The Role of Assimilating to the US Culture and the Relationship Between Neighborhood Ethnic Composition and Dietary Intake Among Hispanic Youth

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Abstract

Background—Dietary fiber and sugar intake have been shown to affect metabolic health in overweight Hispanic youth. Evidence on the influence of culture on fiber and sugar intake in Hispanic youth is limited.

Methods—The associations among score for levels of assimilation, neighborhood ethnic characteristics, and daily total and added dietary sugar and dietary fiber intake were assessed using regression analyses.

Results—One hundred twenty-four Hispanic youth (age = 13.6 ± 3.0 , 106 female) were included. The proportion of Hispanic population in the neighborhood was positively associated with fiber intake (standardized $\beta = 0.205$, $p < 0.01$) and inversely associated with added (standardized $\beta = -0.234$, $p < 0.01$) and total sugar intake (standardized $\beta = -0.229$, $p < 0.01$).

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in the three study protocols were approved and in accordance with the ethical standards of the University of Southern California Institutional Review Board and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent All participants provided their informed assent along with signed informed consents from their parents or legal guardians.

Youth's self-identified levels of assimilation inversely moderated (standardized $\beta = -0.465$, $p = 0.036$) the association between %HP and dietary fiber intake.

Conclusions—Hispanic youth residing in areas of that are predominantly populated with Hispanics may be protected from conforming to unhealthy dietary behaviors. This protective effect is weaker among Hispanic youth with higher level of assimilation.

Keywords

Acculturation; Hispanic youth; Fiber intake; Sugar intake

Introduction

Ethnic minority children and adolescents are disproportionately impacted by the obesity epidemic [1] and modifying dietary behaviors is a key effort in mitigating the risk of obesity and metabolic disease. Among Hispanic youth, increased dietary fiber and decreased total sugar consumption are particularly important for improving metabolic health [2, 3]. Furthermore, adolescence is a critical period for obesity development [4], and modifying dietary fiber and sugar consumption early can potentially affect risk of obesity in Hispanic youth into adulthood [5]. Therefore, understanding factors that affect dietary sugar and fiber consumption in Latino youth merits more investigations.

A major focus of pediatric obesity prevention efforts has been on identifying and understanding potential socio-cultural and environmental factors that affect dietary behavior in the ethnic minority youth populations [6–8]. A burgeoning body of evidence suggests the potential effect of acculturation on dietary behavior of ethnic minority populations [9]. Acculturation is broadly defined as the process of adapting to a new environment and the subsequent change in values, norms, or behavioral patterns as a result of adapting to the mainstream culture of the host country [10, 11]. In the existing literature, Hispanic individuals who reside in the USA longer, as approximated by age of migration, years living in the USA, or generation status, have higher obesity risks [12] and less healthy dietary patterns (e.g., higher consumption of sugar-sweetened beverages [13–15] and fast food [16, 17] and lower consumption of fruit and vegetables [13, 18–20]). Among Hispanic individuals living in the USA, living in areas with a high proportion of Hispanic residents or in a household that speaks Spanish only, or in ethnic enclaves, are protective from adapting to less healthy dietary patterns [21, 22]. Furthermore, compared to Hispanic individuals living in the USA, the dietary patterns of Hispanic individuals living in their countries of origin are also different [12, 23–27]; Mexican Americans consume greater amounts of sugar, salty snacks and saturated fats, and fewer corn tortillas, compared to Mexicans living in Mexico [26]. With similar results found among other ethnic minorities [12, 27], these findings suggest that changes in both cultural and physical environment could affect dietary patterns of ethnic minority populations living in the USA. There is an abundance of evidence on dietary acculturation among the Hispanic population, but evidence has been predominantly focused on the adult populations [12], leaving the effect of culture on dietary behavior among minority youth population understudied [12, 23, 28]. Youth may be particularly vulnerable to decreased engagement in healthy behavior when faced with the

conflict between home and mainstream US culture [29]. Therefore, a more thorough investigation on how acculturation affects dietary behavior of Hispanic youth is needed.

