




Adolescent Obesogenic Behaviors: The Influence of Race/Ethnicity, Generation Status, Acculturation, and Time Lived Outside the United States

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Abstract

Children living with obesity are at higher risk for chronic disease. Dietary behaviors, sedentary time, and physical activity contribute to the risk of developing obesity. The purpose of this research was to identify associations between acculturation and race/ethnicity influences on obesogenic behaviors in middle school students. A national convenience sample of diverse U.S. children (11–14) was recruited to participate in an online survey ($N = 615$). Dietary behaviors, including fruit and vegetable consumption (F/V) and sugar-sweetened beverage consumption (SSB), as well as screen time and physical activity, were quantified. Multivariable regression models (linear and logistic) were built. We analyzed relationships between race/ethnicity, acculturation, time lived outside of the United States, and obesogenic behaviors. American Culture Competency (ACC; $p < 0.0001$), English Language Competency (ELC; $p = 0.0001$), time lived in the United States ($p < 0.0001$), generation American ($p < 0.0001$), race/ethnicity ($p < 0.0001$), and peer physical ($p = 0.0024$) activity together predicted daily screen time. ELC ($p = 0.0024$), peer meals ($p < 0.0001$), and race/ethnicity ($p < 0.0001$) all predicted SSB consumption. ACC ($p = 0.0183$), ELC ($p = 0.0438$), race/ethnicity ($p = 0.0152$), and time lived in the United States ($p = 0.0063$) predicted meeting physical activity recommendations. ACC ($p = 0.0002$), ELC ($p < 0.0001$), race/ethnicity ($p = 0.0052$), time lived in the United States ($p = 0.0061$), peer meals ($p < 0.0001$), and family dietary health ($p = 0.0053$) predicted F/V consumption. Results demonstrate that acculturation and race/ethnicity affect obesogenic behaviors. These results indicate that there are opportunities to consider acculturation and race/ethnicity in behavior modification among adolescents.

Keywords: *acculturation, physical activity, nutrition, adolescents*

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Introduction

Children living with obesity are at risk for many chronic and acute diseases. Several chronic diseases are associated with childhood obesity, such as type II diabetes, asthma, cancer, and cardiovascular disease (Han et al., 2010; Kushi et al., 2012; Umer et al., 2017). Childhood obesity is correlated with poor school performance, stigmatization (which can lead to social and emotional distress), and lower quality of life (Sahoo et al., 2015).

Racial and ethnic disparities are substantial when it comes to childhood obesity. Populations from minoritized (groups with distinct experiences with marginalization) and immigrant backgrounds in the United States consistently experience a higher rate of overweight and obesity than their non-Hispanic White counterparts (Krueger & Reither, 2015). Additionally, obesity rates among minoritized children and youth have continued to rise in recent years, while rates in White children and adolescents have remained unchanged (Anderson et al., 2019).

Socioeconomic status (SES) is also an important factor to consider in terms of childhood obesity. In one longitudinal study, children who were from low-income households were likely to maintain overweight status throughout the study, while children whose families became low-income during the study period were more likely to be obese at the end of the study (Demment et al., 2014). Yet Wang and Zhang (2006) found inconsistent patterns among different races/ethnicities relative to SES and risk for obesity. Thus, race/ethnicity continues to be an important variable of interest.

The development of obesity is multi-faceted and complex but includes obesogenic behaviors, such as poor diet, low physical activity, and high sedentary behavior (Centers for Disease Control and Prevention, 2024). In U.S. adolescents, low levels of physical activity (MVPA) have been linked with minority race/ethnicity and low-income status, as observed in the study conducted by Armstrong et al. (2018). Non-Hispanic Blacks, Hispanics/Latinos, and non-Hispanic Asian youth are less likely to meet recommendations for sleep, physical activity, and screen time compared to White youth (Knell et al., 2019). Additionally, immigrant and refugee groups report low physical activity levels and report many perceived barriers to physical activity (Wieland, 2015).

Acculturation can influence the adoption of obesogenic behaviors. As immigrants move to the United States, they may adopt Western behaviors (including obesogenic behaviors) through acculturation (Argueza et al., 2020). Acculturation is a dynamic process of adjusting to the presence of more than one cultural influence, which can be linked to stress from having to balance one's culture of origin with the dominant culture (Chun et al., 2016). Children who immigrated to the United States at a younger age also tended to adopt unhealthy habits of host countries faster, presumably due to lower exposure to the culture in their birth country (Zhang et al., 2019). Some immigrant and refugee children have been documented to respond to cultural adjustments and stress by overeating (Lane et al., 2018). However, acculturation may have positive outcomes, such as higher self-efficacy and an ability to meet the demands of both cultures (Chun et al., 2016), as well as improving self-esteem (Lee et al., 2019).

There are mixed results relative to the relationship between acculturation and obesity risk. Acculturation and its surrogates are sometimes protective and sometimes predictive of obesity. For example, a systematic review indicates that the use of the English language is negatively correlated with obesity in some Asian/Pacific Islander groups and may lower the risk for obesity among low-income Latino populations (Zhang et al., 2019). Asian American children of U.S.-born mothers have a lower chance of obesity; however, they also experience

lower fruit intake than children of recent immigrants (Argueza et al., 2020). On the other hand, longitudinal data from another study found the opposite, as acculturation was positively associated with obesity in Asian/Pacific Islander immigrant groups (Singh & Lin, 2013). “Number of generations lived in the United States” has a positive correlation with obesity, especially among Latinos and Blacks (Zhang et al., 2019).

