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Television, Adiposity, and Cardiometabolic Risk in Children and Adolescents

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Abstract

Background—It is largely unknown how TV use relates to depot-specific adiposity or cardiometabolic risk in children.

Purpose—To examine relationships between having a TV in the bedroom and TV viewing time with total fat mass, abdominal subcutaneous and visceral adiposity, and cardiometabolic risk in children and adolescents.

Methods—A cross-sectional study of 369 children and adolescents aged 5–18 years was conducted (2010–2011; analysis 2011–2012). Waist circumference; resting blood pressure; fasting triglycerides, high-density lipoprotein cholesterol [HDL-C] and glucose; fat mass by DXA; and abdominal subcutaneous and visceral adiposity by MRI were assessed. Cardiometabolic risk was defined as three or more risk factors including adverse levels of waist circumference, blood pressure, triglycerides, HDL-C, and glucose. Logistic regression analysis was used to compute ORs of high fat mass, subcutaneous and visceral adipose tissue mass (top age-adjusted quartile), and cardiometabolic risk, based on self-reported TV present in the bedroom and TV viewing time, controlling for age, gender, ethnicity, moderate-to-vigorous physical activity level, and unhealthy diet.

Results—In multivariable models, presence of a TV in the bedroom and TV viewing time were associated with ($p<0.05$) higher odds of high waist circumference (OR= 1.9–2.1); fat mass (OR= 2.0–2.5); and subcutaneous adiposity (OR= 2.1–2.9), while viewing TV ≥5 hours/day was associated with high visceral adiposity (OR=2.0). Having a TV in the bedroom was associated with elevated cardiometabolic risk (OR=2.9) and high triglycerides (OR=2.0).

Conclusions—Having a bedroom TV and TV viewing time were related to high waist circumference, fat mass, and abdominal subcutaneous adiposity. TV viewing time was related to visceral adiposity, and bedroom TV was related to cardiometabolic risk in children, controlling for moderate-to-vigorous physical activity and an unhealthy diet.

Registration—This study is registered at clinicaltrials.gov NCT01595100.

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Introduction

It is recommended that children's TV viewing time be limited to <2 hours/day.[1] Yet, TV viewing consumes approximately 4.5 hours every day for the average child aged 8–18 years in the U.S., and seven of ten youth have a TV in their bedroom.[2] Concurrently, 33.2% of those aged 6–19 years are considered overweight or obese.[3] One reason to limit TV viewing is its association with unfavorable body composition and health outcomes in children, as demonstrated in a meta-analysis of 232 studies.[4] Viewing TV for >2 hours/day and having a TV in the bedroom have each been associated with higher odds of overweight among children and adolescents in the National Survey of Children's Health.[5,6] Compared to peers who viewed TV <2 hours/day, obese children aged 4–17 years who viewed TV 2–4 hours/day or ≥4 hours/day had a 2.5 and 3.3 greater odds of hypertension, respectively.[7] TV viewing time during childhood and adolescence tracks into adulthood,[8] resulting in overweight and elevated total cholesterol in adulthood.[9]

The established association between TV and obesity is predominantly based on BMI.[4] The association between TV and fat mass, adiposity stores in specific depots (including abdominal subcutaneous and visceral adipose tissue), and cardiometabolic risk, is less well understood. One cross-sectional study of 434 African-American and white youth aged 14–18 years demonstrated that TV viewing time was related to body fat percentage but not to visceral adiposity.[10] The present study is a cross-sectional examination of youth aged 5–18 years to determine the association of TV viewing time and having a bedroom TV with subcutaneous adiposity, visceral adiposity, fat mass, and cardiometabolic risk factors. It is hypothesized that higher levels of TV viewing and the presence of a TV in the bedroom are associated with higher amounts of depot-specific adiposity and cardiometabolic risk.

Methods

Participants

Overall, 423 children and adolescents aged 5–18 years participated in a cross-sectional study of factors related to abdominal adiposity. Participants were recruited from Baton Rouge LA, and a telephone screening attempted to balance the sample across gender, ethnicity, age, and BMI status. Data collection occurred between 2010 and 2011, with the study analysis occurring in 2011–2012.