Few studies have examined the mechanism underlying the effect of acculturation on dietary behavior among youth populations. Consistent with adult findings, less acculturated Hispanic youth consume less sugar-sweetened beverages [12, 30], fast food [16, 23], and more vegetable [12, 23] compared to their more acculturated counterparts. Nonetheless, the majority of the studies investigating the relationship between acculturation and dietary behaviors used indirect measurements for acculturation, for example, generation status [12, 23, 30]. Although length of exposure to the culture of the host country provides valuable approximation of level of acculturation, these indirect measurements were not designed to assess the effects of salient contributing factors to acculturation experience and dietary behavior in Hispanic youth, for example, exposure to home culture, cultural identity, and popular culture. While this information may help delineate the mechanism underlying acculturation and dietary behavior [12], the evidence investigating the effect of self-identified cultural orientation and dietary intake among youth is limited. Therefore, the aim of the current study is to investigate the relationship between acculturation and dietary sugar and fiber intake using both indirect measurements (i.e., proportion of neighborhood ethnic composition) and the direct measurement of acculturation using self-identified cultural orientations in Hispanic youth.

Based on existing literature, we hypothesized that Hispanic youth who live in areas with higher proportion of Hispanic residents, an approximation for level of exposure to the Hispanic culture, will have healthier diets (i.e., consume more fiber and less sugar). As a comparison, we further hypothesized that Hispanic youth with higher self-identified levels of assimilation to the US culture have less healthy diets (i.e., lower fiber and higher sugar consumption). With emerging evidence suggests that the level of acculturation moderates the relationship between structural factors and dietary intake [31], we further hypothesized that the positive relationship between indirect measurements of acculturation (i.e., proportion of Hispanic population) and dietary sugar/fiber intake is moderated by the level of assimilation. Considering that other structural factors, such as food access [22, 23, 32, 33], may confound the relationship between areas with a high proportion of ethnic minority, an exploratory aim of this study is to examine whether the relationship between acculturation and dietary sugar and fiber intake is affected by food access in the neighborhood of residence.

Methods

Participants

Baseline data from 124 overweight and obese youth from 7 to 18 years of age at baseline were used in this analysis. The 124 participants included in this study were from three linked pediatric obesity studies that shared a set of standardized protocol and measurements that took place between 2005 and 2008, including a longitudinal observational study [34] and two behavioral intervention studies [35, 36]. All the participants were recruited from local clinics, churches, schools, and community centers in the Los Angeles area [37]. All three studies recruited only youth with a gender-specific BMI ≥ 85th percentile. Other inclusion and exclusion criteria for these studies were described elsewhere [34–36]. All the study

participants provided their informed assent along with their parental informed consent. All procedures performed in the three study protocols were approved and in accordance with the ethical standards of the University of Southern California Institutional Review Board and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Anthropometry

Participants' heights and weights were measured in triplicate using a wall-mounted stadiometer and a beam medical scale to the nearest 0.1 cm and 0.1 kg, respectively, after arriving in the afternoon at the University of Southern California Clinical Trial Unit. Sex- and age-specific BMI percentiles were determined based on the established Center for Disease Control and Prevention normative curve [38].

Acculturation Measurements

Cultural Orientations—The Acculturation, Habits, and Interests Multicultural Scale for Adolescents (AHIMSA) [29] was used for measuring self-identified cultural orientations in youth living in multicultural community settings. The eight-item scale focuses on measuring cultural orientations via various daily life perspectives and was previously validated in comparison with other commonly used acculturation scales in minority youth living in a major metropolitan area [29]. For each item, participants were asked to select from only one of the four cultural orientations: “United States,” “country of origin (home culture),” “both countries,” or “neither countries.” The cumulative frequency for selecting each of the four options corresponds to scores for level of assimilation, separation, integration, and marginalization, respectively. Each participant has all four of these scores that range from zero to eight. The scores for separation and marginalization in the current sample were not utilized in this analysis due to low variance (marginalization score: mean = 0.42, SD = 1.03; separation score: mean = 1.64, SD = 1.80), a similar limitation reported in the original study [16, 29]. In the present study, the scores for assimilation, or the corresponding score for the “United States” cultural orientation was used in the analytic models.

