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Preliminary Data on the Relation between Acculturation, Weight, and Sleep in Recently Immigrated Adolescents from Central America

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Abstract

Data on Hispanic immigrants links increased acculturation with behavioral health concerns, though most data focuses on adults and Mexican-Americans. The aim of this study was to test the hypothesis that acculturation and acculturative stress act as predictors of increased body mass index (BMI) and decreased sleep in a sample of 62 recently immigrated Central American adolescents. Findings indicated a significant link between increased language acculturation and decreased sleep in bivariate analyses, but failed to confirm relations using multivariate methods or document relations to weight. Preliminary conclusions suggest that concerns regarding obesity documented in other immigrant groups may not be relevant among adolescents from Central America but decreased sleep duration may be related to acculturation in this group.

Key Words: acculturation; weight; sleep; immigrant; adolescent

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Immigrated Adolescents from Central America

The number of adolescents that have entered the United States (U.S.) from Central

American countries such as Honduras, El Salvador, and Guatemala increased 131% between

2015 and 2016 (U.S. Customs and Border Patrol, 2016). These numbers highlight the relevance

of Central American migrants to broader public health. Critically, acculturation (defined as the

process of cultural and psychological changes that result from the merging of cultures; Sam &

Berry, 2010) has been linked to weight and sleep disturbances in other subgroups entering the

U.S. Little research has examined these relations with Central American immigrants, particularly

youth, despite very rapid growth in this demographic sector. The aim of this study was to address

these gaps by providing preliminary data regarding acculturation, weight, and sleep in recently

immigrated adolescents from Central America.

Acculturation and Weight

In general, research has shown that greater acculturation to the U.S. amongst Hispanic

subgroups leads to multiple health issues, including but not limited to, increased body mass

index (BMI). BMI can be used as a categorical metric wherein BMI between 18.5 and 25 falls

within the normal weight range, between 25 and 30 falls within the overweight range, and 30 or

higher falls within the obese range (CDC, 2017). For the purposes of this literature review, the

terms normal, overweight, and obese/obesity will refer to these standard BMI categories.

Regarding obesity, this effect has been documented in Puerto Rican women (Fitzgerald,

Himmelgreen, Damio, Segura-Pérez, Peng, & Pérez-Escamilla, 2006) and in Mexican-

Americans (Ahluwalia, Ford, Link, & Bolen, 2007; Hazuda, Haffner, Stern, & Eifler 1988).

Indeed, Hispanics who live in the U.S. for less than five years have an obesity rate of 9.4 percent

compared to 24.2 percent for those who lived in the U.S. fifteen or more years (Kaplan, Huguet, Newsom, & McFarland, 2004). Regarding BMI, more acculturated Latinos have higher BMI scores (Abraido-Lanza, Chao, & Florez, 2005), longer duration in the U.S. is directly associated with higher BMI (Goel, McCarthy, Phillips, & Wee, 2004), and better English—a result of language acculturation— and duration of time in the U.S. are associated with higher BMI scores (Himmelgreen, Pérez-Escamilla, Martinez, Bretnall, Eells, Peng, & Bermúdez, 2004).

The link between increased acculturation and risk for obesity is also echoed in literature comparing generations of immigrants on the basis of health factors. For instance, obesity frequency is significantly higher for second-generation immigrants than for first-generation immigrants (Creighton, Gikdman, Pebley, & Chung, 2012; Popkin & Udry, 1998). Also, Hubert, Snider, and Winkleby (2005) found that when comparing exercise, diet, and years in the U.S., generational status had the strongest link to obesity. Assuming that latter generations of immigrants are more acculturated to the U.S., this literature base serves to further bolster the notion that acculturation poses a risk regarding risk for obesity among immigrants.

