

Physical Activity, Screen Time, and Obesity: A Statistical Inquiry into Latina/o Youth

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Abstract

Background and Purpose: Overweight and obesity have been identified by the World Health Organization as a global epidemic and disproportionately affects minority populations in the United States. This study explored cross-sectional associations with TV viewing, physical activity, video game playing, gender, and Latina/o ethnicity with Body Mass Index (BMI). **Methods:** Data from the 2011 Youth Risk Behavior Surveillance System (YRBSS) were utilized ($N=15,503$). **Results:** Time spent in physical activity, watching television, playing video games, male gender, and Latina/o ethnicity status were all significantly associated with increased risk of overweight and obesity, but age was not. There was also a significant interaction effect in which above-median levels of physical activity had a stronger relationship with lower overweight/obesity rates among non-Latinos compared to Latinos. **Conclusion:** Our findings support previous findings regarding well-known correlates of overweight and obesity. The significant interaction effects suggest that the relationships of these correlates are nuanced, and future interventions may be more effective if demographic-specific relationships between correlates and obesity-related outcomes are considered.

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Keywords: screen time, physical activity, Latino, obesity, BMI, gender

Introduction

Obesity has been identified by the World Health Organization as a global epidemic, and this issue is particularly prevalent in economically developed countries (Rauner, Mess, & Woll, 2013). In the United States, obesity is a rising problem among children. The percentage of children 6 to 11 years old identified as obese rose from 7% to almost 18% between 1980 and 2010, while adolescent (12 to 19 years old) obesity rose from 5% to 18% in the same period (Centers for Disease Control [CDC], 2012c). For children, being overweight is defined by the CDC as having a Body Mass Index (BMI) between the 85th and 95th percentile among their peers of the same age and gender. Obesity is defined as having a BMI above the 95th percentile (CDC, 2012c). Numerous health consequences, both short- and long-term, have

been identified for overweight and obese children, including high blood pressure and high cholesterol, increased chance of glucose intolerance, insulin resistance or type II Diabetes, breathing, joint, and liver problems, social-emotional problems, and an increased likelihood of obesity in adulthood (CDC, 2012c).

Obesity and Latina/o Ethnicity

The obesity epidemic has been found to disproportionately affect minority populations in the United States, including Latina/o-Americans (Kumanyika, 2008). Mexican-American males under the age of 20 have been identified as having the highest propensity towards obesity when compared to non-Hispanic White and non-Hispanic Black male youth (CDC, 2012b). Latina/o children also experience disproportionately higher levels of being

overweight and obese as compared to non-Latina/o White children (Gao, Hannan, Xiang, Stodden, & Valdez, 2013). This elevated risk may be related to an increasingly high-calorie diet among Latina/o immigrants and their children as the time they spend in the United States increases, which correlates with increasing use of high-calorie and sweetened food and beverages (Drieling et al., 2014).

Physical Activity

Physical activity (PA) helps control body weight and is associated with a reduction of weight-related health risks (Layne, Mama, Banda, & Lee, 2011). Adequate PA is important, as fitness levels are inversely related to body weight (Kohl & Cook, 2013). Minority youth are disproportionately affected by obesity (Ogden, Carroll, Kit, & Flegal, 2014). A large study showed PA levels significantly declined among youth between 2003-2006 with, females (ages 6-19) and older youth experiencing the greatest levels of PA decline and increases in sedentary activity (Belcher et al., 2010).