Participants were excluded from the present analysis if they were missing data on primary analysis variables or covariates including TV use (n=1), diet (n=12), or cardiometabolic risk factors (n=18). Twenty-four participants were excluded due to incomplete magnetic resonance image (MRI) or dual-energy x-ray absorptiometry (DXA) scans because of motion artifacts or participant refusal, and four participants were excluded for exceeding equipment weight limits. One participant was excluded as an outlier on visceral adiposity (> ±3 SD from the mean for age and gender).

The present sample included 369 children and adolescents (M: 12.3 ± 3.5 years), of which 52.6% were female (49.9% black, 46.9% white, and 3.2% other ethnicity). Informed assent and consent were provided by participants and their parents/guardians, respectively. This trial and study procedures were approved by the IRB at the Pennington Biomedical Research Center, 2009.

Anthropometry

Weight was measured to the nearest 0.1 kg on a digital scale after outer clothing and shoes were removed. Height was measured to the nearest 0.1 cm with a wall-mounted stadiometer. BMI percentile was computed using the SAS program for the 2000 CDC Growth Charts for the U.S.[11] Waist circumference was measured at the superior border of the iliac crest, at the end of normal expiration. Weight, height and waist circumference were each averaged based on two measurements (closest two of three if the difference exceeded more than 0.5 kg for weight, more than 0.5 cm for height or waist circumference).

Body Composition

Fat mass was measured by a whole body QDR 4500 DXA scanner. Body mineral and soft tissue content were analyzed by two distinct energies to compute the attenuation ratio. Scans were analyzed with QDR software for Windows V11.2. Fat mass was the sum of the fat content of the tissue at each pixel.

Subcutaneous and visceral adipose tissue of the chest/abdomen were measured using a General Electric Signa Excite MRI (3.0 Tesla). A series of five to eight slices, spaced 4.78 cm apart, were obtained between the highest point of the liver to the bottom pole of the right kidney. The number of slices varied depending on participant stature.

Subcutaneous and visceral adipose tissue area at each slice was quantified using the CNS Software Analyze package. Each slice's area was multiplied by slice gap (28 slices) by 0.000001 by voxel depth. The five to eight volumes were summed to calculate total subcutaneous or visceral adipose tissue volume (liters). This volume was multiplied by 0.9193 to calculate total mass (kilograms). The MRI analysis technician reanalyzed 20 images at the L4-L5 slice (blinded), and the coefficient of variation for test reliability averaged 0.99 (SD=1.00) for subcutaneous adiposity area and 6.63 (SD=6.35) for visceral adiposity area.

Cardiometabolic Risk Factors

A blood sample was drawn following an overnight fast. Serum triglyceride and glucose were obtained on a Beckman Coulter DXC600, high-density lipoprotein cholesterol (HDL-C) was assayed using a Trinity DXC600, and insulin level was determined by immunoassay on a Siemens Immulite 2000. Resting blood pressure was measured with a standard mercury manometer. Systolic and diastolic measurements were each measured twice and averaged (closest two of three if difference >10 mm/Hg).

Elevated cardiometabolic risk was determined based on the 2011 NIH Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents.[12] High waist circumference was defined as ≥90th percentile for age, gender, and height.[13] High-triglyceride level was defined as triglycerides ≥75 mg/dL for those aged 5–9 years and ≥90 mg/dL for those aged 10–18 years. Low HDL-C level was defined as HDL-C ≤45 mg/dL. High-glucose level was defined as fasting glucose ≥100 mg/dL. High blood pressure was defined as blood pressure ≥90th percentile for age, gender, and height.[14] Elevated cardiometabolic risk was categorized as the presence of three or more cardiometabolic risk factors.

Lifestyle Questionnaire

Participants completed a written lifestyle questionnaire, with parental assistance if necessary. Gender, age, and ethnicity were self-reported. Age was verified by birth and observation dates. Participants reported TV behaviors using questions taken from the National Health and Nutrition Examination Survey (NHANES) 2009–2010 questionnaire. These questions are similar to reliable and valid self-report instruments used in other studies.[15] To determine the presence of TV in the bedroom, participants were asked: *Do you have a TV in your bedroom?* To determine typical TV viewing time, participants were asked: *During the past 30 days, on average how many hours per day did you sit and watch TV or videos?* TV viewing time was categorized as 0–2 hours; 3–4 hours; or ≥5 hours.