Because of the multi-faceted nature of obesity development, particularly among minoritized populations, additional research is needed to examine the relationship between acculturation, race/ethnicity, family and peer influences, and obesogenic behaviors.

Purpose of the Study

Because studies examining acculturation and obesogenic behaviors are somewhat limited or have mixed results, particularly among adolescents, more information is needed about this phenomenon. Thus, the aim of this study was to identify associations between various races/ethnicities and acculturation on obesogenic behaviors among middle school students.

Methods

Participants

A national quota sample of middle school students, ages 11–14, was recruited through Qualtrics (Qualtrics, Provo, UT). Qualtrics guaranteed an ethnically/racially diverse sample of middle school students by creating a minimum quota of 600 students with the following demographics: Asian (100), Black (150), Hispanic/Latinx (150), and White (200). Recruitment quotas were based on Qualtrics’ ability to recruit an ethnically/racially diverse sample of middle school students. Prior to completing a survey, consent and assent were obtained. All recruitment, consenting/assenting, and participant compensation were conducted through Qualtrics. Data were collected in February through March 2021. Institutional Review Board approval was obtained through Brigham Young University. A total of 615 participants completed the survey, but six individuals whose responses did not meet inclusion criteria were dropped. Additionally, there were 37 participants (~6% of the data) who were unsure what generation they were and were subsequently excluded from any analyses that included generation status.

Procedure

Data were collected from a sample of 11- to 14-year-old middle school students across the United States. All states were represented with at least one participant, except for Maine, Rhode Island, and Vermont. Parental consent was obtained as the first question on the survey. For parents who did not consent, the survey was terminated. After parental consent was obtained, child assent was asked as the second question on the survey. For participants that did not assent, the survey was terminated. Consistent with common human-subjects research, participants could skip questions or terminate the study at any point. All data were provided anonymously to the research team by Qualtrics. The study was approved by the Institutional Review Board of Brigham Young University, which included informed consent for all participants. A cross-sectional study design was used as a basis for this study.

Instrumentation

The survey included 169 items (demographics, acculturation, physical activity, general nutrition, family meals, and school meals). Questions were primarily taken from previously conducted research and validated scales (Centers for Disease Control and Prevention, 2019, Khalsa et al., 2017; Kuzik et al., 2017, Melbye et al., 2017). Before distributing the survey, we conducted a cognitive interview with one student from the target

population to verify that the language was appropriate for this age group. Feedback was used to make minor changes to the survey to improve clarity. Demographic information was collected (age, grade, gender, race/ethnicity). While Qualtrics guaranteed a quota sample using the numbers above, race/ethnicity was divided into the following categories: White/European, Black/African, Asian, Hispanic/Latinx, Native/Indigenous American, and Multiple Race/Ethnicities. Additional exploratory analyses were conducted on sub-groups within the Asian group (East/Southeast Asian, Pacific Islander, and South Asian). Each of these variables was treated as a categorical variable in the analysis.

Acculturation Variables

Acculturation was measured using an adapted version of the Abbreviated Multidimensional Acculturation Scale (AMAS-ZABB; Zea et al., 2003). Three of the six dimensions were relevant to our study and were measured: American Culture Identity (six items), English Language Competency (nine items), and the American Culture Competency (six items; see Table 1). American Culture Identity assessed how respondents viewed themselves as Americans. English Language Competency assessed how respondents viewed their English skills. American Culture Competency assessed respondents' perceptions of how well they know American icons. Responses were rated using a 4-point Likert scale ranging from 1 (strongly agree) to 4 (strongly disagree) on culture identity subscales, and from 1 (extremely well) to 4 (not well at all) for the language and culture competency subscales. Higher subscale scores indicate higher acculturation. Each subscale had high internal consistency in our sample (Cronbach's alpha of 0.85, 0.92, and 0.89, respectively). In the present study, each sub-scale was treated as a continuous variable.

Table 1. *Items Used Across Scale and Factors*

Variable Names	Research Questions
American Culture Identity	<p>I think of myself as being U.S. American.</p> <p>I feel good about being U.S. American.</p> <p>Being U.S. American plays an important part in my life.</p> <p>I feel that I am part of the U.S. American culture.</p> <p>I have a strong sense of being U.S. American.</p> <p>I am proud of being U.S. American.</p>
English Language Competency	<p>How well do you speak English at school?</p> <p>How well do you speak English with friends?</p> <p>How well do you speak English on the phone?</p> <p>How well do you speak English with strangers?</p> <p>How well do you speak English in general?</p> <p>How well do you understand English on television or movies?</p> <p>How well do you understand English in newspapers or magazines?</p> <p>How well do you understand English in general?</p>
American Culture Competency	<p>How well do you know American national heroes?</p> <p>How well do you know popular American television shows?</p> <p>How well do you know popular American newspapers and magazines?</p> <p>How well do you know popular American actors and actresses?</p> <p>How well do you know American history?</p> <p>How well do you know American political leaders?</p>

Family Dietary Health	My parents offer me healthy foods. Healthy eating is encouraged in my family. My parents model healthy eating habits. My parents have a healthy diet.
Peer Meals	My peers talk to me about healthy eating. My peers like to try new foods.
Importance of Family Meals	Meals are an important part of my family life. Eating together is the most important part of our holidays and celebrations

