside San Diego County within one year
Research associates of SDPRC identified eligible participants and obtained informed consent, and one-on-one interviews were conducted to gather baseline data on information regarding the participants’ acculturation and current leisure-time MVPA level.

**DATA COLLECTION**

Trained bilingual and bicultural research associates administered interviews in either English or Spanish depending on the women’s preferences. The interview gathered information on a variety of topics that pertain to overall well-being, including physical activity, acculturation, and demographics.

**Physical Activity**

Self-reported physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ; Bull et al., 2009). The GPAQ is comprised of 18 questions that assess the intensity, duration, and frequency of physical activity, and examines three types of physical activity: 1) occupational physical activity, 2) transport-related physical activity, and 3) leisure-time physical activity. The GPAQ has been used in over 100 countries, and has shown to be valid and reliable (Bull et al., 2009). Cleland et al. (2014) assessed the validity of the GPAQ by comparing the questionnaire with accelerometer data to assess criterion validity in occupational, transport-related, and leisure-time MVPA and sedentary behavior. Results indicated that the GPAQ is a valid measure for assessing community or population level MVPA \((r=0.48, p<0.001)\), and less valid for measuring sedentary behavior (Cleland et al., 2014). Another study assessed the validity of the GPAQ using the previously validated International Physical Activity Questionnaire (IPAQ) as a comparison (Bull et al., 2009). Participants were recruited from nine countries, and results indicated that the GPAQ data showed a moderate-to-strong positive correlation with the IPAQ on measuring total MVPA \((r=0.45-0.57)\), thus demonstrating that the GPAQ is a reliable and valid measure to monitor physical activity (Bull et al., 2009). For the purposes of this study, only leisure-time physical activity was examined. Using the GPAQ, participants were asked if they participated in any vigorous-intensity sports, fitness, or leisure activities that caused large increases in breathing or heart rate for at least 10 minutes continuously, with response options of yes (1) and no (0). If they answered yes, they were asked to specify the type of activity or sport, and were given 16 options of common sports and an ‘other’ box to specify any activity that was not on the
list. They were then asked how many days they participated in vigorous-intensity sports, fitness, or leisure activities in a typical week, coded continuously on a range from 0-7 days. They were asked how much time they spent engaging in these vigorous-intensity activities, which was continuously measured in minutes. They were then asked the same questions for moderate-intensity physical activity, coded the same way.

Metabolic equivalent of tasks (MET) are often used to assess physical activity intensity and are defined as the energy cost of an activity (Jetté et al., 1990). The MET unit can be used as part of a prescriptive method to determine the functional capacity and exercise tolerance of an individual based on the amount of oxygen consumed during a particular activity (Jetté et al, 1990). One MET is defined as the energy cost of being at rest with little oxygen consumption due to little physical activity, and is equivalent to 1 kcal/kg/hour (Singh & Purohit, 2011). For this study, the GPAQ score for leisure-time MVPA was provided in MET minutes of leisure-time MVPA per week. The GPAQ protocol estimates that a person’s caloric consumption is four times higher when engaging in moderate physical activity and eight times higher when engaging in vigorous physical activity compared to when he or she is sitting quietly. To calculate a participant’s overall energy expenditure using the GPAQ, 4 MET’s were assigned for minutes spent engaging in moderate intensity leisure-time physical activity, and 8 MET’s were assigned for minutes spent engaging in vigorous intensity leisure-time physical activity. To calculate MET minutes of moderate intensity leisure-time physical activity, the number of days in a week the participant engaged in the activity was multiplied by minutes of engagement in the activity, and this was multiplied by 4 MET’s. The same was done for vigorous intensity leisure-time physical activity, except the number of days and minutes were multiplied by 8 MET’s.

Acculturation

Four acculturation variables were examined in this study: generation status, years of residence in the U.S., age of arrival in the U.S., and language preference.

Generation status

Place of birth was answered as either United States (0) or foreign born (1). Generation status was measured by asking a participant where her father and mother were born. Using these data, foreign born was coded as 1st generation (1), women born in the U.S.
with foreign-born parents was coded as 2nd generation (2), and U.S.-born women with one parent or more born in the U.S. was coded as 3rd generation (3). Second and 3rd generation women were collapsed into the category “2nd generation or greater” due to insufficient sample size in the 3rd generation category (n = 3).

**Acculturation Domains**

The Marin Bidimensional Acculturation Scale (BAS) was developed by Marín and Gamba (1996) and considers acculturation as a bidimensional process where an individual can embody aspects of both the original and the host culture. The BAS was created to reflect two cultural domains: Latino and non-Latino (Marín & Gamba, 1996). The scale includes 24 items, with 12 items per cultural domain and assesses three language-related areas: 1) language use, 2) linguistic proficiency, and 3) use of electronic media in English or Spanish languages. In the language use subscale, responses ranged from almost never (1) to almost always (4) with respect to how often a participant thinks or speaks in Spanish or English. The linguistic proficiency scale assessed how well a participant can speak, read, write, and understand English and Spanish, and responses ranged from very poorly (1) to very well (4). The final area assessed how often a participant watches TV or listens to the radio or music in English and Spanish, and responses ranged from almost never (1) to almost always (4). These three subscales combined for each cultural domain separately showed high internal consistency (alpha = 0.90 for the Latino domain and alpha =0.96 for the non-Latino domain; Marín & Gamba, 1996). The BAS was validated using other acculturation scales, such as the ARSMA created by Cuellar et al. (1995).