These general trends can also be found amongst adolescents, for example, Gordan-Larsen, Harris, Ward, and Popkin (2003) found that adolescent, second-generation immigrants were more likely to be overweight than first generation immigrants in Puerto Ricans and Cubans but not Mexicans, and that acculturation demonstrated a significant relation to overweight status amongst all three groups. Ji-Hong, Yong, Frongillo, and Probst (2012) found that among U.S. born teenagers of Mexican descent, heavier weight was associated with higher language acculturation. Given the disproportionate occurrence of obesity among Hispanic youth born in the U.S., compared with Hispanics who are born outside the U.S. and immigrate to the U.S. (e.g., Ji-Hong et al., 2012), it is important to explore the psychosocial risk factors underlying risk for

obesity. Similarly, examining first generation immigrants—in particular, young Hispanics who immigrated themselves to the U.S.—may be an important avenue to understanding psychosocial protective factors that may account for why first generation immigrants are less likely to be obese than their second generation counterparts.

In explaining the link between acculturation and unhealthy weight, numerous authors have suggested that increased acculturation to U.S. norms includes increased engagement in health risk behaviors that are prevalent in the U.S. For example, Delavari, Sonderlund, Swinburn, Mellor, and Renzaho (2013) reviewed nine publications revealing that the host culture, the U.S., promoted unhealthy weight gain, resulting in rising BMI scores among immigrants, especially those more acculturated. Additionally, Unger, Reynolds, Spruijt-Metz, Sun, and Johnson (2004) found that amongst both Hispanic and Asian adolescents, acculturation was associated with lower rates of physical activity and a higher rates of fast-food consumption, indicating a relation between acculturation and obesity risk behaviors.

Despite strong evidence suggesting a link between increased acculturation to the U.S. and increased risk for unhealthy weight, several limitations in this literature exist particularly in relation to adolescent immigrants. First, very little of this work has focused on youth samples despite prior research conducted by Kaushal (2009) reporting that the younger an immigrant is at arrival, the more likely they are to become obese with length of time in the U.S.—with this risk particularly inflated for Hispanics. This limitation is profound given the aforementioned, high risk for obesity among Hispanic youth in the U.S. Second, the bulk of this literature has excluded the most common immigrant subgroups arriving in the U.S. recently— Salvadorians, Guatemalans, and Hondurans. This is particularly problematic in light of evidence that these links vary amongst different Latino groups (Lara, Gamboa, Kahramanian, Morales, & Bautista,

2005). Both Lara et al. (2005) and Pérez-Escamilla and Putnik (2007) note that existing evidence is based mostly on Mexican participants. To our knowledge, only one such study has included Salvadorian participants, and confirmed links between time in the U.S. and overweight status (Bertera, Bertera, & Shankar, 2003). Third, some studies have failed to document a link between acculturation and higher BMI values —introducing inconsistency to this literature base. For example, Khan, Sobal, and Martorell (1997) found mixed results amongst Puerto Ricans, Cubans, and Mexican Americans, in that a linear relation between acculturation and BMI was only noted in Mexican Americans.

Acculturation and Sleep

An emerging literature has also linked acculturation to sleep difficulties, broadly suggesting that more acculturated Hispanics experience reduced sleep duration, more trouble sleeping, and more self-reported sleep complaints. For example, Hale and Rivero-Fuentes (2011) found that individuals of Mexican origin who were born in the U.S., and therefore are expected to be more acculturated to U.S. customs than first-generation immigrants, were 40 percent more likely to be short sleepers (defined as sleeping less than 6.5 hours per night) than first-generation Mexican immigrants. Short sleep duration (i.e., sleeping less than 6.5 hours per night) has been associated with a number of health problems including obesity, heart disease, hypertension, and death (Loredo et al., 2010), suggesting that identifying factors that underlie decreased sleep duration can have important public health effects. Likewise, while first-generation Mexican immigrants are at the lowest risk for sleep disorders, inadequate sleep duration, and trouble sleeping compared to U.S.-born Mexican Americans and non-Hispanic Whites; this low risk did not extend to second-generation Mexican immigrants and their descendants (Hale, Do, & Rivero-Fuentes, 2010). Further, Hale, Troxel, Kravitz, Hall, and Mathews (2014) reported that higher

language acculturation resulted in greater likelihood of reporting sleep problems. Another study by D'Anna-Hernandez, Garcia, Coussons-Read, Laudenslager, and Ross (2016) focused on pregnant Hispanics and found that more acculturated women had more sleep disturbances, which could have perinatal consequences including low birth weight (<2500 g), earlier infant gestational age, and flatter diurnal cortisol slope late in pregnancy—problems which have been linked to increased acculturation (D'Anna, Hoffman, Zerbe, Coussons-Read, Ross, & Laudenslanger, 2012). Finally, a recent analysis of data from the Hispanic Community Health study indicated that increased acculturation was associated with increased daytime sleepiness and short sleep duration (defined as less than seven hours, rather than the usual 6.5 hours, in this study) among Hispanics (Alcántara et al., 2017).