The Godin-Shephard Leisure-Time Physical Activity Questionnaire,[16] a reliable instrument validated against the Caltrac accelerometer and other self-report surveys,[17] was used to determine self-report moderate-to-vigorous physical activity (MVPA) levels. Participants estimated the number of 15-minute bouts in a 7-day period that they engage in strenuous, moderate, or mild exercise. Descriptors and examples were provided for each intensity level. Total number of bouts of physical activity for each activity level was then multiplied by METs (9 for strenuous, 5 for moderate, and 3 for mild).[16] The total score is the total estimated METs per week.

Dietary intake was self-reported using an adapted instrument that has been validated against a reference standard food frequency questionnaire.[18] Participants recorded how many times per week they usually eat or drink: (1) fruits; (2) vegetables; (3) sweets (candy or chocolate); (4) coke or other soft drinks that contain sugar; (5) cake, pastries, or donuts; (6) diet coke or diet soft drinks; (7) low-fat/semi-skimmed milk (1%, 2% or skim); (8) whole milk (homogenized); (9) cheese; (10) other milk products (such as yogurt, chocolate milk, pudding); (11) cereals (such as cornflakes, Lucky Charms); (l2) white bread; (13) brown bread; (14) potato chips; (15) french fries; (16) fish; or (17) vitamins. Response options for each food/drink included never, less than once a week, once a week, 2–4 days a week, 5–6 days a week, once a day/every day, or every day more than once.

Data Analysis

A dietary pattern covariate was created using principal components analysis, controlling for age. Principal components analysis reduced the set of dietary intake variables to factors, which extract the maximum variance from the original variables.[19] The first principal component is the linear combination of variables that explains the most variance in dietary pattern. The first component was selected to represent a contrast between healthy versus less-healthy foods, explaining 17.5% of the variance in the original variables with an eigenvalue of 2.97, which exceeds the threshold of 1 for sufficient variance explained.

A chi-square test was used to examine the relationship between having a bedroom TV and TV viewing time. Differences in primary analysis variables (fat mass, subcutaneous adipose tissue, visceral adipose tissue, and cardiometabolic risk factors) by bedroom TV were calculated by independent samples *t*-tests, and differences in these variables by TV viewing time (≤2 hours/day, 3–4 hours/day, ≥5 hours/day) were calculated by ANOVA. The top quartiles of age-adjusted fat mass, subcutaneous and visceral adipose tissue mass from the overall sample were computed for analysis.

To examine the relationship between TV use and adiposity, logistic regression models were used to estimate the odds of being in the top quartile of age-adjusted fat mass, subcutaneous adipose tissue or visceral adipose tissue mass. To examine the relationship between TV use and cardiometabolic risk, logistic regression models were calculated to estimate the odds of high waist circumference, high triglycerides, low HDL-C, high glucose, and overall elevated cardiometabolic risk. The independent variables of TV viewing time (3–4 hours/day and ≥5 hours/day, with 0–2 hours/day as the referent) and having a bedroom TV (with no TV in the bedroom as the referent) were analyzed together in each model, to test for independent associations with health outcomes.

Model 1 included the covariates age, gender, and ethnicity (black versus nonblack). Model 2 also included the covariates MVPA level and dietary pattern. Bonferonni correction was used to adjust for multiple comparisons, with an alpha threshold of p=0.05/9=0.006 for analysis of proportions across TV categories, p=0.05/3=0.017 for logistic regression for adiposity, and p=0.05/6=0.008 for logistic regression for cardiometabolic risk. Interaction terms between gender and TV variables were not significant in any model, so both genders were pooled for analyses.

Results

Participants with a TV in the bedroom accounted for 65.6% of the sample. TV viewing time of 0–2 hours/day was reported by 35.2% of the sample; 31.4% reported 3–4 hours/day; and 33.3% reported ≥5 hours/day spent watching TV. Having a bedroom TV and TV viewing time were related (p<0.0001): those who had a TV in the bedroom were more likely to watch more hours/day of TV. Based on CDC BMI percentile classification,[11] 99 boys and 93 girls were normal weight, 23 boys and 30 girls were overweight, and 53 boys and 71 girls were obese.