Additional proxy measures for acculturation included time lived outside of the United States and generational status (Aldiu et al., 2018). Participants self-reported where they had spent time living (only in the United States; mostly in the United States; equally in and outside of the United States; mostly outside of the United States; and only outside of the United States). If individuals indicated that they lived outside of the United States they were put into a different dichotomous category than those who had only lived in the United States due to small sample sizes within subgroups. Participants also self-reported what generation of American they were (1st generation: I was born in a country other than the United States; 2nd generation: I was born in the United States, at least one of my parents was born in a country other than the United States; 3rd generation: I was born in the United States, both of my parents were born in the United States, and my grandparents were born in a country other than the United States; 4th generation: I was born in the United States, both of my parents were born in the United States, and at least one but not all of my grandparents were born in the United States; 5th generation: I was born in the United States, both of my parents were born in the United States, and all of my grandparents were born in the United States; and I'm not sure). Fourth and fifth generations were collapsed into one category. Comparisons between first and second generation and subsequent generations were made for American Culture identity, English Language Competency, American Culture Competency, and all outcome variables, but because there were no significant differences between first and second generation participants and all others, the five categories were retained.

Family and Peer Influences

Several questions in the survey assessed family and peer influences relative to physical activity and diet. The influence of family physical activity was assessed through one question: Physical activity is a priority for my family (5-point Likert collapsed to Agree, Neutral, Disagree). The influence of peer physical activity was assessed through the question, "Physical activity is a priority for my friends and peers" (5-point Likert collapsed to Agree, Neutral, Disagree). A factor analysis was conducted among seven questions assessing the family's influence on dietary habits and two factors were created by taking the sum and average of the Likert responses. The first factor created was family dietary health ("My parents offer me healthy foods"; "Healthy eating is encouraged in my family"; "My parents model healthy eating habits"; "My parents have a healthy diet." While many survey questions asked about "healthy eating" this term was not defined for the participants, thus was subject to their own interpretation of what they perceive as "healthy eating." The second factor was the importance of family meals ("Meals are an important part of my family life"; and "Eating together is the most important part of our holidays and celebrations"). Peer meals were assessed through two Likert-scale questions that were summed and averaged ("My peers talk to me about healthy eating"; and "My peers like to try new foods").

Outcome Variables

Average daily screen time was assessed using two self-report items: the number of hours per day they spent watching TV and the number of hours they played video games or computer games that are not considered

schoolwork on an average school day (Centers for Disease Control and Prevention, 2019). The number of hours reported for both questions was summed for total daily screen time.

Meeting physical activity (PA) recommendations was assessed using one self-report item. Participants reported the number of days in the last 7 days they did 60 or more minutes of moderate-to-vigorous physical activity (Centers for Disease Control and Prevention, 2019). Because the PA guidelines recommend adolescents engage in 7 days of 60 minutes or more low levels of physical activity (MVPA; Piercy et al., 2018), the variable was dichotomized to reflect “Meeting” or “Not Meeting” PA guidelines.

Meeting fruit and vegetable consumption recommendations was assessed using two self-report items. Participants reported the average number of servings of fruits and vegetables they ate per day. Using recommendations by the U.S. Department of Agriculture (U.S. Department of Health and Human Services, 2021), a categorical variable was created for meeting fruit recommendations and another for meeting vegetable recommendations. Fruit and vegetable recommendations vary by age and gender (U.S. Department of Health and Human Services, 2021). These variations were accounted for in the creation of the outcome variable. These variables were summed for a total fruit and vegetable score and then dichotomized for meeting fruit and vegetable recommendations.

Sugar-sweetened beverage (SSB) consumption was assessed through the self-reported average number of cups of juice, soft drinks (soda), energy drinks, and other sugary drinks they consume per day. The total number of cups was summed as a total SSB consumption score.

Data Variables

Data were analyzed in SAS, Version 9.4 (SAS Institute, Cary, NC). Univariate analyses were performed for all salient variables. Bivariate relationships were tested between each covariate and the outcome variables using chi-square or regression analysis. After a preliminary bivariate analysis to test assumptions, variables with a p -value of $<.20$ were considered for inclusion in the final multivariable models. A forward stepwise logistic regression strategy was used to test for main effects for categorical outcomes. A similar strategy was used for continuous outcome variables using general linear modeling.

Results

In total, there were 607 respondents. The largest racial/ethnic group in the study was White (33.1%) and most of the sample was in 8th grade (45.20%). Just over half of the sample identified as male (58.28%; see Table 2).

Table 2. Characteristics of the Study Sample

Variable	Frequency (%) Mean (SD) <i>N</i> = 609
Demographic Variables	
Age	
11	43 (7.08)
12	168 (27.68)
13	209 (34.43)
14	187 (30.81)
Grade	
6th	136 (22.41)
7th	195 (32.13)
8th	276 (45.47)

Race/Ethnicity	
White/European	201 (33.11)
Black/African	133 (21.91)
Asian	85 (14.00)
<i>East/Southeast Asian</i>	52 (8.57)
<i>Pacific Islander</i>	4 (0.66)
<i>South Asian</i>	29 (4.78)
Hispanic/Latinx	100 (16.47)
Native/Indigenous American	4 (0.66)
Multiple Race/Ethnicities	84 (13.84)
Gender	
Male	352 (58.28)
Female	252 (41.72)
Other	3 (0.49)
Acculturation Variables	
Time Lived in the United States	
Never lived outside the United States	528 (86.99)
Lived outside the United States	79 (13.01)
Generation American	
First	82 (14.34)
Second	136 (23.78)
Third	85 (14.86)
Four or higher	269 (47.03)
American Culture Identity	1.39 (0.49)
English Language Competency	1.22 (0.39)
American Culture Competency	1.86 (0.71)
Family and Peer Variables	
Peer Meals Factor	2.42 (1.07)
Family Dietary Health	1.85 (0.70)
Importance of Family Meals	1.71 (0.73)
Peer Physical Activity	
Agree	409 (67.38)
Neutral	142 (23.39)
Disagree	56 (9.23)
Family Physical Activity	
Agree	440 (72.49)
Neutral	119 (19.60)
Disagree	48 (7.91)
Obesogenic Behaviors	
Average Daily Screen Time (hours/day)	9.19 (5.60)
Physical Activity Recommendations*	
Not met	528 (86.70)
Met	81 (13.30)
F/V Consumption Recommendations	
Not met	255 (42.01)
Met	352 (57.99)
Sugar-Sweetened Beverage Consumption	
None	65 (10.71)
1 cup per day	122 (19.77)
More than 1 cup per day	422 (69.52)