Neighborhood Characteristics—Home addresses of all participants were geocoded using Arc-GIS software (ESRI, Redland, California, USA) and linked to the 2000 US Census data in the tract level. Percentage of Hispanic population in the Census tract corresponding to each participant's home address was used as an indirect measurement for level of exposure to the Hispanic culture [23, 39]. The 2000 US Census data were used because the demographic information captured in the earlier Census better represents the environment where the acculturation process of the participants took place than the more recent Census. Median household income of the Census tract of participants' residential address was used as the measurement for neighborhood socioeconomic status.

Local Food Access—Neighborhood food access variables, along with neighborhood SES, were included in analytic models as covariates. Neighborhood food access was operationalized as count of supermarkets, convenient stores, and fast food restaurants within a 0.5 mile radius of participants' residences, as these three types of food sources have been commonly used in studies that examined association between food access and dietary

behavior [40]. The 0.5 mile buffer was chosen for this study to estimate the potential confounding effect of food access in the relationship between proportion of Hispanic population and dietary intake, as 0.5 miles is approximately a 10-min walking distance [41]. Food sources around home were identified using the same classification system as the data source (North America Industry Classification System (NAICS)) and were geocoded using Arc-GIS. Food sources included supermarkets over 40,000 square feet, convenience stores, and the top six largest fast food restaurants that are generally available in major metropolitan areas. All three neighborhood food access variables were included in every statistical model as covariates.

Dietary Intake

Dietary intake was estimated using 3 days of dietary recall interviews conducted by trained research staff using the multiple pass techniques. Trained staff called participants and collected at least two weekdays and one weekend day of diet recalls. In this cross-sectional secondary data analysis, only participants with 3 days of valid dietary data were included. Dietary recall data were entered and analyzed by the Nutrition Data System for Research software (NDS-R, version 2008; Nutrition Coordinating Center at the University of Minnesota, Minneapolis, Minnesota, USA). All participants received instructions for completing phone diet recall interviews. Participants were provided with measurement tools, including cups, spoons, and rulers, to improve portion size estimates. All completed recalls were reviewed by at least one other trained staff for quality assurance. Dietary data was cleaned and reduced by a trained dietician. The NDS-R program calculated key dietary variables for this analysis, including mean energy intake, total sugar intake, added sugar intake, and dietary fiber intake.

Statistical Analysis

Outcome variables were examined for normality. Mean total sugar and mean added sugar intake variables were square root transformed and the mean fiber intake variable was log-transformed, as these variables were non-normally distributed. Multiple linear regression models were used to estimate the relationship between self-identified level of assimilating to the US culture, neighborhood ethnic characteristics, and dietary intake. Multiple linear regression models were chosen over multilevel modeling approaches due to the lack of clustering observed from this sample at the Census tract level: the 124 Hispanic youth included in the analysis resided in 94 unique Census tracts, leaving the average size of each cluster to be 1.31 participants per tract.

The average daily intake of total sugar, added sugar, and fiber was included in separate statistical models as outcome variables. Both the indirect measurement of acculturation (% Hispanic population (%HP) in the Census tract of residence) and the direct measurement of acculturation (scores for the US orientation) were included in each model as predictors. The following covariates included were included in each model: age, sex, BMI percentile, mean energy intake, the three food source variables described above, and the median household income of participants' Census tract of residence. The potential mediation effects of the US cultural orientation on the relationship between neighborhood characteristic and each of the dietary intake variables were assessed using criteria described by Preacher and Hayes [42].