Scoring the BAS involves calculating two scores ranging from one to four for each cultural domain. A score of 2.5 was used as a cutoff score to indicate low or high levels on each of the cultural domains. If an individual scored greater than a 2.5 in the Latino domain and a 2.5 or less in the non-Latino domain, he or she was considered “traditional” (1). A traditional individual retains most of the aspects of the original culture, with limited adoption of the host culture (Lara et al., 2005). If an individual scored a 2.5 or less in the Latino domain and greater than a 2.5 in the non-Latino domain, he or she was considered “assimilated” (2). An assimilated individual is considered completely embodying the new host culture (Lara et al., 2005). If a participant scored above a 2.5 in both the Latino and non-
Latino domain, he or she was considered “bicultural” (3). (Marín & Gamba, 1996). A bicultural individual retains some aspects of the original culture, but adopts some of the cultures of the host country (Lara et al., 2005). Lastly, if a participant scored a 2.5 or less in both the Latino and non-Latino domain, he or she was considered “marginalized” (4). A marginalized individual rejects the host culture and the culture of the country of origin (Lara et al., 2005). In order to meet statistical assumptions, bicultural, assimilated, and marginalized women were collapsed into the category “bicultural” due to the small sample sizes in the assimilated (n = 8) and marginalized (n = 0) categories.

**Years of Residence in the U.S.**

To assess years of residence in the U.S., women were asked how many years they had lived in the U.S. from the time they first moved. The women indicated the number of years as a continuous variable. For women who were born in the U.S., their age was the number of years indicated for this question. Responses were retained as continuous variables. Marquez et al. (2013) showed that for every year of U.S. residence, physical activity as a means to lose weight increased by 18% (OR = 1.18, 95% CI = 1.01-1.39). This study shows that among foreign born women, increased years of U.S. residence is associated with greater levels of leisure time physical activity.

To further examine years of residence in the U.S., the women were dichotomized into two categories, those who had lived in the U.S. for (1) less than 15 years and (2) 15 years or greater. This dichotomization was found to be associated with obesity prevalence. Latina immigrants who have resided in the U.S. for at least 15 years were 4.3 times more likely to be obese than Latina immigrants who resided in the U.S. for 0 to 4 years (OR = 4.31, 95% CI: 2.39-7.78; Kaplan, Huguet, Newsom, & McFarland, 2004).

**Age of Arrival in the U.S.**

When assessing age of arrival in the U.S., women responded with the age at which they first came to the U.S. This variable was assessed continuously, and was further categorized into (1) those who arrived in the U.S. prior to age 25 and (2) those who arrived in the U.S. at age 25 or greater. This dichotomization was used in a study conducted by Evenson et al. (2004), which found that women who arrived in the U.S. prior to the age of 25 were twice as likely to meet physical activity recommendations than women who arrived in
the U.S. at age 25 or older (OR=2.09, 95% CI: 1.18-3.72; Evenson et al., 2004). No studies have examined the association of leisure-time MVPA with age of arrival in the U.S. as a continuous variable that was transformed into a categorical variable, which may produce novel results.

**Demographics**

To describe the sample, the interview assessed the age, marital status, employment status, and income of the women.

To assess age, women were asked “What is your age?” and answered it as a continuous variable, which was then re-coded into: 18-25 years (1), 26-35 years (2), 36-45 years (3), 46-55 years (4), and 56 years and older (5). Marital status was asked, and six categories were available for the participants to choose: married, living with spouse (1), married, not living with spouse (2), living together, as married (3), divorced (4), widowed (5), separated (6), and single (7). These data were re-coded and collapsed with the first three categories reclassified as married (1) and the other four categories as not married (0). Women were asked about their living situation, and chose from rent a house (1), rent an apartment/townhouse/condo/trailer (2), own a house (3), own an apartment/townhouse/condo/trailer (4), and other (assisted living facility, retirement home, sheltered housing, military housing) (5). The data were re-coded with categories 3 and 4 collapsed into own a home (1) and categories 1, 2, and 5 collapsed into rent/other (0). The women were then asked about their employment status, and their options were employed full-time (>=35 hours/week) (1), employed part-time (<35 hours/week) (2), self-employed (>=35 hours per week) (3), self-employed part-time (<35 hours/week) (4), employed in seasonal labor (5), out of work for more than 1 year (6), out of work for less than 1 year (7), homemaker (8), retired (9), do not work (10), and unable to work (11). The data were collapsed for the first five categories as employed (1), and the remaining six categories were collapsed as unemployed (0). Lastly, women were asked about their household monthly income from all sources. The options began at less than $500 (1), and went up by $500 increments until the final category of $4500 to $4999 (10). The household monthly income data were collapsed as above the federal poverty level (1) and below the federal poverty level (0). Poverty thresholds were determined using the United States Census Bureau (USCB)
standards, which factors the age of the individual, the individual’s household size, and how many children the individual has under the age of 18 (USCB, 2015; see Table 1). Household size was determined by asking the participants how many children under the age of 18 and how many adults (age 18 and older) lived in their home, measured continuously.