*The physical activity recommendations for children 6–17 years old are 60 minutes or more moderate-to-vigorous physical activity every day.

The majority of participants (86.99%) had lived only in the United States, and 14.34% of the sample indicated they were first-generation Americans. Mean acculturation scores were: American Culture Identity = 1.39 (*SD* 0.49), English Language Competency = 1.22 (*SD* 0.39), and American Culture Competency = 1.86 (*SD* 0.71).

The average score for the peer meals factor was 2.42 (*SD* 1.07). The average score for the family dietary health factor was 1.85 (*SD* 0.70), and the average score for the importance of family meals was 1.71 (*SD* 0.73). Most of the sample indicated that physical activity was important to their peers (67.38%) and important to their family (72.49%).

Most participants (86.22%) did not meet physical activity recommendations. Just over half of the sample (58.05%) self-reported meeting fruit and vegetable consumption recommendations. Almost 70% of the participants indicated that they consumed more than 1 cup of sugar-sweetened beverage per day. Daily screen time averaged 9.22 hours per day.

Multivariable Models

Behaviors That Increase Risk for Obesity

American Culture Competency ($p < 0.0001$), English Language Competency ($p = 0.0001$), time lived in the United States ($p < 0.0001$), generation American ($p < 0.0001$), race/ethnicity ($p < 0.0001$), and peer physical activity ($p = 0.0024$) together significantly predicted daily screen time. As American Culture Competency decreased, average daily screen time increased. As English Language Competency increased, average daily screen time also increased. Individuals who had lived outside the United States also had higher daily screen time. Compared to first-generation Americans, all other generations had lower screen time use. Compared to Whites, all other races/ethnicities, with the exception of Native/Indigenous Americans (non-significant results), had lower screen time use. This association was also observed for East/Southeast Asians and South Asians compared to Whites when disaggregated. Individuals who perceived that physical activity was a priority for their peers had higher screen time than those in the neutral perception group. There were no differences between individuals who perceived that physical activity was not a priority and the priority group (see Table 3).

English Language Competency ($p = 0.0024$), peer meals ($p < 0.0001$), and race/ethnicity ($p < 0.0001$) were all significantly related to consuming more than 1 cup of SSBs in a day. As English Language Competency increased, the frequency of SSB consumption increased. As peers discussed healthy eating and tried new foods more frequently, the likelihood of consuming 1 cup of SSBs more than once per day decreased. All other racial/ethnic groups were less likely to consume SSBs compared to White adolescents, with the exception of Native/Indigenous Americans (non-significant result). This association was also observed for East/Southeast Asians and South Asians compared to Whites when the Asian group was disaggregated (see Table 3).

Table 3. *Adjusted Effects Between Outcome and Predictor Variables*

Variable	Beta (Standard Error) [<i>p</i> -value]
<i>Average Daily Screen Time (hours/day)</i>	
American Culture Competency	-1.91 (0.32) [< 0.0001]
English Language Competency	2.11 (0.55) [0.0001]
Time Lived in the United States	
Never lived outside the United States	Ref.
Lived outside the United States	2.13 (0.61) [0.0005]
Generation	
First	Ref.
Second	-1.77 (0.66) [0.0078]
Third	-1.80 (0.74) [0.0152]
Four or higher	-2.26 (0.62) [0.0003]

Race/Ethnicity	
White/European	Ref.
Black/African	-2.74 (0.57) [$<.0001$]
Asian	-2.95 (0.73) [$<.0001$]
East/Southeast Asian	-5.39 (0.80) [$<.0001$]
Pacific Islander	-4.43 (2.72) [0.1038]
South Asian	-6.27 (0.96) [$<.0001$]
Hispanic/Latinx	-4.14 (0.61) [$<.0001$]
Native/Indigenous American	-3.10 (2.71) [0.2518]
Multiple races	-4.05 (0.66) [$<.0001$]
Peer Physical Activity	
Agree	Ref.
Neutral	-1.68 (0.51) [0.0010]
Strongly disagree	-0.99 (0.70) [0.1540]
Variable	Odds Ratio/Point Estimate (Confidence Interval)
Meeting Daily Physical Activity Recommendations*	
American Culture Competency	0.49 (0.31, 0.78)
English Language Competency	0.22 (0.07, 0.68)
Race/Ethnicity	
White/European	Ref.
Black/African	0.41 (0.20, 0.86)
Asian	0.34 (0.14, 0.83)
East/Southeast Asian	0.29 (0.08, 1.03)
Pacific Islander	6.31 (0.47, 83.98)
South Asian	0.32 (0.09, 1.16)
Hispanic/Latinx	0.29 (0.13, 0.65)
Native/Indigenous American	—
Multiple races	0.44 (0.19, 0.98)
Time Lived in the United States	
Never lived outside the United States	Ref.
Lived outside the U.S.	2.43 (1.23, 4.82)
Meeting Fruit and Vegetable Recommendations	
American Culture Competency	0.55 (0.40, 0.75)
English Language Competency	3.79 (2.16, 6.66)
Family Dietary Health	0.64 (0.47, 0.88)
Peer Meals	0.59 (0.47, 0.74)
Race/Ethnicity	
White/European	Ref.
Black/African	0.70 (0.40, 1.22)
Asian	0.31 (0.17, 0.59)
East/Southeast Asian	0.35 (0.17, 0.73)
Pacific Islander	0.19 (0.02, 2.47)
South Asian	0.28 (0.11, 0.68)
Hispanic/Latinx	0.36 (0.20, 0.64)
Native/Indigenous American	1.02 (0.10, 10.49)
Multiple Races	0.44 (0.23, 0.83)
Time Lived in the U.S.	
Never lived outside the U.S.	Ref.
Lived outside the U.S.	2.48 (1.30, 4.75)
Sugar-Sweetened Beverage Consumption Frequency	
English Language Competency	2.50 (1.38, 4.01)
Peer Meals	0.60 (0.50, 0.72)

