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Being obese versus trying to lose weight: Relationship with physical inactivity and soda drinking among high school students

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Abstract

BACKGROUND—Among adolescents, physical inactivity and unhealthy dietary habits are associated with being obese. We know little about how those are associated with trying to lose weight.

METHODS—We analyzed the 2013 Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Surveillance data (N = 13,583) to examine how obesity and trying to lose weight are associated with: (1) <5 physically active days per week with 60 minutes physical activity; (2) playing with video computer games 3 hours per day on average; (3) no participation in any sports team in the past year; and (4) drinking soda 2 times per day. We applied survey logistic regression adjusting for age and Hispanic ethnicity, stratified by sex.

RESULTS—Both being obese (13.7%) and trying to lose weight (47.7%) are significantly associated with physical inactivity. Soda drinking was associated with being obese (odds ratio [OR] = 1.34, p = .003 for boys and OR = 1.36, p = .014 for girls); it was inversely associated trying to lose weight among girls (OR = 0.72, p < .001) but not among boys (OR = 1.13, p = .174).

CONCLUSION—Obesity was associated with physical inactivity and drinking soda in both sexes. Only girls appeared to avoid drinking soda as a strategy for losing weight. Trying to lose weight was associated with a higher likelihood of physically inactive behaviors both sexes. High schools need to develop collaborative strategies for reducing adolescent obesity and supporting students who are trying to lose weight that address physical inactivity and soda intake.

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Human Subjects Approval Statement

As this study used publicly available data, IRB approval was not required.

Conflict of Interest

We have none to declare.

Keywords

YRBS; adolescent health; obesity; dieting; physical inactivity; soda consumption

Adolescent obesity has increased over the past few decades.¹ As adolescent obesity has detrimental effects on health outcomes,² and diverse mental and clinical conditions increase during adolescence and adulthood,³⁻⁵ efforts to control weight during adolescence are important.^{6,7} The cause of adolescent obesity is associated with a variety of unhealthy lifestyle factors⁸ in addition to familial or genetic factors.^{9,10} Adolescent obesity-promoting lifestyles include physical inactivity and unhealthy dietary practices, such as soda drinking.^{11,12}

Individuals who try to lose weight would want to change unhealthy lifestyles through decreasing energy or calorie intake by reduced diets and increasing energy expenditure by physical activities and exercises. Although motivations underlying trying to lose weight may be diverse, so are weight-control strategies or practices including use of diet pills, commercial weight control programs, surgical procedures, and other strategies; many studies show that two strategies, diet and physical activity/exercise, are mostly adopted by persons trying to lose weight.¹³⁻¹⁸ Losing weight per se might have beneficial effects on health outcome.¹⁹

We know little as to whether increasing physical activity and changing an unhealthy diet is associated with trying to lose weight among high school students. Using a nationally representative sample of US high school students, we examine two primary hypotheses: (1) Being obese is associated with greater physical inactivity and soda drinking among high school students regardless of sex; and (2) Trying to lose weight is associated with less physical inactivity and less soda drinking regardless of sex. A secondary aim is to test if these potential associations differ for obese and nonobese youth.

METHODS

Data Source

We used the nationally representative US Centers for Disease Control and Prevention's (CDC) Youth Risk Behavior Survey (YRBS) compiled in 2013.²⁰ The CDC conducts the YRBS biennially, using a multi-level survey sampling design, as a cross-sectional school-based national survey of representative samples of high school students on six types of youth health-risk behaviors (<https://www.cdc.gov/healthyyouth/data/yrbs/data.htm>). The YRBS items have established validity and reliability.²¹

Participants

Overall, the CDC sampled 193 US high schools from 50 states and the District of Columbia in the 2013 survey. A total of 13,583 high school students (9th to 12th grade) responded to the survey. After removing 12 participants with missing sex-identification information, our sample included 13,571 participants (6950 boys and 6621 girls) for the analytic sample.

Outcome Definitions

First, “being obese” or obesity was defined following the CDC criteria, that is, sex-age-specific body mass index percentile ≥ 95 . Second, we classified participants as “trying to lose weight,” if the participants selected the response option “lose weight” to the questionnaire item: “Which of the following are you trying to do about your weight?”