Like the literature connecting acculturation to unhealthy weight, emerging literature connecting acculturation to sleep disturbances suffers from several limitations. First, while the literature suggests that sleep issues are a result of higher acculturation rates in Hispanics—broadly echoing Hale and Do (2007) who found that racial minorities in general are more likely to have sleep problems— little research has been conducted on subgroups like Salvadorians, Hondurans, and Guatemalans (Loredo, Soler, Bardwell, Ancoli-Israel, Dimsdale, & Palinkas, 2010). Second, inconsistency across studies has been noted. For instance, Ram, Seirawan, Kumar, and Clark (2010) found that Hispanics were less likely to have sleep problems compared to the Black participants in their study. Strine and Chapman (2005) found that Hispanics had less sleep complaints than non-Hispanic Whites. Third, there is a critical absence of research on adolescent immigrants. To our knowledge, only two studies on adolescent Hispanics have been conducted. While one study found no significant difference in sleep between race or ethnicity among European American, African American, and Mexican American participants (Roberts,

Roberts, & Chan 2006), another study found that adolescents who identified themselves as

Mexican rather than Mexican-American were at lower risk for insomnia (according to symptom

criteria; Roberts, Sul Lee, Hernandez, & Solari, 2004).

Current Study

The broad aim of this study was to address existing gaps in the aforementioned literatures

by providing descriptive data on acculturation, obesity, and one aspect of sleep disturbance,

decreased sleep duration, among Latinos. These limitations include absence of data on

adolescents from El Salvador, Guatemala, and Honduras. Existing literature has predominantly

focused on Mexican immigrants, Mexican-Americans, and Puerto Ricans. Published research

includes predominantly adult samples with little representation of adolescent samples. Moreover,

existing adolescent data has been published by few research groups. Finally, aforementioned

studies often link acculturation to negative health outcomes without considering the role of

acculturative stress – defined as the psychological and social stress experienced due to cultural

adaptation (Berry, Kim, Minde & Mok, 1987) and construed as being a "pervasive, intense, and

lifelong" (Smart & Smart, 1995, p. 25). Indeed, acculturative stress is rarely measured directly

and therefore it is not possible to parse out the risk for obesity and sleep disturbance conferred by

acculturation alone—for instance growing accustomed to unhealthy diet habits common in the

U.S.— versus acculturative stress. The latter is a significant gap in the available literature given

that acculturative stress is hypothesized to have deleterious effects on the entire body system

because it poses a "weathering" effect in which immigrants are repeatedly faced with a chronic

stressor (Maldonado et al., 2017). Thus, we aimed to test the hypothesis that acculturation and

acculturative stress act as independent predictors of increased BMI and decreased sleep in a

sample of recently immigrated Central American adolescents. This study is among the few to

examine links between acculturation and acculturative stress and health outcomes in Central

American adolescents.

Methods

Participants

Data for this study was obtained through an ongoing, longitudinal study (Author self-

citation). Participants were recruited from a public high school for recently immigrated

adolescents in the Southwestern U.S. The school's student body is primarily Hispanic (92%); the

overwhelming majority of students are English Language Learners (93%) and receive Free and

Reduced Price Lunch (78%); a minority of students earn satisfactory marks on the annual

reading (i.e., 11.4% were rated as "approaches grade level on STAAR," State of Texas

Assessments of Academic Readiness, in 2018) and math (7.5% were rated as "masters grade

level on STAAR" in 2018) benchmark exams. Approximately 300 students (entire school

enrollment) were invited to participate in the study. Students ($n = 109$) returned signed informed

consent by their legal guardian; however, 47 students either did not provide assent, were not

from Central American countries, or failed to provide data for the main study outcomes. Thus,

the present analyses included 62 recently immigrated adolescents from Central America in

grades 9-12. The average age of the youth was 19 ($SD = 2$). Participants self-reported

demographics: age ranged between 16 and 15, 24 (38.7%) indicated their gender as female and