Race/Ethnicity	
White/European	Ref.
Black/African	0.37 (0.20, 0.69)
Asian	0.11 (0.06, 0.21)
East/Southeast Asian	0.13 (0.06, 0.26)
Pacific Islander	0.20 (0.02, 1.94)
South Asian	0.09 (0.04, 0.20)
Hispanic/Latinx	0.33 (0.17, 0.62)
Native/Indigenous American	0.35 (0.04, 3.15)
Multiple Races	0.25 (0.13, 0.48)

Behaviors That Decrease Risk for Obesity

American Culture Competency ($p = 0.0183$), English Language Competency ($p = 0.0438$), race/ethnicity ($p = 0.0152$), and time lived in the United States ($p = 0.0063$) were significant predictors of meeting physical activity recommendations. As scores for American Culture Competency decreased, the probability of meeting physical activity recommendations went up. Participants who have lived outside of the U.S. were almost 2.5 times as likely to meet physical activity recommendations compared to adolescents who had lived only in the United States. Compared to Whites, all other racial/ethnic groups were less likely to meet daily physical activity recommendations (see Table 3).

American Culture Competency ($p = 0.0002$), English Language Competency ($p < 0.0001$), race/ethnicity ($p = 0.0052$), time lived in the United States ($p = 0.0061$), peer meals ($p < 0.0001$), and family dietary health ($p = 0.0053$) were together significantly related to meeting fruit and vegetable recommendations. As American Culture Competency scores increased, the probability of meeting fruit and vegetable recommendations decreased. As English Language Competency increased, the probability of meeting fruit and vegetable recommendations increased. Individuals who have lived outside of the United States were almost 2.5 times more likely to meet fruit and vegetable recommendations than those who had not lived outside the United States. Additionally, as family dietary health increased, meeting fruit and vegetable recommendations decreased; a similar relationship was observed for peer meals. Lastly, all other racial/ethnic groups were less likely to meet fruit and vegetable recommendations compared to White adolescents. These associations were also observed for East/Southeast Asian and South Asians groups when compared to Whites (see Table 3).

Discussion

The findings from the present study highlight the complexity of the relationships between acculturation, race/ethnicity, family and peer influences, and obesogenic behaviors in adolescents. While obesogenic behaviors vary between racial and ethnic groups, these results exemplify the importance of understanding acculturation as a factor influencing behaviors, in addition to race/ethnicity. Several acculturation variables were salient in the study including American Culture Competency, English Language Competency, Culture Identity, having lived outside the United States, and how many generations the family had lived in the United States.

Scholars recognize that as immigrants acculturate to a new society, they are likely to experience a change in their identity (Cobb et al., 2017). Cultural identity is indicative of an individual's self-identification; this can be either their ethnic identity (adherence to one's racial/ethnic group and positive views of that group) or it can refer to national identity (attachment to the receiving culture; Phinney & Ong, 2007). In our study, American Culture Identity (higher scores of adherence to Western/American culture) was inversely associated with meeting physical activity guidelines in our sample; as American Culture Identity went down, the likelihood a participant met physical activity guidelines increased. This may be related to the fact that physical activity for U.S.-born adolescents looks different than for those who came from a different country. For example, Weiland et al. (2015) identified several barriers to immigrants and physical activity. Their findings underlined that

participants who reported spending more time outdoors in their country of origin for work and social activity had more physical activity. Their findings also highlighted that work both inside and outside of the home required less physical activity than in the United States (Weiland et al., 2015).

Language competence is also an important component of the acculturation process (Schwartz et al., 2010). In our sample, English Language competence was positively associated with daily screen time, meeting fruit and vegetable recommendations, and SSB consumption but inversely associated with meeting physical activity guidelines. Mixed results are found in the literature relative to this phenomenon. For example, Taverno et al. (2010) found that speaking a language other than English at home among a Hispanic population could be protective of screen time in children. Yet, Williams et al. did not find that language use and generation status were significantly related to screen time in a nationally representative sample of 10th-grade students (2018).