<table>
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<tr>
<th>Size of family unit</th>
<th>Related children under 18 years</th>
<th>None</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five</th>
<th>Six</th>
<th>Seven</th>
<th>Eight or more</th>
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<td>One person (unrelated individual)</td>
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<td>Under 65 years</td>
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<td>65 years and over</td>
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<tr>
<td>Two people</td>
<td>15,853</td>
<td>19,317</td>
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<td>Three people</td>
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<td>Five people</td>
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<td>Six people</td>
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<td>34,004</td>
<td>33,503</td>
<td>32,831</td>
<td>31,633</td>
<td>31,041</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seven people</td>
<td>38,971</td>
<td>39,214</td>
<td>38,375</td>
<td>37,791</td>
<td>36,701</td>
<td>35,431</td>
<td>34,036</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eight people</td>
<td>43,686</td>
<td>43,970</td>
<td>43,179</td>
<td>42,485</td>
<td>41,501</td>
<td>40,252</td>
<td>38,953</td>
<td>38,822</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nine people or more</td>
<td>52,430</td>
<td>52,695</td>
<td>51,964</td>
<td>51,398</td>
<td>50,430</td>
<td>49,101</td>
<td>47,896</td>
<td>47,631</td>
<td>45,768</td>
<td></td>
</tr>
</tbody>
</table>

**DATA ANALYSIS**

Data were analyzed using the Statistical Package for the Social Sciences (SPSS, Inc., Chicago, IL). Normality tests were performed to determine if the data were normally distributed and met statistical assumptions. Alpha levels of .05 were selected as statistically significant. Descriptive statistics, such as frequencies, means, and standard deviations, were used to characterize the sample. Spearman’s rank order correlations were performed first to identify any significant associations between total leisure-time MVPA and covariates in order for significant association to be controlled for in subsequent analyses. The covariates included the women’s age, marital status, living situation, employment status, education level, and poverty threshold.

Hypothesis 1: An independent sample t-test was performed to compare total leisure-time MVPA in MET minutes by generation status, 1st versus 2nd generation and beyond.
Hypothesis 2: To compare total leisure-time MVPA in MET minutes with the acculturation groups, an independent sample t-test was performed comparing traditional women versus bicultural women.

Hypothesis 3: An independent sample t-test was performed to compare total leisure-time MVPA in MET minutes by years of residence in the U.S. among foreign born women, comparing those who resided in the U.S. for less than 15 years versus 15 years or greater.

Hypothesis 4: An independent sample t-test was performed to compare total leisure time MVPA in MET minutes with age of arrival in the U.S. among foreign born women, comparing those who arrived prior to age 25 versus at age 25 or greater.

Hypothesis 5: Sequential linear regression analyses were used to further examine the association between total MET minutes of leisure time MVPA and the continuous measures of number of years of residence in the U.S. and age of arrival in the U.S.
CHAPTER 3

RESULTS

The initial sample consisted of 441 participants; however, 26 participants reported greater than 3135 MET minutes of leisure-time MVPA per week. Thus the data were not normally distributed and the outliers were removed using the criteria of twice the standard deviation plus the mean. One woman did not report her years of residence in the U.S. and age of arrival in the U.S., and was excluded from the sample. The analytic sample consisted of 414 women.

DESCRIPTION OF PARTICIPANTS

Descriptive statistics, including demographics, acculturation, and physical activity are reported in Tables 2 and 3. Of the 414 women, 96.6% completed the interview in Spanish, 24.9% reported they were currently not married, 73.4% rented their homes, 65.5% were not employed, and 35.3% completed less than a high school education. One hundred and eleven women (26.8%) did not report their income. From among those who did, 44.4% lived below the poverty threshold. The mean age of the study sample was 39.9 \((SD = 9.6)\) years.

Table 2. Descriptive Statistics On The Sample \((N=414)\)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Percent of total ((n)) or Mean (Standard Deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>39.9 (9.6)</td>
</tr>
<tr>
<td>Language of interview: Spanish</td>
<td>96.6% (400)</td>
</tr>
<tr>
<td>Not married</td>
<td>24.9% (103)</td>
</tr>
<tr>
<td>Rent home</td>
<td>73.4% (304)</td>
</tr>
<tr>
<td>Not employed</td>
<td>65.5% (271)</td>
</tr>
<tr>
<td>Less than high school education</td>
<td>35.3% (146)</td>
</tr>
<tr>
<td>Below poverty threshold(^1)</td>
<td>44.4% (184)</td>
</tr>
</tbody>
</table>

\(^1\)One hundred and eleven women did not report their household income

Of the study sample, 82.9\% were foreign born or first generation women (see Table 3). The mean years of residence in the U.S. among these women were 15.1 \((SD = 10.4)\) years
(n = 343). Among foreign born participants, the mean age of arrival was 24.4 (SD = 10.3) years. The average Latino domain acculturation score was 3.6 and the average non-Latino domain score was 2.4 on a 4-point scale. This resulted in 62.6% of the sample characterized as traditional and 37.4% as bicultural or assimilated. The mean MET minutes of total leisure-time MVPA of the sample was 806.8 (SD = 774.3). The mean MET minutes of leisure-time moderate intensity and vigorous intensity physical activity were 458.2 (SD = 483.4) and 349.8 (SD = 591.2), respectively.