Descriptive characteristics of the sample are reported in Table 1, stratified by bedroom TV and by TV viewing time. Males were more likely to have a bedroom TV (72% vs 60% for females, p=0.01), and black youth were more likely to have a bedroom TV (76% vs 55% for nonblacks, p<0.0001) and to view TV more hours/day (p<0.0001) than nonblack youth. Youth with a bedroom TV had higher fat mass (p=0.003); subcutaneous adipose tissue mass (p=0.002); visceral adipose tissue mass (p=0.02); and systolic blood pressure (p=0.016), compared to those who did not have a TV in the bedroom. Increasing amounts of TV viewing time were related to higher BMI percentile (p=0.035); fat mass (p=0.005); subcutaneous adipose tissue (p=0.002); waist circumference (p=0.007); glucose levels (p=0.004), and systolic blood pressure (p=0.049).

Table 2 reports the proportion of participants in the top quartile of fat mass, subcutaneous adipose tissue, visceral adipose tissue, and at elevated cardiometabolic risk, by bedroom TV and TV viewing time. A higher proportion of youth who had a bedroom TV were in the top quartile of fat mass (p=0.001) and subcutaneous adipose tissue mass (p < 0.001) and classified as high waist circumference (p=0.004), compared to those who did not have a bedroom TV. Similarly, there was a linear association across TV viewing time categories where youth who watched more hours/day of TV were more often in the top quartile of fat mass (p=0.005); subcutaneous adipose tissue mass (p=0.003); and classified as high waist circumference (p=0.005).

Logistic regression analyses revealed that bedroom TV and TV viewing time >2 hours/day were each independently associated with 2.0 to 2.5 higher odds of being in the top quartile of fat mass, when adjusted for age, gender, ethnicity, MVPA level, and dietary pattern (Table 3). In fully adjusted models, bedroom TV and TV viewing time >2 hours/day were associated with 2.1 to 2.9 higher odds, respectively, of being in the top quartile of subcutaneous adipose tissue mass. In fully adjusted models, TV viewing time ≥5 hours/day was associated with 2.0 higher odds of being in the top quartile of visceral adipose tissue mass, but bedroom TV was not associated with being in the top quartile of visceral adipose tissue mass.

In fully adjusted models, bedroom TV was associated with a 2.9 higher odds of elevated cardiometabolic risk, but TV viewing time was not (Table 4). Bedroom TV and TV viewing time 3–4 hours/day or ≥5 hours/day were each independently associated with 2.1, 1.9, and 2.1 higher odds of high waist circumference, respectively. Bedroom TV was associated with 2.0 higher odds of high triglycerides. Neither bedroom TV nor TV viewing time was associated with low HDL-C, high fasting glucose, or high resting blood pressure.

Discussion

This present study presents novel findings in regard to the relationship between TV and fat mass and depot-specific adiposity, utilizing DXA and MRI: the gold standards for these measurements. Having a TV in the bedroom and viewing TV >2 hours/day were each associated with 2 to 2.5 times the odds of being in the top quartile of fat mass, even when adjustments were made for age, gender, ethnicity, MVPA level, and diet. Similarly, both having a TV in the bedroom and viewing TV >2 hours/day were associated with 2.1 to 2.9 times the odds of being in the top quartile of subcutaneous adipose tissue mass, and viewing TV ≥5 hours/day was associated with two times the odds of being in the top quartile of VAT mass. Prior studies supporting the link between TV viewing and higher likelihood of being overweight/obese relied on anthropometric measurements of obesity.[4]

In addition to examining fat mass and depot-specific adiposity, this study also examined the relationship between TV use and cardiometabolic risk. Having a TV in the bedroom was associated with three times the odds of elevated cardiometabolic risk and was also related to a higher likelihood of elevated waist circumference and elevated triglyceride level. Exceeding TV viewing recommendations (>2 hours/day) was associated with two times the odds of elevated waist circumference. These findings partially support findings of two longitudinal and nine cross-sectional studies that demonstrated that viewing TV for more than 2 hours/day was associated with elevated cardiometabolic risk.[4] However, longitudinal studies demonstrated a link between TV viewing and high cholesterol[9] and high blood pressure,[20] which were not associated with TV viewing in the present study.

There was a stronger association between having a TV in the bedroom versus TV viewing time, with the adiposity and health outcomes. A bedroom TV may create additional disruptions to healthy habits, above and beyond regular TV viewing. For instance, having a bedroom TV is related to lower amounts of sleep and lower prevalence of regular family meals, independent of total TV viewing time.[6] Both short sleep duration[21] and lack of regular family meals[22] have been related to weight gain and obesity.