38 (61.3%) indicated male; 51 (82.3%) indicated that their first language was Spanish; the modal

number of years residing in the U.S. was 2 (and ranged between less than one year and eleven

years); El Salvador ($n = 14$, 22.5%), Honduras ($n = 9$, 14.5%), and Guatemala ($n = 24$, 38.7%)

were the most common countries of origin with 47 (75.7%) from these three countries.

Measures

Sleep & Weight. A demographic form contained three relevant questions answered via self-report: how many hours do you sleep per night; how much do you weigh; and how tall are you? Data from the latter two were used to compute Body Mass Index (BMI)—a method used to categorize people into weight categories of overweight, obese, or healthy weight (CDC, 2017). BMI between 18.5 and 25 falls within the normal weight range, between 25 and 30 falls within the overweight range, and 30 or higher falls within the obese range (CDC, 2017).

Acculturation. Acculturation was measured using the Short Acculturation Scale (Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987). It is a 12-item measure that includes questions like: "In general, what language(s) do you read and speak?" "In what language(s) are the T.V. programs you usually watch?" and "You prefer going to social gatherings/parties at which the people are," with response options ranging from "All My Culture" to "All Americans." Items are summed to produce subscale scores for Language, Media, and Social Acculturation as well as a total score where higher scores indicate greater acculturation to the U.S. In the current study, Cronbach's alpha for the total scale was .74 with alpha equal to .67, .63, and .64 for the Language, Media, and Social subscales.

Acculturative Stress. Acculturative stress was measured using the Societal, Attitudinal, Familial, and Environmental Acculturative Stress Scale for Children (SAFE; Chavez et al., 1997). It is a 36-item scale that includes statements such as: "I don't feel at home here in the United States" and "People think I am shy, when I really just have trouble speaking English." Participants are asked to rate how much these statements bother them on a scale of 0 (Doesn't Apply) through 5 (Bothers Me a Lot). This instrument was selected for the current study because it utilizes the items published by Mena, Padilla, and Maldonado (1987) for use with college

students but includes simplifications in wording to reduce the reading level (relevant to the

current participants) made by Chavez et al. (1997), who also demonstrated adequate

psychometric performance in children ages 8 to 10. Per published instructions, all items are

summed for a total score. In the current study, Cronbach's alpha for this scale was .91.

Procedures

Institutional Review Board and school district approvals were sought prior to data

collection. A Certificate of Confidentiality from the National Institutes of Health was also

obtained. Informed consent from the adolescents' caregivers was collected followed by assent

from the adolescent. Both adolescents and their guardians were provided documentation in

Spanish and all study procedures were undertaken in Spanish. Adolescents completed surveys in

private with supervision and assistance (e.g., clarification of instructions, assistance in reading if

requested) from the corresponding author and/or bilingual research assistants. Gift cards (totaling

$30 per respondent) were mailed to the respondent's home upon completion of the study.

Data Analysis

Dependent variables were formed utilizing self-reported data and included BMI

(computed from self-reported height and weight) as well as number of hours slept. Following

descriptive, exploratory, and bivariate analyses to characterize the sample and identify relevant

confounds, the main study hypotheses were tested. Whether acculturation and acculturative

stress act as independent predictors of increased BMI and decreased sleep was tested using

regression analyses. Specifically, acculturation and acculturative stress were entered as

predictors in a linear regression model examining sleep continuously and in multinomial

regression utilizing BMI as a categorical outcome, while controlling for relevant confounds.

Results

Descriptive Data

In this sample, BMI ranged from 17.43 to 51.45 with a mean of 26.25 ($SD = 6.75$). Evidence of non-normality was noted, *Shapiro-Wilk* = .85, $p < .01$, and BMI was therefore utilized as a categorical variable in subsequent analyses. Using the aforementioned categorical cutoff scores, 53.2% of respondents were classified as having a healthy BMI, 25.8% as overweight BMI, and 21.0% obese BMI. The reported number of hours slept per night ranged between 3 and 10, with a mean of 6.63 ($SD = 1.53$). No evidence of non-normality in the sleep variable was noted, *Shapiro-Wilk* = .96, $p = .07$. There was no significant gender difference regarding categorical BMI classification (*chi-square* = 6.91, $p = .032$) or continuously reported sleep ($t = -.61$, $p = .547$).