Table 3. Descriptive Statistics on Acculturation & Physical Activity Measures (N=414)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Percent of total (n) or Mean (Standard Deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of Birth: Foreign born or 1st generation</td>
<td>82.9% (343)</td>
</tr>
<tr>
<td>Years of Residence in the U.S. among foreign born</td>
<td>15.1 (10.4)</td>
</tr>
<tr>
<td>Age of Arrival in the U.S. among foreign born</td>
<td>24.4 (10.3)</td>
</tr>
<tr>
<td>Latino Domain of Acculturation Scale</td>
<td>3.6 (0.4)</td>
</tr>
<tr>
<td>Non-Latino Domain of Acculturation Scale</td>
<td>2.4 (0.7)</td>
</tr>
<tr>
<td>Acculturation Groups</td>
<td></td>
</tr>
<tr>
<td>Traditional</td>
<td>62.6% (259)</td>
</tr>
<tr>
<td>Bicultural</td>
<td>35.5% (147)</td>
</tr>
<tr>
<td>Assimilated</td>
<td>1.9% (8)</td>
</tr>
<tr>
<td>Marginalized</td>
<td>0% (0)</td>
</tr>
<tr>
<td>Leisure Time Physical Activity (MET minutes)</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>458.2 (483.4)</td>
</tr>
<tr>
<td>Vigorous</td>
<td>349.8 (591.2)</td>
</tr>
<tr>
<td>Total MVPA</td>
<td>806.8 (774.3)</td>
</tr>
</tbody>
</table>

**GENERATION STATUS AND TOTAL LEISURE TIME MVPA**

An independent sample t-test was performed to test the hypothesis that women who were 2nd generation or greater would report greater MET minutes of leisure time MVPA than 1st generation women. Total MET minutes of leisure time MVPA was lower among 1st generation women ($M = 803, SD = 783$) compared with 2nd and 3rd generation women ($M = 840, SD = 741$), but the differences between these groups was not statistically significant, $t(413) = -0.367, p = .714$ (Figure 1).
Figure 1. Association between generation status and total leisure-time MVPA.

**ACCULTURATION AND TOTAL LEISURE TIME MVPA**

An independent sample t-test was performed to test the hypothesis that women considered bicultural according to the BAS would report greater MET minutes of leisure-time MVPA than traditional women. Total MET minutes of leisure-time MVPA was higher among bicultural women \( (M = 878, SD = 812) \) compared with traditional women \( (M = 768, SD = 751) \), but these differences were not statistically significant, \( t(413) = -1.415, p = .158 \) (Figure 2).
Figure 2. Association between acculturation groups and total leisure-time MVPA.

YEARS OF RESIDENCE IN THE U.S. AND TOTAL LEISURE TIME MVPA

To explore the association between years of residence in the U.S. and total leisure-time MVPA among foreign born women, an independent sample t-test was performed to test the hypothesis that foreign born women who resided in the U.S. for at least 15 years (n = 149) would report greater MET minutes of leisure-time MVPA than foreign born women who resided in the U.S. for less than 15 years (n = 194; Figure 3). Total MET minutes of leisure-time MVPA was lower among women who resided in the U.S. for less than 15 years ($M = 774, SD = 766$) compared to women who resided in the U.S. for 15 years or greater ($M = 834, SD = 803$), but the group differences were not statistically significant, $t(341) = -0.708$, $p = .479$. 
Figure 3. Association between years of residence in the U.S. and total leisure-time MVPA.

**AGE OF ARRIVAL IN U.S. AND TOTAL LEISURE TIME MVPA**

To explore the association between age of arrival in the U.S. and total leisure-time MVPA among foreign born women, women were split into two categories based on the mean age of arrival in the U.S.: (1) arrived prior to 25 years of age and (2) arrived at 25 years of age or older. An independent sample t-test was performed to test the hypothesis that foreign born women who arrived in the U.S. prior to 25 years of age (n = 183) would report greater MET minutes of leisure-time MVPA than foreign born women who arrived in the U.S. by 25 years of age or greater (n = 160; Figure 4). Total MET minutes of leisure-time MVPA was higher among women who arrived in the U.S. prior to age 25 ($M = 884, SD = 847$) compared to women who arrived in the U.S. by 25 years of age or greater ($M = 704, SD = 690$), and these differences were statistically significant, $t(341) = 2.174, p = .030, d = .23$ (small effect).
IDENTIFYING COVARIATES FOR MULTIVARIATE MODELS

Spearman’s rank order correlations were performed to identify any significant associations between total leisure-time MVPA and potential covariates: marital status, home ownership, employment status, education level, and poverty threshold are reported in Table 4. Of these correlations, there was one statistically significant negative correlation between total MET minutes of leisure-time MVPA per week and employment status ($r = -0.173$, $p < 0.001$). This indicated that women who were employed reported fewer MET minutes of leisure time MVPA than women who were unemployed. Thus, employment was adjusted for in the sequential linear regression performed to test the association between years of residence in the U.S., age of arrival in the U.S., and total MET minutes of leisure-time MVPA among foreign born women.
Table 4. Spearman’s Rank-order Correlation Coefficient of Covariates With Total Leisure Time MVPA Among Foreign Born Women (N=343)