Strengths and Limitations

A marked strength of this study was the adjustment for confounders, an important consideration in the study of TV and health outcomes.[23] The present analysis adjusted for demographic variables, MVPA and dietary patterns. Shared household characteristics, such as parental rules concerning TV viewing, may also influence the association between TV viewing and adiposity. In follow-up analyses, a mixed-model approach using the SAS procedure genmod was used to control for household, of which there were 253 unique ones. Results were consistent (data not shown).

Parental SES may also confound the relationship between TV and adiposity. In follow-up analyses, the poverty income ratio[24] was not related to any adiposity or cardiometabolic risk factor (p>0.20) when added to the logistic regression models. Results were consistent (data not shown) but attenuated due to a reduced sample size with reported income (n=349). BMI may be an additional confounder in the relationship between TV and cardiometabolic risk.[25] When adjusted for BMI percentile in addition to age, gender, ethnicity, MVPA level, and dietary pattern, logistic regression analysis revealed that having bedroom TV was associated with a 1.9 higher odds (95% CI=1.1, 3.5) of high-triglyceride levels. However, the association of bedroom TV and cardiometabolic risk (two or more risk factors, excluding waist circumference) was attenuated.

One limitation of the present study was its cross-sectional design, so it is not possible to establish a causal relationship between TV use and adiposity or cardiometabolic risk.

However, interventions to reduce sedentary time including TV usage were associated with reduced BMI in a meta-analysis,[4] demonstrating a potential causal link between TV viewing and obesity that may be reversed by restricting sedentary time. The sample size was small across the wide age range, which prevented robust analysis of age, gender, and ethnicity differences, and the sample was not representative of the U.S. population. Four participants were excluded from analysis due to exceeding weight limits of the DXA, which reduced the variability of the fat mass and adiposity variables and therefore may have contributed to an underestimation of the main effects.

An additional limitation is the self-report nature of TV use, physical activity and diet. Participants may have inaccurately estimated the number of bouts of exercise, which could misclassify this key confounding variable. Future studies would benefit by the objective assessment of MVPA by using accelerometers or pedometers, and the objective measurement of TV use by remote monitoring.

A further limitation is the definition of having TV in the bedroom. Given the current trends of computer/laptop/cell phone usage for watching TV shows and movies,[2] it is possible that some youth who do not have an actual TV set in the bedroom still accumulate hours of screen time in their bedroom through other media. Considering that children aged 8–18 years spend more than 7.5 hours consuming media each day, of which only 59% is TV viewing,[2] the shift from TV to mobile devices, laptops, and iPads suggests an even more pervasive effect of media use on children's lives beyond the TV screen.

This study demonstrated that high levels of TV viewing and having a TV in the bedroom are independently associated with fat mass, subcutaneous adiposity, and waist circumference, even when MVPA and diet are controlled. Viewing TV for 5 or more hours/day was associated with increased visceral adiposity, and having a TV in the bedroom was associated with elevated triglycerides and overall cardiometabolic risk. The influence of TV on the health of children and adolescents is of substantial importance to public health.

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Table 1

Descriptive characteristics of study sample by TV in the bedroom and by TV viewing time.