Significance tests of the indirect effect used the product of coefficient method with bias-corrected bootstrap confidence intervals, based on 5000 bootstrap samples [42]. Moderation effects of the self-identified US cultural orientation scores on the relationship between neighborhood characteristic and each of the dietary intake variables were examined by including interaction terms in the corresponding linear regression models. All statistical procedures were conducted using SAS version 9.3 (Cary, North Carolina, USA) and the significance was set at $p < 0.05$.

Results

One hundred and 24 Hispanic adolescents (mean age 13.5 ± 3.1 , 86 % female) were included in the analytic sample and the demographic information is presented in Table 1. There were no significant differences in the three dietary intake variables between sexes and across ages.

Average Dietary Intake and Neighborhood Ethnic Characteristics

As presented in Table 2, the percentage of Hispanic Residents (%HP) around home of the study participants was inversely associated with total sugar intake (standardized $\beta = -0.229$, $p < 0.01$) and added sugar intakes (standardized $\beta = -0.234$, $p < 0.01$) and was positively associated with total fiber intake (standardized $\beta = 0.205$, $p < 0.01$). There was no significant association found between level of assimilation and the three average dietary intake variables. There was no significant indirect effect found between the proposed independent variable and mediator variable, as the estimated confidence limit included 0. Therefore, the proposed subsequent analysis for mediation effect of US cultural orientation between average dietary intake and the percentage of Hispanic residents in the Census tract of residence was not warranted [42].

The Level of Assimilation as an Effect Modifier

Participant self-identified level of assimilation negatively moderated (standardized $\beta = -0.46547$, $p = 0.036$) the relationship between the percentage of Hispanic residents in the Census tract of residence and average fiber intake, but not the sugar intake (Table 2).

Discussion

The results of the current study confirmed that there are positive associations between the indirect measurement of acculturation (i.e., proportion of Hispanic residents in the Census tract of residence) and healthier diets (i.e., higher fiber intake and lower total and added sugar intake) among Hispanic adolescents. Conversely, our results did not support the hypothesized association between the direct measurement of acculturation (i.e., self-identified levels of assimilation) and dietary sugar or fiber consumption. However, the null direct relationship between the levels of assimilation and dietary intake is not completely unexpected. A probable explanation for the lack of direct relationship may be that structural factors exist in areas where there are high proportion of Hispanic population, including cultural norms [9] and the home food environment [7, 43, 44], which might be stronger predictors for a youth's diet rather than their own self-identified cultural orientations. While

we did not observe a direct association between youth's self-identified levels of assimilation and their dietary fiber and sugar intakes, the strength of association between neighborhood characteristics and dietary fiber intake was weakened among youth with a higher level of assimilation regardless of their age and sex. This observation indicates that living in areas of high Hispanic population or ethnic enclaves can protect Hispanic youth from adapting to a low-fiber diet, but this protective effect is not universal for all youth. School-aged youth spend a large proportion of their waking hours at school, away from the cultural environment surrounding their residences. Therefore, school-aged youth who identify more with the US culture may conform to a lower fiber dietary pattern, similar to their more assimilated adult counterpart, when they are at schools. Similarly, the absence of the moderating effect on the lowered sugar intake may be due to the legislations that prohibited sugar-sweetened beverages vending machines implemented later in the past decade, as this legislation reduced school-aged youth's access to the major contributors of sugar consumption at school [45]. This study provides the first evidence that self-identified assimilation may be a target to address in obesity prevention and treatment efforts, especially when promoting fiber intake. Conversely, while availability of food outlets and neighborhood socioeconomic level may affect dietary intake of its residents, as suggested in some literature, results of the current study indicate that neighborhood ethnic composition is a stronger predictor fiber and sugar intake in youth. These results are consistent with findings found among the adult [21, 22] and adolescent populations [12, 23, 30, 40, 46]. As the food outlet variables were constructed to approximate the physical food access within the independent walking distance of a child or adolescent, our results suggest that determinants of dietary intake may lay in a context other than the physical food availability around their the location of residency. The independent associations found between the neighborhood characteristics and dietary intake and the moderating effect of self-identified cultural orientation among Hispanic youth suggests that cultural context may be a stronger determinant of dietary intake of Hispanic adolescents than food availability around the neighborhood of residence.