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.35</td>
<td>0.522</td>
</tr>
<tr>
<td>Marital Status</td>
<td>0.30</td>
<td>0.576</td>
</tr>
<tr>
<td>Living Situation</td>
<td>0.48</td>
<td>0.379</td>
</tr>
<tr>
<td>Employment Status</td>
<td>-0.172</td>
<td>0.001</td>
</tr>
<tr>
<td>Education Level</td>
<td>0.007</td>
<td>0.897</td>
</tr>
<tr>
<td>Poverty Threshold</td>
<td>-0.065</td>
<td>0.309</td>
</tr>
</tbody>
</table>

**MULTIVARIATE MODEL**

A sequential linear regression was run to determine if years of residence in the U.S. and age of arrival in the U.S. were associated with greater MET minutes of leisure-time MVPA after controlling for employment status. To identify potential collinearity between years of residence in the U.S. and age of arrival in the U.S., correlation coefficients and tolerance values were inspected. Among these variables, there were no correlations that exceeded 0.7, and all tolerance values were greater than 0.1.

The full model was statistically significant, $R^2 = 0.045$, $F(3,339) = 5.349$, $p = 0.001$. Years of residence in the U.S. was not significantly associated with leisure-time MVPA. The addition of age of arrival in the U.S. to the model led to a statistically significant increase in $R^2$ of 0.011, $F(1, 339) = 3.926$, $p = 0.001$. This indicated that after controlling for employment status, women who arrived in the U.S. at a later age reported fewer MET minutes of leisure-time MVPA per week.
### Table 5. Sequential Multiple Regression Predicting Total Leisure Time MVPA From Years of Residence in the U.S. and Age of Arrival in the U.S., Controlling for Employment Status (N=343)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment status</td>
<td>-.173</td>
<td>-.182</td>
<td>-.177</td>
</tr>
<tr>
<td>St. B</td>
<td>.001</td>
<td>.001</td>
<td>.001</td>
</tr>
<tr>
<td>Yrs. residence in U.S.</td>
<td>.065</td>
<td>-.004</td>
<td>-.125</td>
</tr>
<tr>
<td>Age of arrival in U.S.</td>
<td></td>
<td>.229</td>
<td>.951</td>
</tr>
<tr>
<td>R square</td>
<td>.030</td>
<td>.034</td>
<td>.045</td>
</tr>
<tr>
<td>R square change</td>
<td>-</td>
<td>.004</td>
<td>.011</td>
</tr>
<tr>
<td>F Statistic</td>
<td>6.01</td>
<td>6.01</td>
<td>5.35</td>
</tr>
<tr>
<td>Sig.</td>
<td>.001</td>
<td>.003</td>
<td>.001</td>
</tr>
</tbody>
</table>
CHAPTER 4

DISCUSSION

Engaging in consistent physical activity decreases body fat and concurrently decreases the risk of developing negative health outcomes, such as diabetes mellitus, cardiovascular disease, hypertension, and cancer (Lakka & Bouchard, 2005; Reilly et al., 2003). According to the WHO guidelines, adults ages 18 years and older are recommended to engage in 150 minutes of moderate-intensity physical activity per week, defined as activity that requires greater energy expenditure and increases the heart rate (CDC, 2014; Kravitz & Vella, 2015; WHO, 2014). Given the prevalence of disease-related deaths due to obesity and a sedentary lifestyle among the Latino population, it is imperative to look at physical activity patterns in the context of the culture and practices of the Latino community (Lakka & Bouchard, 2005). Understanding whether acculturation is associated with physical activity among Latinas is critical, as findings are inconsistent on whether and how they are associated (Barcenas et al., 2007).

SUMMARY OF FINDINGS

The primary goal of this study was to examine the relationship between Latina women’s acculturation status and their leisure-time MVPA. Acculturation was assessed by proxy measures and an acculturation scale: generation status, years of residence in the U.S., age of arrival in the U.S., and Marín & Gamba’s Bidimensional Acculturation Scale (BAS; Marín & Gamba, 1996). It was hypothesized that total leisure-time MVPA per week measured in MET minutes would be greater among Latina women who (1) were 2nd generation and beyond compared to Latina immigrants, (2) who were considered bicultural according to the BAS compared to those who were considered traditional, (3) had resided in the U.S. for 15 years or greater compared to those who resided in the U.S. for less than 15 years, and (4) had arrived in the U.S. prior to age 25 compared to those who arrived in the U.S. at age 25 or older. Similarly and using continuous measures, it was hypothesized that
total leisure-time MVPA per week measured in MET minutes would be greater among Latinas who lived more years in the U.S. and arrived in the U.S. at an earlier age.

**Generation Status**

Results failed to find support for a relationship between generation status and leisure-time MVPA. Although total MET minutes of leisure-time MVPA were lower among 1st generation women compared with 2nd and 3rd generation women, the differences between the groups were not statistically significant. The lack of significance is likely due to the unbalanced cell sizes between the two groups, with 82.9% of the sample being 1st generation women and 17.1% of the sample being 2nd and 3rd generation women. These unbalanced cells lead to little variance in generation status, and the assumption of homogeneity of variances was violated.