Physical education has been found to be essential in providing Latina/o children, especially girls, with access to physical activity opportunities. Without access to in-school physical education, girls are at an increased risk of being sedentary (Dauenhauer & Keating, 2011). Rauner, Mess, and Woll (2013) suggest that a limited number of studies examine relationships between physical activity, physical fitness, and obesity. This indicates a need for more research to further explore the interrelationship between these factors in order to better inform public health policy decisions. Students get much of their physical activity during school hours. However, the trend in diminishing opportunities for students to be active in school is strikingly obvious. The U.S. Department of Health and Human Services' recommendation of 60 minutes of physical activity a day for young people aged 6 to 17 has been widely ignored (Physical Activity Guidelines Advisory Committee, 2008). Only 29% of high school students surveyed in a nationally representative sample actually participated in 60 minutes of physical activity per day (CDC, 2012d). In this sample, only 31%

attended physical education class daily. Furthermore, half of U.S. students do not receive physical education in an average week (NASPE, 2012). Latina/o students, in particular, are more likely to attend under-resourced schools and not have equitable access to sports and physical education (Eskenazi, Eddins, & Beam, 2003).

Electronic Media Usage and Obesity

Past research has demonstrated an association between electronic media usage and obesity (Danner, 2008). Although the exact causal mechanisms are not clear, researchers have developed a "couch-potato" hypothesis" (Vandewater, Shim, & Caplovitz, 2004, p.72) in which electronic media use (i.e., games and social media on smart phones, tablets, and computers) displaces physical activity, leads to an increase in snacking, increases exposure to advertisements for densely caloric foods, and possibly even decreases metabolism more than sitting or sleeping. In addition, interaction effects between gender and electronic game usage on weight have been documented, although it is unclear whether an increase in electronic game usage leads to a linear increase in weight for girls (but not boys) or whether an increase in girls' weight leads to social isolation for girls and, therefore, a linear increase in girls' electronic game usage (Vandewater, Shim, & Caplovitz, 2004). Although the cause is unclear, youth are spending more time in front of TVs and computers. Over 31% of youth spend three or more hours a day on the computer not related to school work and 32.4% of students watch television for more than three hours on an average school day (CDC, 2012d). Between 1999 and 2011, the obesity rate in the U.S. has increased (CDC, 2012d). Yet, there has been limited research that examined Latino/a screen time.

Previous research has focused primarily on how certain behaviors, particularly related to television viewing and physical activity, impacted the odds of becoming overweight or obese for youth (Robinson, 1999; Vandewater, Shim, & Caplovitz, 2004). This study examined the association of a wider range of behaviors on overweight and obesity, including electronic game playing as well as television viewing. To

achieve this, data from the 2011 Youth Risk Behavior Surveillance System (CDC, 2012e) were utilized in order to explore the following questions:

1. What are the relative associations of physical activity, TV viewing, and video game playing on overweight and obesity? Based on the current research we predicted that a sedentary lifestyle (low PA) and higher screen time (higher TV viewing and higher video game playing) would increase the likelihood of obesity and overweight status.

2. Is BMI related to Latina/o ethnicity? Based on the available research (Gao, Hannan, Xiang, Stodden, & Valdez, 2013) we hypothesized that Latina/o ethnicity was directly related to overweight/obesity status.

3. What are the interaction effects of Latino/a ethnicity with physical activity, TV viewing, and video game playing on overweight and obesity? Several studies have examined the effects of PA interventions on Latino youth. Some successful ones utilize multi-level models that involve the community (Crespo et al., 2012). To date, no systematic review of these studies has been conducted. More research is needed to determine the impacts of PA on BMI and to examine variance by ethnicity.

Methods

Source of Data

We accessed the cross-sectional YRBSS 2011 data set to answer our research questions. The Youth Risk Behavior Surveillance System (YRBSS) was established by the CDC in 1990 to monitor youth behaviors that most influence health (CDC, 2012a). The YRBSS monitors health-risk behaviors, such as physical inactivity, unhealthy dietary behaviors, and substance use, which contribute to the leading causes of death and disability among youth and adults (CDC, 2013). The YRBSS also measures the prevalence of obesity in youth. The main goal of the YRBSS is to measure progress toward the *Healthy People 2020* objectives. The national Youth Risk Behavior Survey (YRBS) is the main instrument used by the YRBSS, which uses a three-stage cluster design to produce a

representative sample of 9th through 12th graders (CDC, 2012d). The population included public, Catholic, and private schools in the 50 states and the District of Columbia. Questionnaires (n = 15,503) were completed in 158 schools. There were 15,425 usable questionnaires with a school response rate of 81% and an overall response rate of 71% (CDC, 2012d).