	TV in the Bedroom			TV Viewing Time (hours/day)			
	No (*n*=127)	Yes (*n*=242)	*p*-value[a]	0–2 (*n*=130)	3–4 (*n*=116)	≥5 (*n*=123)	*p* for trend[b]
Age, years	11.8 (3.5)[c]	12.6 (3.5)	ns	12.0 (3.7)	12.6 (3.2)	12.4 (3.6)	ns
Male, %	38.6	52.1	**0.01**	46.9	47.4	50.1	ns
Ethnicity, %							
black	34.6	57.9	**<0.0001**	33.8	52.6	64.2	**<0.0001**
nonblack	65.4	42.1		66.2	47.4	35.8	
BMI Percentile, %	69.9 (27.1)	74.8 (28.0)	ns	68.1 (27.9)	75.1 (26.6)	76.6 (28.0)	**0.035**
Fat Mass, kg	14.4 (9.1)	18.4 (13.0)	**0.003**	14.3 (10.6)	18.0 (11.7)	19.0 (13.0)	**0.005**
Subcutaneous adipose tissue Mass, kg	3.2 (2.7)	4.4 (3.9)	**0.002**	3.1 (3.0)	4.3 (3.6)	4.6 (4.0)	**0.002**
Visceral adipose tissue Mass, kg	0.11 (0.11)	0.14 (0.15)	**0.020**	0.12 (0.13)	0.15 (0.14)	0.15 (0.14)	ns
Waist circumference, cm	71.9 (15.0)	78.4 (18.3)	ns	72.4 (15.4)	77.7 (17.8)	78.8 (18.7)	**0.007**
Triglyceride, mg/dL	63.8 (31.4)	68.7 (36.2)	ns	64.3 (33.0)	70.5 (38.0)	66.6 (32.9)	ns
HDL-C, mg/dL	53.3 (11.7)	53.3 (12.4)	ns	52.9 (11.4)	52.2 (11.2)	54.9 (13.7)	ns
Glucose, mg/dL	88.1 (6.3)	88.9 (6.5)	ns	87.4 (6.3)	90.2 (6.7)	88.5 (6.0)	**0.004**
Insulin, uU/mL	9.8 (10.1)	6.2 (5.1)	**0.0002**	6.5 (5.2)	10.4 (12.0)	9.0 (7.9)	**0.002**
Systolic Blood Pressure, mm/Hg	101.9 (11.0)	104.8 (10.7)	**0.016**	101.9 (10.8)	104.6 (11.1)	105.0 (10.5)	**0.049**
Diastolic Blood Pressure, mm/Hg	64.3 (8.2)	64.6 (9.4)	ns	63.7 (8.9)	65.3 (8.8)	64.7 (9.3)	ns

Note. Bold indicates significant difference between TV categories, $p<0.05$. HDL-C, high-density lipoprotein cholesterol.

[a] For bedroom TV, the *p*-value was calculated by chi-square tests for categoric variables and *t*-tests for continuous variables.

[b] For TV viewing time, the *p* for trend was calculated by chi-square test for categoric variables and ANOVA for continuous variables.

[c] Parentheses indicate SD.

Table 2

Proportions of the sample at elevated adiposity and cardiometabolic risk,[12] stratified by TV in the bedroom and TV viewing time.

	TV in the Bedroom			TV Viewing Time, hours/day			
	No (*n*=127)	**Yes (*n*=242)**	***p*-value**	**0–2 (*n*=130)**	**3–4 (*n*=116)**	**≥ 5 HDLH (*n*=123)**	***p* for trend**
Top Quartile Fat Mass [a]	15.0	30.2	**.001**	15.4	27.6	32.5	**.005**
Top Quartile	13.4	31.0	**<.001**	14.6	29.3	31.7	**.003**
Subcutaneous adipose tissue Mass [a]							
Top Quartile visceral adipose tissue Mass [a]	20.5	27.3	ns	18.5	27.6	29.3	ns
High Waist Circumference [b]	21.3	36.0	**.004**	20.8	33.6	39.0	**.005**
High Triglycerides [c]	19.7	25.2	ns	20.8	25.9	23.6	ns
Low HDL-C [d]	24.4	24.8	ns	26.2	23.3	24.4	ns
High Glucose [e]	1.6	5.0	ns	1.0	6.0	4.9	ns
High Blood Pressure [f]	6.3	7.0	ns	5.4	6.9	8.1	ns
High Cardiometabolic Risk [g]	3.9	9.5	ns	5.4	9.5	8.1	ns

Note. Bold indicates significant difference between TV categories, $p < 0.006$. HDL-C, high-density lipoprotein cholesterol.

[a] Adjusted for age.

[b] High waist circumference was defined as ≥90th percentile based on age, gender, and height.

[c] High triglycerides was defined as ≥75 mg/dL for those aged 5–9 years and ≥90 mg/dL for those aged 10–18 years.

[d] Low HDL-C was defined as ≤45 mg/dL.

[e] High glucose was defined as fasting glucose ≥100 mg/dL.

[f] High blood pressure was defined as ≥90th percentile for age, gender and height.

[g] Cardiometabolic risk was calculated as the presence of three or more cardiometabolic risk factors.