Predictor Variables

Physical inactivity YRBS-calculated variables included the following three items: (1) 5 or fewer physically active days per week with at least 1 hour physical activity; (2) play with video computer games ≤ 3 hours per day on average school day; and (3) no participation in any sports team in the past year. Soda drinking was defined as ≥ 2 times per day intake of a can, bottle, or glass of soda or pop.

Covariates

We included age and Hispanic ethnicity as adjusting covariates.

Data Analysis

We calculated descriptive statistics for mean and standard deviation (SD) and percentages and 95% confidence intervals (95% confidence interval [CI]) based on survey mean and frequency analysis that consider complex multi-level survey sampling design parameters by applying appropriate sampling weights following the YRBS analytic guideline (https://www.cdc.gov/healthyouth/data/yrbs/pdf/2015/2015_YRBS_analysis_software.pdf). Similarly, we applied survey logistic regression to bivariate analyses followed by multivariable analysis adjusting for age and Hispanic ethnicity stratified by sex for each combination of outcomes and predictor variables of physical inactivity and soda drinking. To test if association between trying to lose weight and each predictor differed between obese and non-obese youth, we included the interaction term between obesity and each predictor in the models. Statistical significance was set at $p < .05$. We used SAS v9.4 (Cary, NC) for all analyses.

RESULTS

Descriptive Statistics

Table 1 shows relevant descriptive statistics. The estimate for obesity prevalence was 16.5% (95% CI 14.8%, 18.3%) for boys and 10.8% (95% CI 9.7%, 12.0%) for girls. Percentages of trying to lose weight were 33.0% (95% CI 31.1%, 34.9%) for boys and 62.6% (95% CI 60.5%, 64.6%) for girls.

Bivariate Analysis

The association between being obese and trying to lose weight was statistically significant: odds ratio (OR) = 7.4 (95% CI 5.9, 9.3), $p < .001$ for boys; and OR = 8.3 (95% CI 5.6, 12.4), $p < .001$ for girls. Regardless of sex, being obese was significantly associated with all three physical inactivity items and soda drinking (Table 2). Trying to lose weight also was significantly associated with all physical activity/inactivity items for boys and girls (Table

3). Trying to lose weight was not significantly associated with soda drinking for boys but was inversely associated for girls (Table 3). The patterns of association in Table 2 are consistent in general between obese and non-obese students; no interaction effect between obesity and each predictor on the trying to lose outcome was statistically significant, regardless of sex (data not shown).

Multivariable Analysis

Even after adjusting for age and Hispanic ethnicity, the bivariate analysis results remained unchanged in terms of direction and statistical significance (Tables 2 and 3). For example, association between soda drinking and trying to lose weight remained non-significant for boys (OR = 1.13, $p = .174$), but remained statistically significant in the reversed direction among girls (OR = 0.72, $p < .001$). Again, no interaction effect between obesity and each predictor on the trying to lose outcome was statistically significant, regardless of sex (data not shown).

DISCUSSION

Being obese was associated with a greater likelihood of trying to lose weight among US high school boys or girls. Although prevalence of being obese was higher among boys, the percentage of trying to lose weight was much higher among girls. This finding implies that girls are probably more sensitive to weight issues and are more aggressively trying to control or lose weight. Finding that greater physical inactivity and soda drinking was significantly associated with adolescent obesity replicates findings from studies in other countries.^{22–24}

Interestingly, greater physical inactivity was significantly associated with trying to lose weight, regardless of sex. This finding was consistent across weight categories and contradictory to our hypothesis that adolescents with obesity, who were trying to lose weight, would increase physical activity. On the other hand, adolescents who are trying to lose weight may reduce soda drinking based on our finding that it was inversely associated among girls but not among boys. That is, girls who tried to lose weight were less likely to drink soda than those who do not, regardless of their weight status.