Measures

Three behavioral questions and two demographic questions were used as independent variables. The behavioral questions were: "During the past 7 days, how many days were you physically active for a total of at least 60 minutes per day?" (n = 15,048); "On an average school day, how many hours do you watch TV?" (n = 15,010); "On an average school day, how many hours do you play video or computer games or use a computer for something that is not schoolwork?" (n = 14,997). Participants could respond that they had been physically active for 0-7 of the past 7 days. For the questions about screen time, participants could answer "never", "less than one hour", "1-4 hours", or "more than 5 hours." The demographic questions asked students to report whether they are male or female (n = 15,364), and if they identified as Hispanic or Latina/o (n = 15,179).

BMI (kg/m^2) was calculated based on self-reported height and weight and reported as a continuous age and sex-adjusted percentage between 0 and 100 with a mean of 63% in this sample. Being overweight was defined as between 85% and 95% and obese as greater than 95% (CDC, 2012d).

Data Analysis

We compared normal weight and overweight/obese participants on the following correlates: (a) physical activity; (b) TV Viewing time; (c) Game Time; and (d) Age, using ANOVA F-ratios, and chi-square statistics for (e) Grade, (f) Gender, and (g) Latino/a ethnicity. Descriptive statistics for these analyses are presented in Table 1. Next logistic regression models were run to predict overweight/obesity status, with each correlates as predictor variables.

Table 1

Descriptive Statistics of the Analytic Sample (n= 14,285)

	Normal Weight Mean (SD) N= 10,069	Overweight/Obese Mean (SD) N= 4,216	F	p
Physical Activity ^a	4.04 (2.54)	3.79 (2.51)	27.25	.001
TV Viewing ^b	2.04 (1.46)	2.27 (1.52)	75.23	.001
Game Time ^b	1.98 (1.54)	2.07 (1.60)	8.29	.004
Age	16.13 (1.21)	16.09 (1.23)	1.94	.163
	n (column %)	n (column %)	χ^2	p
Grade in School				
9 th	2,359 (23.5)	1,085 (25.8)	12.72	.013
10 th	2,460 (24.5)	972 (23.2)		
11 th	2,740 (27.3)	1,130 (26.9)		
12 th	2,479 (27.3)	1,006 (24.0)		
Males	4,804 (47.7)	2317 (55.0)	62.42	.001
Females	5,265 (52.3)	1899 (45.0)		
Latino Ethnicity	2,863 (28.8)	1,375 (33.0)	24.87	.001
Non-Latino Ethnicity	7,095 (71.2)	2,796 (67.0)		

Notes: ^a number of days per week. ^b hours per day.

Table 2

Effect of Physical Activity, TV Viewing, Gender, and Latina/o ethnicity on Odds of being Overweight or Obese

	AOR	95% C.I.	p
Physical Activity	.951	.936-.965	.0001
TV Viewing	1.107	1.079-1.136	.0001
Game Time	.992	.968-1.017	.517
Grade in School	.957	.925-.989	.010
Female Gender	.694	.643-.750	.0001
Latina/o Ethnicity	1.200	1.107-1.300	.0001

Adjusted odds ratios (AORs), along with their 95% confidence intervals, are presented in Table 2. Last, we included the hypothesized Latino

ethnicity x independent variable interaction terms in the models to determine their significance.