Mean levels of acculturation, where higher scores indicate greater acculturation to the U.S., were as follows: Total 28.07 ($SD = 6.13$; possible range = 12-60), Language 9.05, ($SD = 2.94$, possible range = 5-25), Media 9.72 ($SD = 2.85$, possible range = 3-15), and Social 9.39 ($SD = 2.55$, possible range = 4-20). The mean total acculturative stress score, where higher scores indicate greater acculturative stress, was 76.70 ($SD = 29.80$, possible range = 0-180). The correlation between acculturative stress and total acculturation was non-significant ($r = .078$, $p = .559$). Gender effects were not noted with regard to acculturative stress ($t = -1.70$, $p = .094$). However, males endorsed higher scores on both Total acculturation ($t = 2.77$, $p = .007$) and Language acculturation ($t = 2.95$, $p = .005$).

Relations between BMI, number of hours slept per night, acculturation, and acculturative stress are reported in Table 1. Only one significant correlation was noted—decreased sleep was

associated with increased language acculturation (i.e., greater use of English in social and

cultural activities).

Table 1

Relations between BMI, number of hours slept per night, acculturation, and acculturative stress

	Sleep Per Night r (p)	BMI Categories M (SD)			
	Hours	Healthy	Overweight	Obese	F (p)
Acculturation Total	-.219 (.090)	27.84 (5.89)	29.69 (6.26)	26.61 (6.60)	.94 (.40)
Acculturation: Language	-.254* (.048)	8.87 (3.13)	9.13 (2.99)	9.38 (2.57)	.14 (.87)
Acculturation: Media	-.193 (.133)	9.70 (2.54)	10.50 (2.58)	8.85 (3.76)	1.22 (.30)
Acculturation: Social	-.019 (.884)	9.45 (2.43)	10.06 (2.69)	8.38 (2.567)	1.61 (.21)
Acculturative Stress Total	-.190 (.145)	82.71 (30.62)	67.75 (25.27)	73.38 (31.82)	1.45 (.24)

Notes. ANOVA analyses examining relations between BMI categories and

acculturation/acculturative stress variables provided no evidence of significant group differences

(F = .94-1.61, p = .21-.87).

Multivariate Relations

In order to test the hypothesis that acculturation and acculturative stress act as independent predictors of increased BMI and decreased sleep, while controlling for the effect of gender, two regression models were conducted. First, a multinomial logistic regression was conducted with BMI (categorical) serving as the outcome variable, gender entered as a factor, and acculturative stress, language acculturation, media acculturation, and social acculturation entered as continuous predictors. No evidence of collinearity was noted, with a tolerance value exceeding .10 and a variance inflation factor less than 10 for all variables. No significant main effects of acculturation or acculturative stress were noted, with the only significant effect being one of gender; males were more likely overweight than healthy weight ($B = 2.09$, $SE = .929$, $p = .025$). Results are reported in Table 2.

Second, a hierarchical linear regression model was conducted with hours slept per night (continuous) serving as the outcome variable, gender entered in Step 1, and acculturation and acculturative stress variables entered at Step 2. No evidence of collinearity was noted, with a tolerance value exceeding .10 and a variance inflation factor less than 10 for all variables. The variables entered in Step 2 did not significantly contribute to the predictive power of the model (R^2 *change* = .10, *F change* = 1.51, $p = .213$) and, further, no significant relations were noted between predictors and sleep ($p = .134$ to .724). Results are reported in Table 3.