We were unable to identify from the cross-sectional YRBS data as to why trying to lose weight is still associated with physical inactivity in general among high school students, and inversely associated with reduced soda drinking, particularly among girls. At the environmental level, access to physical activity facilities at schools and neighborhood areas may be discouraged, perhaps due to inadequate or outdated equipment,²⁵ as well as safety issues.²⁶ In addition, health education and promotion of healthy physical activity behaviors might be inadequate. At the individual level, it may be harder to reduce screen times on game-playing or navigating social networking sites and apps that have become a perceived “essential,” yet often excessive, part of adolescent daily life.^{27,28} In addition, academic burdens also may hinder students from spending more times on physical activity. Therefore, drinking less soda might be easier option to take as a strategy for high school students who try to lose weight than increasing physical activity.

The soda reduction strategy, however, ideally would combine with interventions or strategies for promoting physical activity among adolescents who try to lose weight. Ultimately, reducing the positive energy imbalance gap would result in weight loss at both individual and population levels.²⁹ To this end, at the society level, an implementation strategy for increasing physical activity might consider contextual factors such as peer support, and home and community environmental settings, that is, walkability on streets or neighborhoods, and use of parks.

School-based interventions might engage families and result in more positive weight outcomes.^{30,31} At the individual level, setting lifestyle SMART (specific, measurable, attainable, reasonable, and time-specific) goals for healthy diet and physical activity may also need to be emphasized. Health educators could assist students with identifying their needs and choosing particular goals and guide them step-by-step in achieving their goals. For example, a SMART goal could be following the dietary guidelines³² or reaching a recommended level of physical activities.³³

Strengths and Limitations

The strength of this study is that findings come from a nationally representative sample of high school students. Therefore, generalizability of the findings is possible. A limitation is its cross-sectional nature that does not allow causal interpretations of the findings. In addition, the criteria applied to the definitions of physical activity variables in the present analysis, albeit calculated by the YRBS, may be somewhat arbitrary. Although the questionnaire items are reliable, the responses are self-reported.

Conclusion

In conclusion, for girls who were obese, trying to lose weight was not associated with reducing physical inactivity even if it was associated with reducing soda drinking. Systematic or orchestrated efforts from all parties including students, families, schools, and communities to assist high school students trying to lose weight are needed that will result in increased physical activity, and in turn, greater likelihood of achieving successful weight management.

IMPLICATIONS FOR SCHOOL HEALTH

Nationwide school-based studies, which include personalized goal setting, health promotion campaigns, environmental changes, and collaboration among stakeholders have achieved modest improvement in some obesity-related indices.^{34,35} Curricula and tools from these studies and governmental agencies are available to help schools develop local programming related to soda intake, physical activity, and other key behaviors. School wellness committees created to comply with the requirement for receiving federal school funding, are positioned to bring together administrators, teachers, students and other stakeholders in the planning process.^{36,37} Strategies with online resources and tool can help schools:

- Assess needs using components from the School Health Index (<https://www.cdc.gov/healthyschools/shi/index.htm>);

- Develop school policies and programming that promote water availability and reduce soda availability, as well as intramural after-school physical activity, through a school wellness committee (<https://www.pta.org/home/programs/Healthy-Lifestyles/School-Wellness-Policies>);
- Incorporate selected modules from Healthy Me curriculum, which addresses water/sugary beverage intake and physical inactivity, into high school health course (<https://www.ck12.org/tebook/HealthCorps-Skills-For-A-Healthy-Me/section/2.0/>, Accessed February 13, 2019)
- Incorporate personalized goal setting, which is based on self-assessment of habits including soda intake and physical inactivity, into high school health curriculum with online tools (<https://www.healthymejourney.com/journey/self-assessment/>); and
- Select components related to sugary beverage intake and physical activity/inactivity from a middle school obesity prevention curriculum (<http://www.healthystudy.org/>).

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Table 1.