There is a lack of research examining the influence of American Culture Competency on obesogenic behaviors. In our sample, American Culture Competency was significantly related to average daily screen time, meeting physical activity guidelines, and meeting fruit and vegetable recommendations; higher culture competency indicated lower screen time but also less likelihood of meeting physical activity (PA) and fruit and vegetable recommendations. Multiple studies indicate that adolescents who identify as immigrants to the United States are less physically active than U.S.-born adolescents (Kimbrow & Kaul, 2016; Singh et al., 2008). Acculturation is one of the major proposed mechanisms for addressing disparities in PA that exist across minoritized populations (Larsen et al., 2013; Wolin et al., 2006), thus more opportunities for diverse/culturally appropriate opportunities for PA should be created and/or promoted.

The literature demonstrates mixed results regarding the relationship between race/ethnicity and SSB consumption. Some studies indicate that in addition to disparities found by race/ethnicity, factors, such as location and income level, contribute to consumption of sugary drinks (Dodd et al., 2013). One study found that White adolescents have a higher soda intake than their Black counterparts (Powell & Nguyen, 2013). Nonetheless, this is reversed in high-income groups where non-Hispanic White adolescents consume more SSB than Black and Hispanic/Latinx adolescents (Mendez et al., 2019).

We also found important relationships between obesogenic behaviors and peer and family influences. As peers discussed healthy eating and tried new foods more frequently, the likelihood of participants consuming 1 cup of SSBs more than once per day decreased, and surprisingly, had an inverse effect on meeting fruit and vegetable recommendations. Much research is dedicated to peer relationships and diet quality. Particularly in adolescents, peers can greatly influence dietary habits. Chung et al. (2018) found that SSB consumption was associated with more time spent with friends and calling or texting with friends every day. They also found that spending more time with friends in the evening was associated with more physical activity. Other research has established that peers' concern for eating healthy was predictive of lower fast-food intake as well (Bauer et al., 2009). While some research has identified how family meals are protective of obesity (Berge et al., 2015), our study did not find a significant association between the perceived importance of family meals and dietary behaviors.

It is also worth noting the high level of screen time reported in our study. Studies have demonstrated that screen time is correlated with obesity through increased calorie consumption while viewing media, and exposure to high-calorie, low-nutrient dense food/beverage marketing (Robinson et al., 2017). The scientific literature also demonstrates the inverse relationship between screen time and physical activity (Sandercock et al., 2012). Thus, it is important to consider ways to reduce screen time, particularly among a minoritized population at risk for obesity.

Limitations

Our study has several limitations. Because we used a quota sample, the participants do not match the exact racial/ethnic classification of the United States. We also may be underpowered in the Native

American/Indigenous American and Pacific Islander groups, thus results for this population should be interpreted with caution. Future research should prioritize exploring acculturation and obesogenic behaviors within these groups given the high number of children living with obesity within these sub-populations. Another limitation is the use of cross-sectional study design; temporal sequence was not established; thus, the findings do not speak to causality. The measures were self-reported, introducing some bias due to perceptions of the social acceptability of responses and salience. The survey data were collected during the COVID-19 pandemic, so responses may have differed if conducted during a typical year. For example, participants may have been engaged in more screen time than in a typical year given online schooling, and lockdowns may have impacted their ability to participate in youth sports, physical education, or other physical activities. Higher food insecurity may have prevented fruit and vegetable consumption. Having 87% of the study population living in the United States only, with 13% being first-generation citizens, should also be noted in the interpretation. Yet, despite these limitations, the results from this study shed light on vulnerable populations and areas for interventions among specific sub-groups.

Conclusion

Comparing obesogenic behaviors of adolescents in the U.S. among various races and ethnicities, while considering acculturation levels, underscores the relationship between culture and obesogenic behaviors. This study is novel because we have found significant differences among several racial/ethnic groups, particularly between South Asians and East/Southeast Asians—two groups that are typically considered as one in many statistical analyses. Additionally, the findings of our study highlight that acculturation is an important piece to be considered in conjunction with racial/ethnic differences among behaviors. The results from this study can move the field of nutrition education and behavior by informing stakeholders about the importance of considering acculturation as a major component of obesity prevention. For example, community programs, particularly those prioritizing minoritized communities, may want to consider how changes in acculturation can put adolescents at an increased risk for obesogenic behaviors.