Table 2

Results of multinomial regression predicting BMI classification from acculturation and

acculturative stress variables

BMI Category	Predictor	B	Std. Error	*p*	Exp(B)
Overweight v. Healthy Weight	Intercept	-2.24	2.12	0.292	
	Acculturation: Language	-0.19	0.15	0.198	0.83
	Acculturation: Media	0.13	0.14	0.355	1.14
	Acculturation: Social	0.17	0.16	0.28	1.19
	Acculturative Stress	-0.01	0.01	0.265	0.99
	Male Gender	2.09	0.93	0.025	8.08
Obese v. Healthy Weight	Intercept	0.95	1.67	0.57	
	Acculturation: Language	0.13	0.15	0.386	1.14
	Acculturation: Media	-0.15	0.14	0.275	0.86
	Acculturation: Social	-0.16	0.15	0.29	0.86
	Acculturative Stress	-0.01	0.01	0.582	0.99
	Male Gender	0.56	0.76	0.464	1.75

Table 3

Results of linear regression predicting hours of sleep from acculturation/acculturative stress

Model	Predictor	*B*	*Std. Error*	*Beta*	*t*	*p*
Step 1	(Constant)	6.21	0.61		10.24	<.01
	Gender	0.27	0.41	0.09	0.65	0.519
Step 2	(Constant)	8.19	1.32		6.20	<.01
	Gender	0.16	0.45	0.05	0.36	0.724
	Acculturation: Language	-0.11	0.08	-0.21	-1.37	0.176
	Acculturation: Media	-0.04	0.08	-0.08	-0.54	0.594
	Acculturation: Social	0.04	0.08	0.07	0.49	0.625
	Acculturative Stress	-0.01	0.01	-0.21	-1.52	0.134

Discussion

The current study aimed to expand on the existing literature linking acculturation to obesity and sleep difficulties in Latinos. We sought to examine acculturation and acculturative stress as predictors of increased BMI and decreased sleep in adolescents primarily from Honduras, El Salvador, and Guatemala, a group that is highly underrepresented in the current literature. Descriptive data from this study indicated that 25.8% of participants were classified as overweight and 21.0% were classified as obese according to BMI. This rate of obese status is elevated compared to prior research in adults; Kaplan et al. (2004) reported an obesity rate of 9.4% for Hispanic immigrants living in the U.S. between 0 and 5 years, Kaplan et al. (2004) and Kaushal (2009) reported an obesity rate of 18% among foreign-born Hispanics living in the U.S. The elevation in obesity in our study may be due to younger age at immigration in our sample, as

compared with the adult research previously published (Kaplan, Huguet, Newsom, & McFarland, 2004; Kaushal, 2009)—indeed Kaushal (2009) reported that rates of obesity increased for immigrants who reported arriving in the U.S. at younger ages (i.e., before they turned 22). The rate of overweight status in our study, however, was lower than what would be expected from extant research with adults (52%; Kaushal, 2009). Descriptive data on sleep, in our sample, indicated that the number of hours slept per night ranged between 3 and 10, with a mean of 6.63 (SD = 1.53). This mean is somewhat lower than the mean sleep duration reported in prior research— 7.89 hours among Mexican adults (Hale & Rivero-Fuentes, 2011).

At the bivariate level, a significant, negative correlation was found between language acculturation, operationalized in this study as greater use of English in social and cultural activities, and decreased sleep. Specifically, this finding indicates that adapting to speaking the host country's language (i.e., English) is associated with fewer hours of sleep per night. It is important to note that the bivariate relation between increased language acculturation and decreased sleep was found in a sample of adolescents who may also experience reduced sleep duration associated with their developmental stage. The fact that the relation between language acculturation and decreased sleep duration was detected in an adolescent sample indicates that decreased sleep duration, in our sample, is not simply a feature of adolescence, but also related to increasing language acculturation within adolescents. This finding is consistent with previous literature linking acculturation, in general, to sleep disturbances, including the only study on sleep and acculturation conducted with Central American adolescents (Roberts, Roberts, & Chen, 2000) and research conducted with adults (Alcántara et al., 2017). While this bivariate result, taken together with prior research, suggests sleep problems are associated with increasing

language acculturation, they should be interpreted with caution given that similar relations were

not observed in multivariate analyses or in other domains of acculturation.