Participants' Characteristics by Sex

Characteristics	Mean (SD), % (95% CI)	
	Boys (N = 6950)	Girls (N = 6621)
Age (years)	16.2 (1.2)	16.1 (1.2)
Height (cm)	176.0 (8.4)	162.6 (7.5)
Weight (kg)	73.8 (16.9)	61.8 (14.4)
Body Mass Index (kg/m ²)	23.8 (4.8)	23.4 (5.1)
Hispanic/Latino Ethnicity	21.0%(16.6%, 25.3%)	21.4%(16.7%, 26.2%)
Physical Activity<5days	42.7%(41.0%, 44.5%)	62.7%(60.0%, 65.4%)
Games 3 hours	42.3%(40.2%, 44.4%)	40.4%(37.5%, 43.2%)
No Sports	40.4%(37.7%, 43.2%)	51.5%(48.9%, 54.1%)
Soda 2 times	22.2%(18.6%, 25.7%)	16.6%(13.8%, 19.3%)
Being Obese (>= 95%-tile)	16.6%(14.8%, 18.3%)	10.8%(9.7%, 12.0%)
Trying to Lose Weight	33.0%(31.1%, 34.9%)	62.6%(60.5%, 64.6%)

Note: Rates of missing data depend on the characteristics.

CI, confidence interval.

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Table 2.

Associations of Being Obese with Physical Inactivity and Soda Drinking

Sex	Being Obese		Bivariate Analysis		Multivariable Analysis [†]	
	Yes	No	OR (95% CI)	p	OR (95% CI)	p
Boys						
Physical Activity <5days	49.90%	40.90%	1.4 (1.2, 1.7)	<.001	1.5 (1.2, 1.7)	<.001
Games 3 hours	50.70%	40.20%	1.5 (1.3, 1.8)	<.001	1.6 (1.3, 1.8)	<.001
No Sports	44.70%	38.80%	1.3 (1.0, 1.6)	0.018	1.3 (1.1, 1.6)	0.012
Soda 2 times	26.60%	21.50%	1.3 (1.1, 1.6)	0.001	1.3 (1.1, 1.6)	0.003
Girls						
Physical Activity <5days	77.30%	60.50%	2.2 (1.8, 2.8)	<.001	2.2 (1.8, 2.8)	<.001
Games 3 hours	49.70%	39.30%	1.5 (1.2, 1.9)	0.002	1.6 (1.3, 1.9)	<.001
No Sports	69.90%	48.80%	2.4 (1.9, 3.1)	<.001	2.4 (1.9, 3.0)	<.001
Soda 2 times	20.30%	15.90%	1.4 (1.0, 1.8)	0.016	1.4 (1.1, 1.7)	0.014

CI, confidence interval; OR, odds ratio.

[†]Adjusted for age and Hispanic ethnicity.

Table 3.

Associations of Trying to Lose Weight with Physical Inactivity and Soda Drinking

Sex	Trying to Lose Weight		Bivariate Analysis		Multivariable Analysis [†]	
	Yes	No	OR (95% CI)	p	OR (95% CI)	p
Boys						
Physical Activity <5days	50.30%	39.10%	1.6 (1.4, 1.8)	<.001	1.6 (1.4, 1.9)	<.001
Games 3 hours	45.20%	41.00%	1.2 (1.0, 1.4)	0.012	1.2 (1.1, 1.3)	0.024
No Sports	46.20%	37.40%	1.4 (1.2, 1.7)	<.001	1.5 (1.3, 1.7)	<.001
Soda 2 times	23.30%	21.60%	1.1 (0.9, 1.3)	0.267	1.1 (0.9, 1.4)	0.174
Girls						
Physical Activity <5days	64.10%	60.20%	1.2 (1.0, 1.4)	0.019	1.2 (1.0, 1.4)	0.007
Games 3 hours	42.40%	37.40%	1.2 (1.1, 1.4)	<.001	1.2 (1.1, 1.4)	0.002
No Sports	53.10%	49.00%	1.2 (1.0, 1.4)	0.021	1.2 (1.0, 1.3)	0.035
Soda 2 times	14.70%	19.70%	0.7 (0.6, 0.8)	<.001	0.7 (0.6, 0.8)	<.001

CI, confidence interval; OR, odds ratio.

[†]Adjusted for age and Hispanic ethnicity.