Despite these limitations, the results of the present study are in concordance with another study that found that male and female U.S.-born Mexican American adults (n = 1134) had a significantly higher prevalence of leisure-time MVPA compared to male and female adults born in Mexico (n = 1138; Crespo et al., 2001). This may be due to the larger sample size and nearly equal cell sizes between adults who were 1st generation compared to adults who were 2nd generation and beyond. Crespo and colleagues also included males and females, which may explain the different results compared to the present sample of females only. Crespo et al. (2001) measured physical activity levels through a household adult questionnaire, which assessed physical activity levels by asking the participants eight questions on leisure-time MVPA as well as four open-ended questions on leisure-time MVPA. This differed from the present study’s use of the GPAQ, which asks six questions on leisure-time MVPA. Thus, the differences in the sample size, participants’ gender, and differences in how leisure-time MVPA were measured may have contributed to why results differed between the present study and that of Crespo and colleagues.

**Acculturation Domains**

No association was found between Marín’s acculturation domains (Marín & Gamba, 1996) and leisure-time MVPA. Total MET minutes of leisure-time MVPA was lower among women classified as traditional compared to women classified as bicultural, but the difference between these groups was not statistically significant. These results are in
concordance with Ayala et al. (2004), who found that bicultural women reported more days of MVPA for at least 30 minutes compared to traditional women. In their study, Ayala et al. (2004) used the ARSMA-II to measure acculturation, and classified the women (n = 357) into the 4 categories of traditional, bicultural, assimilated, and marginalized based on their Mexican and Anglo orientation scores. Because the size and composition of the sample in both the Ayala et al. study and the present study are very similar, the significant results produced in the Ayala et al. study may be due to the differences in the way physical activity was measured. While the present study calculated leisure time MVPA in MET minutes, Ayala and colleagues reported physical activity in number of minutes without converting them to MET minutes.

**Years of Residence in the U.S.**

While total MET minutes of leisure-time MVPA was greater among those who resided in the U.S. for 15 years or more compared to those who resided in the U.S. for less than 15 years, the results were not statistically significant. These results were similar to what was seen in Evenson et al. (2004), who found that number of years in the U.S. was not significantly associated with leisure time MVPA participation among 671 Latina immigrants. However, a study by Marquez et al. (2013) surveyed Latina immigrants (n = 75) on both occupational and leisure-time MVPA for weight loss and showed that increased physical activity as a mechanism to lose weight was related to increased years of residence in the U.S. According to the study, the odds of engaging in physical activity for weight loss increased by 18% for each year of U.S. residence. The women in the sample differed from the present study’s sample, as the women in the Marquez et al. study were predominately Latinas from the Dominican Republic, Columbia, and Puerto Rico. The average years of residence in the U.S. of the Marquez sample was 12.5 years compared to the present study’s average of 15.1 years. The differences in the sample size and composition, type of physical activity measured, and analysis of years of residence in the U.S. may explain differences observed between the Marquez et al. study and the present study.

**Age of Arrival in the U.S.**

There was a significant association between the dichotomy of arriving in the U.S. prior to age 25 versus at age 25 or greater on leisure-time MVPA. Among foreign born
Latinas, those who arrived in the U.S. prior to 25 years of age engaged in more MET minutes per week of leisure-time MVPA compared to those who arrived in the U.S. at age 25 or greater. These results are consistent with those found by Evenson et al. (2004), who used the same dichotomization to assess age of arrival in the U.S. with physical activity. Evenson et al. (2004) found that women who arrived in the U.S. prior to age 25 were twice as likely to meet physical activity recommendations than women who arrived in the U.S. at age 25 or older. Very few studies have examined age of arrival in the U.S. as a categorical variable in relation to physical activity, suggesting the novelty of these results.

**Multivariate Model**

Results showed that women who were employed reported fewer MET minutes of leisure- time MVPA compared to women who were unemployed. These findings are similar to a study conducted by Voorhees and Young (2003), who surveyed Latinas living in urban areas and found that Latinas who were employed were less likely to be physically active than those who were not employed.

After controlling for employment status, women who arrived in the U.S. at a later age reported fewer MET minutes of leisure-time MVPA per week. There is only one study in the literature to date that explored age of arrival in the U.S. with physical activity among 1st generation immigrants (Evenson et al., 2004).

**Study Strengths**

The present study had a moderately large sample size of 414 Latina women after excluding outliers that affected the normality of the distribution of the data for the analyses of generation status and acculturation domains. A sample size of 343 Latina women was used for the analyses of years of residence in the U.S., age of arrival in the U.S., and the multivariate model. A larger sample size more accurately reflects the population it was drawn from, thus allowing researchers to draw inferences that are more generalizable. A large sample size is also necessary to identify differences between groups to maximize the potential for sufficient sample sizes in each of the groups being compared. However, despite our large sample size, we were unable to uncover significant differences between groups on leisure-time MVPA due to unbalanced cell sizes.
Although the study sample may not be representative of the Latina population in the U.S., in part because 96.6% completed the interview in Spanish, the location of this study was ideal for studying the behaviors and practices of less acculturated women. Due to the close proximity to Mexico, South San Diego County fosters an environment that is supportive and welcoming of Mexican traditions and customs, decreasing the barriers for Mexican immigrants to continue to practice their culture in the U.S. This explains the high prevalence of women who considered themselves traditional in our sample.