References

- Alidu, L., & Grunfeld, E. A. (2017). A systematic review of acculturation, obesity and health behaviours among migrants to high-income countries. *Psychology & Health, 33*(6), 724–745. <https://doi.org/10.1080/08870446.2017.1398327>
- Anderson, P. M., Butcher, K. F., & Schanzenbach, D. W. (2019). Understanding recent trends in childhood obesity in the United States. *Economics and Human Biology, 34*, 16–25. <https://doi.org/10.1016/j.ehb.2019.02.002>
- Argueza, B. R., Sokal-Gutierrez, K., & Madsen, K. A. (2020). Obesity and obesogenic behaviors in Asian American children with immigrant and US-born mothers. *International Journal of Environmental Research and Public Health, 17*(5), 1786. <https://doi.org/10.3390/ijerph17051786>
- Armstrong, S., Wong, C. A., Perrin, E., Page, S., Sibley, L., & Skinner, A. (2018). Association of Physical Activity with income, race/ethnicity, and sex among adolescents and young adults in the United States. *JAMA Pediatrics, 172*(8), 732. <https://doi.org/10.1001/jamapediatrics.2018.1273>
- Bauer, K. W., Larson, N. I., Nelson, M. C., Story, M., & Neumark-Sztainer, D. (2009). Socio-environmental, personal and behavioural predictors of fast-food intake among adolescents. *Public Health Nutrition, 12*(10), 1767–1774. <https://doi.org/10.1017/s1368980008004394>
- Berge, J. M., Wall, M., Hsueh, T.-F., Fulkerson, J. A., Larson, N., & Neumark-Sztainer, D. (2015). The protective role of family meals for youth obesity: 10-year longitudinal associations. *The Journal of Pediatrics, 166*(2), 296–301. <https://doi.org/10.1016/j.jpeds.2014.08.030>
- Centers for Disease Control and Prevention (2019). *2019 middle school youth risk behavior survey*. CDC. https://www.cdc.gov/healthyyouth/data/yrbs/pdf/2019/2019_YRBS-Standard-MS-Questionnaire.pdf
- Centers for Disease Control and Prevention. (2024, March 22). *Causes of obesity*. CDC. <https://www.cdc.gov/obesity/basics/causes.html>
- Chun, K. M., Kwan, C. M. L., Strycker, L. A., & Chesla, C. A. (2016). Acculturation and bicultural efficacy effects on Chinese American immigrants' diabetes and health management. *Journal of Behavioral Medicine, 39*(5), 896–907. <https://doi.org/10.1007/s10865-016-9766-2>
- Chung, S. J., Ersig, A. L., & McCarthy, A. M. (2018). Parent, school, and peer factors related to U.S. adolescents' diet and exercise. *Journal for Specialists in Pediatric Nursing, 23*(4), Article e12227. <https://doi.org/10.1111/jspn.12227>
- Cobb, C. L., Xie, D., Meca, A., & Schwartz, S. J. (2017). Acculturation, discrimination, and depression among unauthorized Latinos/as in the United States. *Cultural Diversity and Ethnic Minority Psychology, 23*(2), 258–268. <https://doi.org/10.1037/cdp0000118>
- Demment, M. M., Haas, J. D., & Olson, C. M. (2014). Changes in family income status and the development of overweight and obesity from 2 to 15 years: A longitudinal study. *BMC Public Health, 14*(1), Article 417. <https://doi.org/10.1186/1471-2458-14-417>
- Dodd, A. H., Briefel, R., Cabili, C., Wilson, A., & Crepinsek, M. K. (2013). Disparities in consumption of sugar-sweetened and other beverages by race/ethnicity and obesity status among United States schoolchildren. *Journal of Nutrition Education and Behavior, 45*(3), 240–249. <https://doi.org/10.1016/j.jneb.2012.11.005>
- Han, J. C., Lawlor, D. A., & Kimm, S. Y. (2010). Childhood obesity. *The Lancet, 375*(9727), 1737–1748. [https://doi.org/10.1016/s0140-6736\(10\)60171-7](https://doi.org/10.1016/s0140-6736(10)60171-7)

- Khalsa, A. S., Kharofa, R., Ollberding, N. J., Bishop, L., & Copeland, K. A. (2017). Attainment of “5-2-1-0” obesity recommendations in preschool-aged children. *Preventive Medicine Reports*, 8, 79–87. <https://doi.org/10.1016/j.pmedr.2017.08.003>
- Kimbro, R. T., & Kaul, B. (2016). Physical activity disparities between U.S.-born and immigrant children by maternal region of origin. *Journal of Immigrant and Minority Health*, 18(2), 308–317. <https://doi.org/10.1007/s10903-015-0180-6>
- Knell, G., Durand, C. P., Kohl, H. W., III, Wu, I. H. C., & Gabriel, K. P. (2019). Prevalence and likelihood of meeting sleep, physical activity, and screen-time guidelines among U.S. youth. *JAMA Pediatrics*, 173(4), 387. <https://doi.org/10.1001/jamapediatrics.2018.4847>
- Krueger, P. M., & Reither, E. N. (2015). Mind the gap: Race/ethnic and socioeconomic disparities in obesity. *Current Diabetes Reports*, 15(11), Article 95. <https://doi.org/10.1007/s11892-015-0666-6>
- Kushi, L. H., Doyle, C., McCullough, M., Rock, C. L., Demark-Wahnefried, W., Bandera, E. V., Gapstur, S., Patel, A. V., Andrews, K., & Gansler, T. (2012). American Cancer Society guidelines on nutrition and physical activity for cancer prevention. *CA: A Cancer Journal for Clinicians*, 62(1), 30–67. <https://doi.org/10.3322/caac.20140>
- Kuzik, N., Carson, V., Andersen, L. B., Sardinha, L. B., Grøntved, A., Hansen, B. H., & Ekelund, U. (2017). Physical activity and sedentary time associations with metabolic health across weight statuses in children and adolescents. *Obesity*, 25(10), 1762–1769. <https://doi.org/10.1002/oby.21952>
- Lane, G., Farag, M., White, J., Nisbet, C., & Vatanparast, H. (2018). Chronic health disparities among refugee and immigrant children in Canada. *Applied Physiology, Nutrition, and Metabolism*, 43(10), 1043–1058. <https://doi.org/10.1139/apnm-2017-0407>
- Larsen, B. A., Pekmezi, D., Marquez, B., Benitez, T. J., & Marcus, B. H. (2013). Physical activity in Latinas: Social and environmental influences. *Women’s Health*, 9(2), 201–210. <https://doi.org/10.2217/whe.13.9>
- Lee, H., Lee, H. E., Cassel, K., Hagiwara, M. I., & Somera, L. P. (2019). Protective effect of biculturalism for health amongst minority youth: The case of Pacific islander migrant youths in Hawai‘i. *The British Journal of Social Work*, 49(4), 1003–1022. <https://doi.org/10.1093/bjsw/bcz042>
- Melbye, E. L., Øgaard, T., & Øverby, N. C. (2011). Validation of the comprehensive feeding practices questionnaire with parents of 10- to 12-year-olds. *BMC Medical Research Methodology*, 11(1). <https://doi.org/10.1186/1471-2288-11-113>
- Mendez, M. A., Miles, D. R., Poti, J. M., Sotres-Alvarez, D., & Popkin, B. M. (2019). Persistent disparities over time in the distribution of sugar-sweetened beverage intake among children in the United States. *The American Journal of Clinical Nutrition*, 109(1), 79–89. <https://doi.org/10.1093/ajcn/nqy123>
- Phinney, J. S., & Ong, A. D. (2007). Conceptualization and measurement of ethnic identity: Current status and future directions. *Journal of Counseling Psychology*, 54(3), 271–281. <https://doi.org/10.1037/0022-0167.54.3.271>
- Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galuska, D. A., George, S. M., & Olson, R. D. (2018). The physical activity guidelines for Americans. *JAMA*, 320(19), 2020. <https://doi.org/10.1001/jama.2018.14854>
- Powell, L. M., & Nguyen, B. T. (2013). Fast-food and full-service restaurant consumption among children and adolescents. *JAMA Pediatrics*, 167(1), 14–20. <https://doi.org/10.1001/jamapediatrics.2013.417>
- Robinson, T. N., Banda, J. A., Hale, L., Lu, A. S., Fleming-Milici, F., Calvert, S. L., & Wartella, E. (2017). Screen media exposure and obesity in children and adolescents. *Pediatrics*, 140(Supplement_2). <https://doi.org/10.1542/peds.2016-1758k>