In contrast to previous research, the current study did not find evidence of a significant

link between acculturation or acculturative stress and BMI. This study then contributes,

preliminarily, to the literature suggesting that the link between acculturation and unhealthy

weight might differ across different immigrant groups. While much of the literature on this topic

demonstrates a link between acculturation and weight, most of that research focuses on Mexican

participants (Lara et al., 2005; Pérez-Escamilla et al., 2007). Mexico, in contrast to El Salvador,

Guatemala, Honduras, and other countries in Central America, reports very high rates of obesity

and overweight adults (32.4% of the adult population; OECD, 2017). Indeed, research on other

demographic groups has not identified the same association (e.g., Khan et al. 1997). Although

Bertera et al. (2003) did identify a link between acculturation and obesity amongst Salvadorian

participants, it is important to note that two-fifths of the 1205 sample had been living in the U.S.

up to 5-10 years. The current study, however, included participants who most commonly

reported being in the U.S. only 2 years and thus, it could be that less exposure to U.S. dietary

customs across the whole sample (and therefore a sort of restriction of range regarding dietary

acculturation to the U.S.) obscured relations identified in previous research. Indeed, in the U.S.,

38.2% of the population is obese or overweight, representing rates just slightly higher than those

in Mexico (OECD, 2017). Further, the current study also included Honduran and Guatemalan

participants, as opposed to Bertera et al. (2003). These sample differences may explain why our

findings were not consistent with the overall literature and, further, provide preliminary evidence

that Central American youth migrants may not face the same public health adversities as

previously studied groups. Further, the current study identified a relation between BMI and

gender in which immigrant males were more likely to be overweight than healthy weight. This finding suggests that future research exploring health risks in recent immigrants may need to take a possible gender effect into account, should such an effect be replicated in a larger sample. Indeed, gender may serve to moderate health risks, though no evidence of a three-way interaction was detected in this sample, perhaps due to limits in statistical power.

The current study is, of course, not without limitations. First, while our sample is a positive contribution to a literature base that has largely omitted recently immigrated Central American youth, it is modest and requires replication. Further, students self-selected into the study and, therefore, participants in this study may differ systematically from those who chose not to participate but attend the same school. Secondly, both weight and height were obtained through self-report and that information was then used to compute BMI. This methodological limitation may be problematic because of the potential for responder bias and error. This potential may be particularly profound given that most participants in this study recently immigrated from poverty and felt forced to flee their homes due to this poverty or regional violence. Their backgrounds may have therefore resulted in limited access to health care physicians, leaving them without accurate knowledge of their height and weight and instead resorting to rough estimations for both metrics. In addition, acculturation and acculturative stress were also measured through self-report measures based on a single informant and future research may wish to include caregiver or teacher reports and examine these constructs longitudinally, as the concurrent data utilized in this study cannot address causal links between key study variables.

Despite these limitations, the current study makes an important first step towards examining links between acculturation and health in this population and identifying areas for needed future research. Indeed, short sleep duration has been associated with a number of health

problems including obesity, heart disease, hypertension, and death (Loredo et al., 2010) in the general population, as well as with chronic stress in the Hispanic population (Alcántara et al., 2017), underscoring the importance of the current study's finding that increased language acculturation was associated with decreased sleep duration. Given the rapid growth in Central American youth migrants that has been reported since 2015 and continues today, identifying psychosocial factors related to decreased sleep duration and, with additional research, targeting decreased sleep duration utilizing evidence based treatments including sleep hygiene techniques and cognitive behavioral interventions for insomnia may prove important components of improving public health. Still, most of the literature linking acculturation amongst Latinos to increased health risks focuses on specific subgroups leaving out those who are from or descendants of Honduras, El Salvador, and Guatemala. While language is a common factor found amongst most Latino countries, cultures vary. Future research may wish to unpack more nuanced links within the broad topic of adolescent Latino health behaviors by tracking how within group differences (e.g., endorsement of Latino cultural values) change post-migration for adolescents and relate to potential changes in health behaviors. Indeed, the second broad area of future research should focus on the mechanism by which immigrants are placed at risk of increasing BMI and decreasing sleep quality in order to identify malleable treatment targets. Finally, in light of the preliminary nature of this report, future research should replicate findings in a large sample and utilize multi-informant approaches that improve upon our limitations.

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