The use of MET minutes rather than regular minutes to quantify PA levels was one of the strengths of this study. While regular minutes solely measures the duration of PA, the conversion to MET minutes factors in the relative intensity of the activity performed (Nelson, Rejeski, Blair, Duncan, & Judge, 2007). The quick conversion from regular minutes to MET minutes of PA allows researchers to not only quantify, but also qualify the PA that the participants engage in. In this way, researchers standardize a unit of PA that is more reflective of effects of the activity on the body’s metabolism and the actual energy expended during the activity (Nelson et al., 2007).

To date, there is only one study that used age of arrival in the U.S. as a measure of acculturation when examining leisure-time MVPA (Evenson et al., 2004). The present study’s results suggest the need for age of arrival in the U.S. to be included as a proxy variable of acculturation in future research. By examining age of arrival in the U.S., researchers can identify what unique exposures early arrivals encounter that influence them to engage in more leisure-time MVPA. Such exposures may include primary and secondary schools in the U.S. that require physical education (P.E.) classes. A review of the benefits and outcomes of P.E. classes indicated that students who were exposed to P.E. classes in school significantly contributed to their fundamental movement skills and physical competences, including participating in physical activity later in life (Bailey, 2006). Late arrivals may not be exposed to the same P.E. classes in their primary and secondary schools, which may influence their decreased PA engagement compared to those who were exposed to P.E. at an earlier age. More research is needed examining age of arrival to test this hypothesis. An alternative hypothesis is that exposure to the importance of PA may be more prevalent among early arrivals than late arrivals. Early arrivals may adopt social norms that encourage PA, perhaps through sports and other hobbies that late arrivals may not be
exposed to. These positive messages about PA may be disseminated through the media or through interpersonal relationships between early arrivers and their more acculturated counterparts. Examining age of arrival in the U.S. using different dichotomizations, such as those who arrived before high school versus those who arrived after, may be critical in understanding the exposures that influence future PA engagement.

**STUDY LIMITATIONS**

While this study produced novel results that provided further knowledge on acculturation and its relation to leisure-time MVPA among Latina women, there were some limitations. The cross-sectional nature of the study design does not allow for the establishment of causality. Furthermore, there was a lack of variance in the sample; 96.6% of the women spoke only Spanish during the interview and 82.9% were foreign born. In other words, the majority of the women in the sample were considered traditional, indicating that they embodied the Latino domain more than the non-Latino domain. The study’s close proximity to Mexico increases the influence of Latino customs, cultures, and language through the crossing of this culture between borders, further allowing Latinas to maintain their Latino traditions and norms on the U.S. side of the border. This situation is unique to San Diego and other border cities along the U.S.-Mexico border, and this locational characteristic cannot be found in the majority of the nation. Thus, this sample may not be representative of the population Latinas on a state or national level, limiting the generalizability of the results.

In addition, these women were recruited to be in an exercise study, and therefore differ from women in the general population because they were willing to participate in a PA intervention. This further affects the generalizability of the results. The present study sample is similar, however, to the study conducted by Ayala et al. (2004) in California, where their study sample consisted of a similar number of Latina women with almost identical descriptive statistics compared to the present study, particularly with respect to generation status, years of residence in the U.S., and acculturation domain classifications. This has interesting implications about the specific populations who would join a study, and is an area that should be further explored.
Another limitation of this study was the use of the validated and reliable Marin & Gamba BAS, which was used in another study to examine acculturation in Latinos (Cordero, 2010). Although this scale is widely used to assess acculturation, it does not account for the social aspects that influence culture. While acculturation scales serve to standardize a way to measure acculturation, scales such as the BAS and ARSMA-II have limitations. Thomson and Hoffman-Goetz (2009) conducted a systematic review of acculturation in public health research and concluded that acculturation scales lack precision, incorrectly use unidimensional scales, and do not measure the acculturative change process. These limitations lead to inconsistencies in the results when understanding the relationship between acculturation and health. In addition, the use of proxy measures such as generation status and years of residence in the U.S. should not be used as sole predictors of acculturation as they do not account for the social aspects that influence acculturation (Lara et al., 2005). It is imperative to study all aspects that influence acculturation, such as the social interactions of the individuals being studied, the cultures of their peers, and how these cultures influence their cultural identity (Lara et al., 2005).

The use of the GPAQ to measure self-reported PA had more limitations than strengths. The GPAQ is based on a 7-day recall, in which participants must report the frequency, duration, and intensity of their PA in the last week. However, there is room for error in accurately reporting on the intensity and duration of PA. What one participant may consider vigorous PA may be moderate to another, and this leads to inaccurate data. Self-report instruments like the GPAQ are the most commonly used measures of PA, and they have their benefits and limitations (Sallis & Saelens, 2000). In addition, while self-report data are convenient to collect due to the low cost and ability to collect data from large numbers of people, there is a risk of recall bias among the participants that may lead to over-reporting or under-reporting the dependent variable examined (Sallis & Saelens, 2000). When measuring PA levels, social desirability bias often leads to over-reporting among participants (Warnecke et al., 1997). Self-report data also relies on the participants to remember what they have done in the past, making it potentially difficult for participants to provide accurate estimates (Baranowski, 1988). Prior to excluding outliers, there were 26 women who reported significantly higher MET minutes of leisure-time MVPA. Although they were excluded from
the final sample, this suggests there may have been participants who over-reported their MET minutes of leisure-time MVPA.