Results

A total of 30.5% of respondents identified as Hispanic or Latina/o. The average age of participants was 16.1 years old (ranging in age from 12 or younger to 18 or older), and the average grade level was 10th (ranging from 9-12). Of the participants, 29.5% had a calculated BMI percentile that would classify them as overweight/obese. Females consisted of 50.15% of the sample size. Table 1 presents descriptive statistics on the correlate variables, stratified by obesity status. Overweight/obese participants

had significantly fewer days of physical activity ($p < 0.01$), more hours of television viewing ($p < .001$), and spent significantly more hours playing video games ($p = .004$) compared to normal weight participants. There was no significant difference in age between overweight/obese and normal weight students, but there was a significant grade difference, such that overweight and obesity status was slightly more frequent in the lower grades relative to the higher grades ($p = .013$). Males were significantly more obese/overweight than females ($p = .001$), and Latino/as were significantly more obese/overweight than non-Latinos ($p = .001$).

Table 2 presents adjusted odds ratios, along with their 95% confidence intervals and p-values, are presented. We found that physical activity ($p = .0001$), TV viewing ($p = .0001$), grade in school ($p = .010$), female gender ($p = .0001$), and Latina/o ethnicity ($p = .0001$) were all significantly associated with obesity status. Game time ($p = .517$) was no longer related to overweight/obesity status.

Last, interactions of Latino ethnicity with physical activity, TV viewing, and game time on overweight/obesity status were examined. An interaction effect was found such that the effects of physical activity on lower prevalence of overweight/obesity status was not present among Latino students, but was present among non-Latino students (AOR = 1.04, $p = .018$). Specifically, Latino students who had above-median levels of physical activity did not differ from Latino students who had below-median levels of physical activity (32.7% vs. 32.3%, respectively). In fact, the opposite would have been expected, where students with above-median levels of physical activity would have slightly lower rates of overweight/obesity. On the other hand, non-Latino students with above-median levels of physical activity had substantially lower rates of overweight/obesity (26.4%) compared to non-Latino students who had below-median levels of physical activity (30.5%).

Discussion

Results from this study suggest that more screen time increases the odds of youth becoming overweight and obese. Specifically, every additional hour of TV viewing increases the odds of being overweight and obese by over 10%. A prior study using the YRBS argued that TV viewing may be correlated with a dual influence of decreased activity and an increased intake of dense-caloric food while sitting in front of the TV (Eisenmann et al., 2008). It can also be suggested that physical activity inversely affects BMI.

We have also paid specific attention to the Latino/a population, as they are part of a rapidly growing population in the US. These findings also support prior research that shows Latina/o and males at a disproportionately higher risk of being overweight or obese (Kohl & Cook, 2013). Research suggests that Latina/o students are 21.1% more likely to be overweight or obese than their non-Latino/a counterparts; more innovative solutions are needed in this underserved population. The YRBS does not include questions on family SES, so further research is necessary for determining the relationships among SES, Latina/o ethnicity, and overweight/obesity status among youth. Drieling and colleagues (2014) suggest that community resources tailored to this population, focusing particularly on acculturation and mental health needs, may help in combating obesity in Latina/o populations.

There is evidence to suggest that days of physical activity, hours of television watching, hours of game time, gender, and Latina/o ethnicity status currently predict weight outcomes. Because the YRBS asked only about electronic media usage on school days, and “[t]ime-use for both children and adults is known to differ widely on weekdays versus weekends” (Vandewater, Shim, & Caplovitz, 2004), further research should be conducted using more accurate descriptions of students’ screen time throughout the week. Although there has been prior research documenting the effects of inactivity in overweight status among

children (Kohl & Cook, 2013). It is especially important to continue examining associations between sedentary activity and overweight/obesity status among Latinos and Latinas, as the prevalence of computers and internet access in Latina/o communities has almost become even with the White population (van Meijgaard, Shi, & Simon, 2013).

It was interesting to find that Latino students who had above median-levels of PA did not differ from Latino students who had below-median levels of PA on obesity/overweight status. Conversely, this was true in non-Latino populations. This may lead us to consider the sociocultural aspect of obesity. Physical activity alone may not be enough to combat a diet that is driven by sociocultural factors of access, traditions, and resources, which can drive the prevalence of childhood obesity (Kaufman & Karpati, 2007).