- Sahoo, K., Sahoo, B., Choudhury, A. K., Sofi, N. Y., Kumar, R., & Bhadoria, A. S. (2015). Childhood obesity: Causes and consequences. *Journal of Family Medicine and Primary Care*, 4(2), 187–192. <https://doi.org/10.4103/2249-4863.154628>
- Schwartz, S. J., Unger, J. B., Zamboanga, B. L., & Szapocznik, J. (2010). Rethinking the concept of acculturation: Implications for theory and research. *American Psychologist*, 65(4), 237–251. <https://doi.org/10.1037/a0019330>
- Singh, G. K., & Lin, S. C. (2013). Dramatic increases in obesity and overweight prevalence among Asian subgroups in the United States, 1992–2011. *ISRN Preventive Medicine*, 2013, Article 898691. <https://doi.org/10.5402/2013/898691>
- Singh, G. K., Yu, S. M., Siahpush, M., & Kogan, M. D. (2008). High levels of physical inactivity and sedentary behaviors among U.S. immigrant children and adolescents. *Archives of Pediatrics and Adolescent Medicine*, 162(8), 756–763. <https://doi.org/10.1001/archpedi.162.8.756>
- Taverno, S. E., Rollins, B. Y., & Francis, L. A. (2010). Generation, language, body mass index, and activity patterns in Hispanic children. *American Journal of Preventive Medicine*, 38(2), 145–153. <https://doi.org/10.1016/j.amepre.2009.09.041>
- Umer, A., Kelley, G. A., Cottrell, L. E., Giacobbi, P., Jr., Innes, K. E., & Lilly, C. L. (2017). Childhood obesity and adult cardiovascular disease risk factors: A systematic review with meta-analysis. *BMC Public Health*, 17(1). <https://doi.org/10.1186/s12889-017-4691-z>
- U.S. Department of Health and Human Services. (2021, August 24). *2015–2020 dietary guidelines*. <https://health.gov/our-work/nutrition-physical-activity/dietary-guidelines/previous-dietary-guidelines/2015>
- Wang, Y., & Zhang, Q. (2006). Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. *The American Journal of Clinical Nutrition*, 84(4), 707–716. <https://doi.org/10.1093/ajcn/84.4.707>
- Wieland, M. L., Tiedje, K., Meiers, S. J., Mohamed, A. A., Formea, C. M., Ridgeway, J. L., Asiedu, G. B., Boyum, G., Weis, J. A., Nigon, J. A., Patten, C. A., & Sia, I. G. (2015). Perspectives on physical activity among immigrants and refugees to a small urban community in Minnesota. *Journal of Immigrant and Minority Health*, 17(1), 263–275. <https://doi.org/10.1007/s10903-013-9917-2>
- Williams, W., Li, K., Haynie, D., & Simons-Morton, B. (2016). Physical activity and sedentary behavior of U.S. immigrant versus non-immigrant adolescents: Findings from the NEXT Generation Health Study data. *Ethnicity and Health*, 23(3), 329–338. <https://doi.org/10.1080/13557858.2016.1265644>
- Wolin, K. Y., Colditz, G., Stoddard, A. M., Emmons, K. M., & Sorensen, G. (2006). Acculturation and physical activity in a working class multiethnic population. *Preventive Medicine*, 42(4), 266–272. <https://doi.org/10.1016/j.ypmed.2006.01.005>
- Zea, M. C., Asner-Self, K. K., Birman, D., & Buki, L. P. (2003). The abbreviated multidimensional acculturation scale: Empirical validation with two Latino/Latina samples. *Cultural Diversity and Ethnic Minority Psychology*, 9(2), 107–126. <https://doi.org/10.1037/1099-9809.9.2.107>
- Zhang, Q., Liu, R., Diggs, L. A., Wang, Y., & Ling, L. (2017). Does acculturation affect the dietary intakes and body weight status of children of immigrants in the U.S. and other developed countries? A systematic review. *Ethnicity and Health*, 24(1), 73–93. <https://doi.org/10.1080/13557858.2017.1315365>



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