**Implications for Research**

Despite the factors that may limit generalizability of the results, our findings were consistent with findings in the literature. Marquez et al. (2013) found that among Latinas, increased years of residence in the U.S. was associated with increased odds of PA engagement, which parallels our results. Ayala et al. (2004) reported that Latinas who considered themselves bicultural engaged in more PA than traditional women, which is consistent with our findings. Evenson et al. (2004) discovered that Latinas who arrived in the U.S. prior to 25 years of age were twice as likely to meet PA recommendations compared with women who arrived in the U.S. at age 25 or older.

Although we found similar results to other studies, there are still inconsistencies in the literature on how to measure acculturation. While some studies use scales, other studies use proxy measures such as years of residence in the U.S., language use, and generation status (Ayala et al., 2004; Crespo et al., 2001; Marquez et al., 2013). There is only one study that used age of arrival in the U.S. as a measure of acculturation and examined its relation to leisure-time MVPA (Evenson et al., 2004). A study conducted by Schwartz and colleagues suggests that the use of scales is not the best measure to understand acculturation, and that the role of ethnicity, cultural similarity, and discrimination in the acculturation process are constructs that should be examined to better understand this phenomenon (Schwartz, Unger, Zamboanga, & Szapocznik, 2010). Miranda, Gonzalez, and Tarraf (2011) suggest that language use is a critical variable in measuring acculturation and health among Mexican-origin populations in particular. Ultimately, researchers must draw a consensus on the best ways to measure acculturation that will produce significant and reliable results.

Similarly, researchers must determine a uniform method to measure PA levels that produces reliable results. The use of the GPAQ (Bull et al., 2009) in the present study has been proven to be a valid measure of physical activity in adult Latinas (Hoos, Espinoza, Marshall, & Arredondo, 2012). However, other methods of measuring PA, such as the CAPS questionnaire (Ainsworth et al., 1999) and the household adults questionnaire, have provided published results that are inconsistent with the present findings (Crespo et al., 2001; Slattery
et al., 2006). These studies found that U.S.-born Mexican American adults had a higher prevalence of PA compared to Mexican immigrants. Although this may be due to different sample compositions, the differences in physical activity measures may be a factor in determining why the present study’s results were insignificant using the GPAQ. Measurement differences affect the ability to see differences between groups because the comprehension and literacy of the questions on the scales may differ. For example, some scales may be worded for an audience with lower comprehension and literacy levels, which may yield different results than one with a higher level of vocabulary and comprehension. Results may also differ between scales depending on whether they are self-administered or conducted by an interviewer. One study showed that the relationship between self-administered and interviewer-administered measures of PA are inconsistent and weak, suggesting that choosing one standardized method of conducting the surveys is necessary in future research (Reuben, Valle, & Hays, 1995).

**Implications for Practice**

Understanding the Latino culture and the effects of the acculturation process on the PA habits of Latinas is critical for implementing culturally tailored interventions that target PA. Researchers have shown that Latinas are more likely to increase PA through increased social support and increased access to environments where PA may be performed (Van Duyn et al., 2007). One culturally tailored PA intervention for Latinas, the Salsa Aerobics program, involved promotores and referent community members promoting PA among women from low-to-moderate income communities (Whitehorse, Manzano, Baezconde-Garbanati, & Hahn, 1999). By involving community leaders to establish positive social norms in the community where these norms were not yet established, participants may become more socially accepting of PA engagement. Thus, future interventions should continue to use the **promotores** model to increase participation in these interventions.

Results from the present study indicated that age of arrival in the U.S. is associated with leisure-time MVPA. In our sample, those who arrived in the U.S. earlier in life had higher PA levels than those who arrived in the U.S. later in life. Public health interventions that aim to increase PA among Latina immigrants who arrive in the U.S. later in life are critical to decrease adverse health outcomes in this population. Community-based
interventions, such as Familias Sanas y Activas II (Elder et al., 2013) that target both early and late arrivers, and worksite interventions that target employed persons and late arrivers who lead sedentary lifestyles may be key to increasing PA participation. Through the development of community-based group activities and programs and engaging community members to promote PA to their peers, increased social support and changing behaviors through social norms may increase PA in the community. Early arrivers may receive more social support and greater exposure to social norms promoting PA through their school environments and their community through sports clubs and summer camps, for example. Workplace changes such as providing a more flexible schedule to allow for leisure-time MVPA, involving employees in PA events, and making PA equipment and facilities available at work can work to increase leisure-time MVPA levels for late arrivers. Late arrivers will particularly benefit from this by adopting the message of the importance of PA that is implemented at the workplace, where people spend a great deal of their time in the day. Further research targeting Latina immigrants who arrive in the U.S. later in life is necessary to create a relevant and efficacious PA intervention.
REFERENCES


Giles-Corti, B., & Donovan, R. J. (2002a). Socioeconomic status differences in recreational physical activity levels and real and perceived access to a supportive physical environment. *Preventive Medicine, 35*(6), 601-611. doi:10.1006/pmed.2002.1115