This study has several methodological and substantive strengths. First, this study offers insight to the moderating role of acculturation on dietary intake using a validated survey specifically designed to capture cultural orientations in youth. Second, this study used dietary data collected using three 24-h dietary recalls, which provides a representative assessment of energy and macronutrient intake.

There are also several limitations that should be mentioned. The neighborhood ethnic composition was estimated using the US Census data collected 2000, approximately 5–8 years prior to our data collection. Nonetheless, this limitation may have a minimal effect on the independent associations found in the study as the percentage of Hispanic residents in Los Angeles County remained stable between the 2000 and 2010 Census. Another limitation is that the generalizability of the findings may not extend beyond Southern California. Results of the current study are most relevant to Hispanic adolescents who reside in areas of large Hispanic populations. However, this protective effect may not be generalizable to adolescents of other ethnic groups, as culture may have different implications on youth of different cultural backgrounds. Lastly, participants included in this analytic sample were predominantly female because two of these three linked studies recruited only females. The

high proportion of female participants in the current analytic dataset may limit the generalizability of the study findings across both sexes.

This study presents an important contribution to the dietary acculturation literature by demonstrating the moderating role of self-identified assimilation levels to dietary intake of Hispanic youth. These findings show that Hispanic youth who live in areas of higher proportion of Hispanic residents consumed greater amounts of fiber and lower amounts of sugar, suggesting that living in areas of high proportion Hispanic residents may potentially be protective against adopting less healthy dietary patterns. These results suggests that cultural has an important role in determining dietary intake among Hispanic youth and despite the protective effect of living in ethnic enclaves, Hispanic youth who are more assimilated to the US culture may be at an increased risk of adopting an unhealthy diets.

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Table 1

Demographics and descriptive statistics

Demographic variables (mean $\pm$ SD)	
Age (years)	13.5 $\pm$ 3.1
BMI percentile	90.61 $\pm$ 16.29
Gender (% female)	85.5 %
Average daily dietary intake (mean $\pm$ SD)	
Energy (kcal)	1717.76 $\pm$ 479.68
Total sugar (g)	102.55 $\pm$ 38.66
Added sugar (g)	66.82 $\pm$ 37.45
Total fiber (g)	14.08 $\pm$ 6.22
Neighborhood characteristics (mean $\pm$ SD)	
% Hispanic population	72.09 $\pm$ 23.40
Acculturation score (mean $\pm$ SD) (range 0–8)	
Assimilation score	1.87 $\pm$ 2.03
Food access (mean $\pm$ SD) (count in 0.5 mile radius)	
# of large super market	0.08 $\pm$ 0.30
# of fast food stores	0.72 $\pm$ 0.97
# of convenient stores	1.97 $\pm$ 1.72
Median household income (USD)	28,088.34 $\pm$ 8383.66

Table 2

Multiple linear regression results

	Total sugar consumptions Standardized β	Added sugar consumptions Standardized β	Total fiber consumption Standardized β
% Hispanic population	−0.22943 **	−0.23384 **	0.20458 **
Level of assimilation	0.11645	0.26275	0.37721 ⁺
%Hispanic population *	−0.04056	−0.13195	−0.46547 *
Level of assimilation			

All the models included age, sex, BMI percentile, average energy intake, median household income of the Census tract of residence, food access variables (count of large supermarkets, convenient stores, and major fast food restaurants within 0.5 mile radius of residence)

**
 $p < 0.01$;

*
 $p < 0.05$;

⁺
 $p < 0.10$