Table 3

ORs for adiposity by TV viewing time and presence or absence of a TV in the bedroom

	Top Quartile of Fat Mass [a]		Top Quartile of subcutaneous adipose tissue mass [a]		Top Quartile of visceral adipose tissue Mass [a]	
	Model 1 b	**Model 2 [c]**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
TV in the Bedroom						
No	1.0	1.0	1.0	1.0	1.0	1.0
Yes	**2.3 (1.3, 4.3)**	**2.5 (1.3, 4.5)**	**2.8 (1.5, 5.3)**	**2.9 (1.5, 5.5)**	1.6 (0.9, 2.8)	1.6 (0.9, 3.5)
p for trend	**0.007**	**0.001**	**0.002**	**<0.001**	0.134	0.077
TV Viewing Time, hours per day						
0–2	1.0	1.0	1.0	1.0	1.0	1.0
3–4	**1.9 (1.0, 3.7)**	**2.0 (1.0, 3.8)**	**2.2 (1.1, 4.3)**	**2.2 (1.1, 4.4)**	**1.9 (1.0, 3.5)**	1.9 (1.0, 3.5)
≥ 5	**2.1 (1.1, 4.0)**	**2.2 (1.2, 4.3)**	**2.0 (1.0, 4.0)**	**2.1 (1.1, 4.1)**	**2.0 (1.1, 3.8)**	**2.0 (1.1, 3.8)**
p for trend	0.029	0.140	0.053	0.252	0.031	0.119

Note. Bold indicates significance, $p < 0.017$.

[a] Adjusted for age.

[b] Model 1 is adjusted for age, gender, and ethnicity.

[c] Model 2 is adjusted for age, gender, ethnicity, MVPA level, and dietary pattern.

Table 4

ORs for cardiometabolic risk by TV viewing time and TV in the bedroom

	Cardiometabolic Risk (Three or more risk factors)		High Waist Circumference		High Triglycerides	
	Model 1 [a]	**Model 2** [b]	**Model 1**	**Model 2**	**Model 1**	**Model 2**
TV in the Bedroom						
No	1.0	1.0	1.0	1.0	1.0	1.0
Yes	**2.9 (1.0, 8.4)**	**2.9 (1.0, 8.4)**	**2.1 (1.2, 3.5)**	**2.1 (1.2, 3.6)**	**2.1 (1.2, 3.7)**	**2.0 (1.1, 3.7)**
p for trend	0.059	0.049	0.011	**0.006**	0.022	0.025
TV Viewing Time, hours/day						
0–2	1.0	1.0	1.0	1.0	1.0	1.0
3–4	2.1 (0.8, 5.9)	2.1 (0.8, 5.9)	**1.9 (1.0, 3.4)**	**1.9 (1.1, 3.5)**	**1.8 (1.0, 3.4)**	1.8 (1.0, 3.4)
≥ 5	1.6 (0.6, 4.7)	1.6 (0.6, 4.7)	**2.1 (1.2, 3.9)**	**2.1 (1.2, 3.9)**	1.6 (0.8, 3.1)	1.6 (0.8, 3.0)
p for trend	0.395	0.594	0.014	0.048	0.149	0.192
	Low HDL-C		High Glucose		High Blood Pressure	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
TV in the Bedroom						
No	1.0	1.0	1.0	1.0	1.0	1.0
Yes	0.9 (0.5, 1.6)	0.9 (0.5, 1.6)	2.7 (0.6, 13.3)	2.8 (0.6, 13.7)	0.8 (0.3, 2.1)	0.8 (0.3, 2.1)
p for trend	0.883	0.611	0.262	0.210	0.706	0.729
TV Viewing Time, hours/day						
0–2	1.0	1.0	1.0	1.0	1.0	1.0
3–4	0.9 (0.5, 1.6)	0.9 (0.5, 1.6)	7.5 (0.9, 63.9)	7.6 (0.9, 64.7)	1.1 (0.4, 3.3)	1.1 (0.4, 3.1)
≥5	1.1 (0.6, 2.0)	1.0 (0.5, 1.9)	5.0 (0.6, 44.4)	5.3 (0.6, 47.3)	1.3 (0.4, 3.8)	1.1 (0.4, 3.2)
p for trend	0.861	0.695	0.232	0.298	0.634	0.915

Note. Bold indicates significance, $p<0.008$.

[a] Model 1 is adjusted for age, gender, and ethnicity.

[b] Model 2 is adjusted for age, gender, ethnicity, MVPA level, and dietary pattern.

HDL-C, high-density lipoprotein cholesterol; MVPA, moderate-to-vigorous physical activity