The authors believe that research and policy centered on Latina/o communities may be the best strategy to reach this population, and to buck the trend of increasing screen time and sedentary behavior. A notable large-scale study called the Stanford GOALS—a 3 year, multi-component, multi-setting intervention being implemented in a community with a large Latina/o population—aims to reduce BMI and sedentary behaviors, specifically targeting screen time (Robinson et al., 2013). This approach aims to move treatment from a medical care setting into the community, and we are eagerly awaiting the results of this trial.

The data from the final model show that there is a relationship between being overweight or obese and the amount of TV viewing, gender, physical activity, and Latina/o ethnicity. Results align with previous research where students who are less physically active are more likely to be overweight or obese and that students on the higher end of the BMI spectrum tended to be more sedentary and less physically active (Wrotniak et al., 2006). It is important to reiterate the potential lack of reliability and validity of the BMI instrument in measuring body composition (Macdonald, 2011).

Nevertheless, BMI is very cost effective and practical to calculate in large surveys such as the YRBS to determine if students are overweight or obese.

Limitations

It is important to discuss briefly the controversy surrounding the use of BMI measurement to determine overweight or obesity status. Macdonald (2011) recognizes that BMI is highly contested as a valid individual measure representing a student's achievement of a healthy body mass. One can easily pull up a picture of a person online who is muscular, large in body mass, but with a low percentage of body fat, but who may still be considered obese according to the BMI chart. BMI does not take into consideration individual differences such as muscle mass. Furthermore, it is important to note that weight and height in the YRBS were self-reported (CDC, 2012d); therefore, the reliability of these measures can be questioned. In addition, there are limitations to how physical activity was measured for the YRBS. This study also reports on analyses performed on data from the 2011 YRBS. Although this is a recent sample, patterns of behavior might shift among young people with respect to physical activity and screen time, so future research should follow up with YRBS data from future years. One such behavior pattern that might have shifted is the growing prevalence of active gaming with devices such as the Nintendo Wii. Studies have shown that exergaming with devices such as the Wii can get students more active and help in weight loss (Staiano, Abraham, & Calvert, 2013).

In addition, the YRBSS is a cross-sectional study rather than a longitudinal study. As a result, as noted earlier, it is difficult to establish causality from this study. This study, in the context of existing research on this topic, shows that screen time and sedentary behavior increase the likelihood of being overweight or obese among youth. However, it is possible that young people who are already overweight or obese are less likely to engage in physical activity or more likely to spend time in front of screens. Longitudinal research would establish whether youth became overweight or obese before or

after decreasing physical activity or increasing screen time. Future research using randomized control trials would also most effectively establish whether increasing physical activity or decreasing screen time impacted the odds of youth becoming overweight or obese.

The reality is that the current generation is embedded with technology. Increasing PA levels in youth can come with the addition of more technology, not less. Current research by some of the authors in this paper use web based applications and accelerometers to track students' movement and educates students on making healthy lifestyle choices by teaching them fitness activities that are easy to employ at home and outside of school. By embracing technology and providing a safe place for minority students in urban areas to be able to be physically active during non-school hours, we are able to help increase PA levels and educate students through technology rather than fighting against it.

Conclusion

Future research should include more intervention studies that impact young people's physical activity levels and sedentary lifestyles and habits, including screen time. Future intervention studies should be targeting students in under-resourced communities and provide additional opportunities for youth to be physically active both in and out of school in a safe environment. Furthermore, exploring how to get young females, especially Latinas, active could improve many health factors necessary for lifelong wellness. This research adds to the existing body of literature, indicating a link between high BMI and a sedentary lifestyle. Additional research is needed to determine the effects of these behaviors at the intersection of gender and Latina/o ethnicity. We are now in the age of action research and public health policy needs to move forward in order to improve young people's health.

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